REPUBLIC OF RWANDA

FIFTH NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY

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EXECUTIVE SUMMARY

The preparation of the Fifth National Report to the Convention on Biological Diversity (CBD) is one of the key obligations of the Parties to the Convention. It is an important communication tool for biodiversity planning, providing the analysis and monitoring necessary to inform decisions on the implementation of the convention.

This report is structured in three major parts:

i. An update of biodiversity status, trends, and threats and implications for human well-being;
ii. National Biodiversity Strategy and Action Plan (NBSAP), its implementation and the mainstreaming of biodiversity in different sectors; and
iii. An analysis on how national actions are contributing to 2020 CBD Aichi Targets, and to the relevant 2015 Millennium Development Goals (MDGs).

PART 1: AN UPDATE OF BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR HUMAN WELL-BEING

This section comprises four main sub-sections including statements on the importance of biodiversity for the country; the main threats to biodiversity both in natural and agro-ecosystems; the major changes that have taken place in the status and trends of biodiversity; and the impacts of the changes in biodiversity for ecosystem services and the socio-economic and cultural implications of these impacts.

- ***Importance of biodiversity for the country's economy:*** it has been demonstrated that the country's economic prosperity depends on how natural capital is maintained. Now, in Rwanda, there is a good understanding of linkages between biodiversity, ecosystem services and human well-being, though the value of biodiversity is not yet reflected in country broader policies and incentive structures.

In fact, the country is endowed with favorable climatic conditions and natural ecosystems that are providing enough important goods and services to support the national economy and improve population's livelihood. National protected areas (parks and reserves) provide a lot of goods and

services contributing to the growth of national economy and population welfare. Rwanda's tourism development mostly nature-based is a key source of development, poverty alleviation and employment. Tourism is estimated to have generated 293.6 Million USD in 2013. Compared to 281.8 Million USD generated in 2012 at the same period, it corresponds to an increase of 4% (RDB, 2014).

Furthermore, in 2010/11 the number of employees in tourism sector was estimated at 23,000 with many more sectors indirectly benefiting from tourism, such as restaurants, transportation services and retail trade (NISR, 2012/EICV-3).

Taking into account the importance of the tourism sector, the Government of Rwanda has enacted the "Rwanda Protected Areas Concessions Management Policy" allowing private sector to invest in protected areas seeking to lay the foundations for increased competence and expertise of the private sector through concessions to increase the productivity of tourism in protected areas, as well as providing revenues to the Government.

Beside biodiversity in protected areas and other natural ecosystems, the agro-biodiversity contributes to also boosting the national economy. In Rwanda, the agriculture sector, through the utilization of agro-biodiversity, contributed 32.7% of GDP in 2011 and 28% of total growth (EDPRS II, 2013). According to the United Nations Food and Agriculture Organization, 40% of the world's economy is based directly or indirectly on the use of biological resources.

- ***Major changes that have taken place in the status and trends of biodiversity:*** both negative and positive changes occurred in the status and trends of biodiversity in Rwanda and most of them are human induced though natural induced changes are also highlighted at some level.

The main ***Negative changes*** occurred or occurring in biodiversity status in Rwanda are the following:

i. Converting process of Karama savannah natural forest covering an estimated area of 1,000 ha (REMA, 2011) into farming, grazing lands and other economic activities;

ii. Massive logging of Nyungwe buffer zone forest for charcoal and timber production where New Forest Company (NFC) is exploiting around 11,000 ha of plantations for poles;
iii. Mukura forest reserve degradation due to mining exploitation;
iv. Water hyacinth invading lakes including lakes of Bugesera, Gisaka, Nasho and other water bodies, especially in Nyabarongo-Akagera rivers system and Akagera wetland complex;
v. Decreasing or extirpation of native fish species in lakes of Nyabarongo-Akagera rivers system due to the invasion and increase of predators species among which are *Protopterus aethiopicus* and *Clarias gariepinus*. The most threatened and disappearing species are : *Barbus kerstenii* PETERS, 1868; *Clarias liocephalus* BOULENGER, 1898; *Mastacembelus frenatus* BOULENGER, 1901; *Oreochromis macrochir* BOULENGER, 1912 (Ntakimazi, 2007);
vi. Drying of water bodies (small lakes) in the summit of volcanoes' mountains of the Volcanoes National Park and altitudinal upward migration of species distribution due to climate change effects;
vii. Underutilization and disappearance of landraces and local breeds due to crop intensification policy that favors high yields varieties and races.

***Positive changes**:* the most existing case of positive change is the ongoing Gishwati forest reserve rehabilitation which is proposed to be upgraded as a national park in future. In addition, the consecutive flooding disasters to Gishwati forest degradation are now controlled due to the rehabilitation of the area.

Other positive changes include among others the following:

i. Increased number of Primates troops and Ungulates populations in Akagera National Park from 1998 to date;
ii. Increased number of Mountain Gorilla population in Virunga Mountains from 1971 to date;
iii. High participation and involvement of local communities around Akagera National Park (ANP) in restoring Akagera lakes;

iv. Erection of the electrical fence completed in the South-Western parts of Akagera National Park;
v. Improvement of environmental education and awareness;
vi. Boreholes, solar surface water pumps and small dams provided for communities outside ANP;
vii. Revenue sharing program for funding socioeconomic activities that benefit the local communities living around national parks; and
viii. Initiation of Special Guarantee Fund to deal with compensation of damages caused by the wild animals.

- ***Main threats to biodiversity both in natural and agro-ecosystems :*** Biodiversity has, over the years, been subjected to various threats causing loss within species richness, populations sizes and ecosystems degradation due to the following main threats: *poaching, boundary encroachment,* f*ires, alien invasive species, predation, deforestation, illegal mining, illegal grazing, human-wildlife conflict, damming, dropping water levels, fish and lions poisoning, commercial fishing, lack of proper regulations, infrastructures' development, water extraction, plant extraction, drainage of wetlands outside park, plant and animal diseases transmissible from livestock to wildlife, lack of connectivity, climate change, etc*.

However, since the early 1990s, Rwanda has made tremendous efforts to address these threats through national programmes and also through international cooperation including ratification of the Convention on Biological Diversity (CBD) and related protocols.

- ***Impacts of the changes in biodiversity on ecosystem services: socio-economic and cultural implications of these impacts***

The biodiversity provides various and useful ecosystems services and goods which are fundamental elements for country economic development, specifically for Rwanda as developing country mostly relying on natural resources for its development and for its population welfare. Therefore, negative changes in ecosystems and other components of the biodiversity can make them unable to provide such services with serious implications on the society and economy development, since main sectors are heavily dependent on biodiversity and ecosystem services.

The degradation of Mukura and Gishwati forest reserves is one of the examples that illustrate the consequences of biodiversity degradation, as this degradation caused drastic reduction in water

flow of upper streams and lowlands drying, because the forest that used to serve as natural sponge feeding downstream water system has been disrupted. Furthermore, downstream water users for crop production and domestic needs have suffered either from water shortage or loss of water quality, because of heavily accumulated soil sediments carried out from upstream by uncontrolled soil erosion. The recent management and conservation programs planned and in execution have halted Gishwati forest reserve's degradation and substantially contributed to reduction in flooding phenomenon, landslides, decreased soil fertility, improper water quality, and heavy river siltation, all of which lead to aggravated poverty within local population.

Socio-economically, the loss of agro biodiversity leads to fewer options for ensuring more diverse nutrition, enhancing food production, raising incomes, coping with environmental constraints and sustainably managing ecosystems (FAO, 2004).

Genetic resources and agro-biodiversity constitute the foundation upon which agriculture development and food security is based. Thus, the loss of agro-biodiversity due to changes in climate conditions undermines such foundation, by posing serious threats to food security, poverty alleviation, and increases the economic risk for human community.

PART 2: NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (NBSAP): IMPLEMENTATION AND THE MAINSTREAMING OF BIODIVERSITY

This section is sub-divided into five sub-sections including:

- National targets set for biodiversity conservation;
- NBSAP development and mainstreaming process;
- Actions undertaken since the Fourth National Report to the CBD and related outcomes;
- First NBSAP implementation level and gaps, and
- Biodiversity mainstreaming into sectoral and cross-sectoral strategies, plans and programmes.

❖ *National targets set for biodiversity conservation*

Nineteen national targets for biodiversity conservation were defined in line with the Biodiversity Aichi Targets of the Strategic Plan for Biodiversity 2011-2020:

Target 1: By 2020, at the latest, Rwandan people are aware of the values of biodiversity and ecosystems services as well as apprehend the steps for use and conserve them sustainably.

Target 2: By 2020, the values of biodiversity and ecosystems' services have been integrated into planning processes, poverty reduction strategy and into national economy.

Target 3: By 2020, at the latest, positive incentives for biodiversity conservation and sustainability towards local communities' development are boosted and applied. Harmful incentives are eliminated.

Target 4: By 2020, public and private sectors and civil society have promoted and implemented plans that consider ecosystem carrying capacity.

Target 5**:** By 2020, natural ecosystems, especially identified "Alliance for Zero Extinction (AZE)" sites are safeguarded, their degradation and fragmentation reduced.

Target 6: By 2020, fishing and aquaculture, agriculture and forestry are managed sustainably, legally and taking into consideration ecosystem specificities to ensure biodiversity conservation.

Target 7**:** By 2020, environmental pollutants including those from excess nutrients are controlled and their harm has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 8**:** By 2020, invasive alien species, their pathways, spatial distribution are identified. Harmful species are controlled or eradicated, and related mitigation measures are put in place.

Target 9: By 2020, at least 10.3 per cent of land area is protected to maintain biological diversity.

Target 10**:** By 2020, the extinction of threatened species are prevented and their conservation status improved, particularly for those that are most endangered of extinction.

Target 11**:** By 2020, the genetic diversity of local animal breeds and landraces as well as their wild relatives are conserved, thus in order to minimize genetic erosion.

Target 12: By 2020, the potential risks resulting from biotechnology use and placement on the market of its products have been minimized and/or eliminated.

Target 13: 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.

Target 14**:** By 2020, 30% of the country is covered by forests hence increasing carbon stocks and contributing to climate change mitigation and adaptation.

Target 15: By 2017, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is integrated into national legislation and administrative practices and enforced.

Target 16: By 2016, Rwanda has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated National Biodiversity Strategy and Action Plan (NBSAP).

Target 17: By 2020, values of traditional knowledge, cultural heritage and practices of local communities relevant for sustainable use and conservation of biodiversity are enhanced, fully integrated into national policy and legal framework and reflected in the implementation of the NBSAP.

Target 18**:** By 2020, knowledge in biodiversity status, values, causes and consequences of biodiversity loss, is enhanced, shared across the country and reflected in the implementation of the NBSAP.

Target N^{o} 19: By 2020, at the latest, the mobilization of financial resources for an effective implementation of NBSAP from all potential sources, and in accordance with agreed process in the strategy for resource mobilization, is reinforced and reach an appreciable level.

- ***Cross-sectoral process for the NBSAP revision and updating***

The national targets have been developed in line with the Aichi Targets of the CBD, but also based on needs and priorities identified during the stocktaking exercise conducted across the

country through broader consultations with different stakeholders from various institutions and organizations, both at central and decentralized levels. In addition to consultation meetings and focus group discussions held, a huge documentation has been collected from various sectors directly or indirectly involved in biodiversity management (conservation and utilization). The literature review included plans, reports, project documents, policies and laws, etc. Different sources of information provided data on current status of biodiversity and related causes and consequences of its loss.

❖ ***Actions undertaken since the Fourth National Report to the CBD and related outcomes***

From the time the Fourth National Report has been prepared and submitted to the CBD, numerous achievements have been recorded towards biodiversity conservation and socio-economic development. The main achieved actions related to each one of the following outcomes are:

✓ ***For the outcome related to "Improved conservation of protected areas and wetlands"***, accomplished actions are:

i. Conducting inventory of the biodiversity of critical wetlands and islands;
ii. Mapping of threatened remnant natural forest ecosystems;
iii. Establishment of regulatory buffer zones for lakes and rivers;
iv. Restoration of lakeshores and riverbanks;
v. Restoration of degraded forests including 15,000 ha restored through the Forest Conservation Project (PAFOR) with financial support of the African Development Bank (AfDB);
vi. Development of forest management plans targeting 30 Districts (MINIFOM, 2010);
vii. Development of laws and related decrees to protect biodiversity, wildlife, forests, wetlands, threatened species, to ensure environmental impact assessment is conducted for any project susceptible to have adverse impact on environment;
viii. Awareness raising through media, television and radio broadcasts, celebration of environment, biodiversity and wetland days;
ix. Restoration/rehabilitation and maintenance of ANP water bodies using the community approach;

x. Creation of environmental schools and clubs around ANP and the implementation of the Greening Schools Project;
xi. Establishment of District environmental committees in 30 districts; and
xii. Establishment of an internship programme to improve environmental mainstreaming at central (sectoral ministries and private sector federation) and decentralized (Districts) levels.

- ✓ ***For the outcome related to "Rational use of biotechnology"***, achieved actions are the development of National Bio-safety Framework (NBF) including:

i. National biotechnology and bio-safety policy;
ii. National bio-safety bill, and
iii. Institutional framework.

However, the adoption of those instruments has not yet been completed, but this provides an opportunity of updating and matching with evolving legal and institutional framework.

- ✓ ***For the outcome related to "Strengthened policy, legal, and strategy frameworks",*** number of new key policies, laws and strategies have been adopted by the Government of Rwanda and include among others the following:

i. Economic Development and Poverty Reduction Strategy (EDPRS) II (2013-2018);
ii. National Climate Change and Low Carbon Development Strategy (2011);
iii. Rwanda Biodiversity Policy (2011);
iv. Rwanda Wildlife Policy (2013);
v. Rwanda Protected Areas Concessions Management Policy (2013);
vi. National Forestry Policy (2010);
vii. National Policy for Water Resources Management (2011);
viii. National Energy Policy and National Energy Strategy (2008-2012);
ix. National Industrial Policy (2011);
x. Biodiversity Law (2013);
xi. Forestry law (2013);
xii. Protected areas law (2013);
xiii. New Land law (2013);

xiv. Law establishing Rwanda National Climate and Environment Fund (FONERWA) (2012);
xv. Law establishing Rwanda Natural Resources Authority (RNRA, 211);
xvi. Decrees for protection of biodiversity, Payment of Ecosystems Services (PES) regulatory framework preparation, etc.

- ✓ ***For the outcome related to "Institutional framework established":***

i. Rwanda Natural Resources Authority (RNRA);
ii. Rwanda National Climate and Environment Fund (FONERWA);
iii. CBD Steering Committee, and
iv. Centre of Excellence in Biodiversity and Natural Resources Management in course of establishment.

- ✓ ***For the outcome on "Benefits derived from the use of biological resources shared equitably"***, related achievements are:

i. Ratification of Nagoya Protocol;
ii. On track development of enabling regulatory framework for domestication of the Nagoya Protocol;
iii. Development of communication-education and public awareness, capacity building;
iv. Establishment of Clearing House Mechanism; and
v. On-going process of genetic resources valuation.

- ❖ ***First NBSAP implementation level and gaps***

Rwanda has developed its first National Biodiversity Strategies and Action Plan (NBSAP) in 2003 after identification of major threats to biodiversity conservation in Rwanda and targeted the following five major outcomes:

i. Improved conservation of protected areas and wetlands;
ii. Sustainable use of the biodiversity of natural ecosystems and agro-systems;
iii. Rational use of biotechnology;
iv. Development and strengthening of policy, institutional, legal and human resource frameworks; and

v. Equitable sharing of benefits derived from the use of biological resources.

A good number of activities have been successfully achieved for each of the outlined outcomes, as it is presented throughout this report.

However, some gaps remain, and are:

i. Inefficiency in coordination of the first NBSAP implementation activities due to lack of key permanent staff to manage and monitor the overall program;
ii. Insufficient technical capacity in biodiversity and related fields;
iii. Insufficient linkage with other international instruments for complementarities and take advantage of their provisional opportunities;
iv. Conflicting priorities based on institutional mandates;
v. Lack of new appropriate financing mechanisms for the NBSAP implementation activities;
vi. Weak mobilization and coordination of donors;
vii. Absence of established benefits sharing mechanisms in agro-ecosystems production and initiation of new stimulating incentives to protect agro-biodiversity.

❖ ***Biodiversity mainstreaming into sectoral and cross-sectoral strategies, plans and programmes***

The Rwanda Vision 2020 provides guidance for the development of the overall national policies, regulations, strategies and programmes including those related to biodiversity conservation. It states that Rwanda will implement adequate land and water management techniques, coupled with a sound biodiversity policy, in order to ensure sustainable development. Cross-sectoral environmental, including biodiversity mainstreaming has been initiated from 2005 with the support of the "Poverty and Environment Initiative (PEI)" country project and has been strengthened through inclusion of an annex on environment and climate change mainstreaming in the budget call circular from 2011 by the Ministry of Finance and Economic Planning (MINECOFIN). In addition various sector ministries in charge of Local Government and Good Governance, Agriculture, Education, Natural Resources, Infrastructure, Energy, Transport, Communications and Trade and Industry are supported to integrate environmental sustainability in their policies and plans. Moreover Rwanda has decided to take the Green Economy pathway

as safer and sustainable approach to economic development and human well-being. The green economy approach is one of the priorities of the Second Economic Development and Poverty Reduction Strategy (EDPRS II) that take into account the preservation of biodiversity and ecosystem services.

PART 3: PROGRESS TOWARDS 2020 AICHI TARGETS AND 2015 MILLENIUM DEVELOPMENT GOALS

For most of both CBD Aichi and MDG targets, Rwanda is on track in their implementation process.

With regards to the progress towards the implementation of Aichi CBD Targets, national achievements reflect fully achievement for Targets 11 and 17; advanced progress for Targets 1, 3, 4, 7, 10, 12, 14, 15 and 19, whilst low achievement has been registered for Targets 2, 6, 8, 9, 13, 16 and 18.

The relevant MDG targets are 7A, 7B and 7C, all of them under MDG 7. Progress towards MGD 7 has been registered as “Advanced progress” for targets 7A, 7B and 7C (related to proportion of population using an improved sanitation facility) while “Fully achieved” has been recorded for 7C (related to proportion of population using an improved drinking water source).

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ABBREVIATIONS & ACRONYMS

AAP	:	African Adaptation Programme
ABAKIR	:	Autorité du Bassin du Lac Kivu et de la Rivière Rusizi
ACNR	:	Association pour la Conservation de la Nature au Rwanda
AfDB	:	African Development Bank
AMC	:	Akagera Management Company
		and Flora
ANP	:	Akagera National Park
AP	:	African Parks
ARCOS	:	Albertine Rift Conservation Society
ARECO	:	Association Rwandaise des Ecologistes
AWC	:	Akagera Wetland Complex
AZE	:	Alliance for Zero Extinction
BZ	:	Buffer Zone
CBD	:	Convention on Biological Diversity
CBFF	:	Congo Basin Forest Fund
CBNRM	:	Community Based Natural Resources Management
CBOs	:	Community Based Organizations
CEPA	:	Communication –Education- Participatory -Awareness
CFPI	:	Community Forest Protection Initiative
CHM	:	Clearing House Mechanism
CITES	:	Convention on International Trade in Endangered Species of Wild Fauna
CMS	:	Convention on the Conservation of Migratory Species of Wild Animals
CoE	:	Centre of Excellence in Biodiversity Conservation
COMIFAC	:	Commission Ministérielle des Forêts d'Afrique Centrale
COP	:	Conference of Parties
DDP	:	District Development Plan
DFGFI	:	Dian Fossey Gorilla Fund International
DRC	:	Democratic Republic of Congo
EAC	:	East African Community
EDPRS	:	Economic Development and Poverty Reduction Strategy

EESD	:	Environmental Education for Sustainable Development
EIA	:	Environmental Impact Assessment
EICV	:	Enquête Intégrale des Conditions de Vie
EMP	:	Environmental Management Plan
EWSA	:	Energy, Water and Sanitation Authority
FAO	:	Food and Agriculture Organization
FFS	:	Farmer Field School
FHA	:	Forest of Hope Association
FONERWA	:	Fond National de l'Environnement au Rwanda
GDP	:	Gross Domestic Product
GEF-SGP	:	Global Environment Facility –Small Grants Program
GIS	:	Geographical Information System
GMOs	:	Genetically Modified Organisms
GO	:	Gorillas Organization
GoR	:	Government of Rwanda
GVTC	:	Greater Virunga Transboundary Collaboration
ICCN	:	Institut Congolais pour la Conservation de la Nature
ICRAF	:	International Center of Research in Agro-Forestry
IGCP	:	International Gorilla Conservation Program
INATEK	:	Institute of Agriculture, Technology and Education of Kibungo
INES	:	Institut National d'Enseignement Supérieur
IRST	:	Institut de Recherche Scientifique et Technologique
IUCN	:	International Union for Conservation of Nature
IWMS	:	Integrated Watershed Management System
KCCEM	:	Kitabi College for Conservation and Environmental Management
KRC	:	Karisoke Research Center
LAFREC	:	Landscape Approach to Forest Restoration and Conservation
LDCF	:	Least Developed Countries Fund
MGVP	:	Mountain Gorillas Veterinary Program
MINAGRI	:	Ministry of Agriculture and Animal Resources
MINECOFIN	:	Ministry of Finance and Economic Planning
MINEDUC	:	Ministry of Education

MINICOM	:	Ministry of Trade and Industry
MINIJUST	:	Ministry of Justice
MININFOR	:	Ministry of Information
MININFRA	:	Ministry of Infrastructures
MINIRENA	:	Ministry of Natural Resources
MINISPOC	:	Ministry of Sports and Culture
MNV	:	Measurement, Notification and Verification
NAEB	:	National Agricultural Export Development Board
NAFA	:	National Forestry Authority
NBF	:	National Biosafety Framework
NBSAP	:	National Biodiversity Strategy and Action Plan
NCA	:	National Competent Authority
NGOs	:	Non-Government Organizations
NIRDA	:	National Industrial Research and Development Agency
NNP	:	Nyungwe National Park
NTFP	:	Non Timber Forest Products
PA	:	Protected Area
PAFOR	:	Projet d'Appui à la Reforestation au Rwanda
PCFN	:	Projet pour la Conservation de la Forêt de Nyungwe
PES	:	Payment of Ecosystem Services
PRA	:	Participatory Rapid Appraisal
RAB	:	Rwanda Agriculture Board
RBC	:	Rwanda Biomedical Center
RBM	:	Ranger Based Monitoring
RBS	:	Rwanda Bureau of Standards
RDB	:	Rwanda Development Board
RECOR	:	Rwanda Environment Conservation Organization
REMA	:	Rwanda Environment Management Authority
RNRA	:	Rwanda Natural Resources Authority
RPSF	:	Rwanda Private Sector Federation
RRA	:	Rwanda Revenue Authority
RTDA	:	Rwanda Transport Development Agency

SLM	:	Sustainable Land use Management
SODEGE	:	Société de Développement Economique et Gestion de l'Environnement
STAR	:	System for Transparent Allocation of Resources
UR	:	University of Rwanda
UWA	:	Uganda Wildlife Authority
VNP	:	Volcanoes National Park
WCS	:	Wildlife Conservation Society
WHO	:	World Health Organization

I. INTRODUCTION

Rwanda ratified the Convention on Biological Diversity (CBD) on 18th March 1995. This act provided the formal framework for the implementation of the provisions of the Convention especially its three objectives. Among key obligations include the Development of National Biodiversity Strategies and Action Plan (NBSAP) and the Preparation of National Reports.

In accordance with Article 26 of the Convention, Rwanda shall present reports on the measures taken for its implementation of the Convention and its effectiveness. In addition, Rwanda shall provide needed information on outcomes that the Conference of the Parties will build on in assessing the status of implementation, identify issues to be addressed, and relevant organizations that can support national implementation.

The Fifth National Report provides a key source of information for a mid-term review of the implementation of the Strategic Plan for Biodiversity 2011-2020. It is an important communication tool for biodiversity planning, providing the analysis and monitoring necessary to inform decisions on implementation.

Specifically, this report provides information on three main aspects that constitute the overall structure of the report:

i. The current status of biodiversity, trends, threats and implications for human well-being;
ii. The National Biodiversity Strategy and Action Plan (NBSAP), its implementation and the mainstreaming of biodiversity; and
iii. An analysis on how national actions are contributing to 2020 Aichi Biodiversity Targets and to the relevant 2015 Millennium Development Goals (MDGs).

DEFINITION OF KEY CONCEPTS

Biodiversity: is the variety of life including plants, animals, micro-organisms and the ecosystems of which they are part. It includes the genetic variation within species, the diversity of species and their interactions as well as the variety of ecosystems.

Ecosystem services: are results of combination of life forms such as ecosystem, species and genetic varieties that has made the Earth a uniquely habitable place providing the goods and services that sustain our lives such as clean air, water, food, medicine plants, fuel and materials for construction.

Agro-biodiversity: refers to all components of biological diversity of relevance to agriculture and all components of biological diversity that constitute the agro-ecosystems including variety and variability of plants, animals and microorganisms, at genetic, species and ecosystem levels, which are necessary to sustain key functions of agro-ecosystem, its structure and processes.

Alliance for Zero Extinction (AZE): is a joint initiative of 88 non-governmental biodiversity conservation organizations around the world working to prevent species extinctions by identifying and safeguarding sites where species evaluated to be Endangered or Critically Endangered under International Union for Conservation of Nature (IUCN) criteria only exist at one location on earth.

II. CURRENT STATUS OF BIODIVERSITY, TRENDS, THREATS AND IMPLICATIONS FOR HUMAN WELL-BEING

2.1. IMPORTANCE OF THE BIODIVERSITY FOR THE COUNTRY

Natural ecosystems and their biodiversity constitute our natural capital. Thus, Rwandan economic prosperity will depend on how we maintain and enhance our assets, including natural capital. In undeveloped country, where more than half of the annual governmental budget is sourced from foreign supports, the need to put forward the clear linkage between biodiversity use, ecosystem services and economic benefits is of great importance to boost the national economy.

While there is now a good understanding of the linkages between biodiversity, ecosystem services and human well-being in Rwanda, the value of biodiversity is not yet 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.

The country is endowed with favorable and less variable climatic conditions and our natural ecosystems might provide important goods and services enough to support the national economy and improve populations' livelihood. Rwanda has key assets such as protected areas as national parks and reserves, sites of scenic and scientific importance. Time has come that environmental issue such as biodiversity conservation strengthens other important economic sectors, supporting employment and local communities' welfare.

National protected areas (National parks and reserves) provide a lot of goods and services contributing to the growth of national economy and population welfare. Tourism development has often been concentrated in and around protected areas. Many governments considered tourism as a source of development, poverty alleviation and employment. Rwanda is one of the countries whose tourism activities are concentrated in protected areas, particularly in National Parks. Tourism is estimated to have generated 293.6 Million USD in 2013. Compared to 281.8 Million USD generated in 2012 at the same period, it corresponds to an increase of 4% (RDB, 2014).

Furthermore, in 2010/11 the number of employees in the tourism sector was estimated at 23,000, with many more sectors indirectly benefiting from tourism, such as restaurants, transportation services and retail trade (NISR, 2012).

Because of the above mentioned benefits, the Government of Rwanda through its Ministry of Trade and Industry developed in 2013, the "Rwanda Protected Areas Concessions Management Policy" in order to attract private sector's investments in protected areas-based tourism. It is expected that the private sector itself will identify new facilities and services to be developed under concession agreements, bringing an entrepreneurial input to investment in protected areas.

In addition, with this Concession Policy, local communities are best placed to take advantages of services provided through infrastructures development such as hotels and other facilities constructed under concession policy. Moreover, land and local products are given a competitive advantage over others.

Introducing the private sector can bring much needed finance, expertise and innovation to the tourism sector, since Rwanda has currently positioned itself as a high-end tourist destination, especially for visits to Mountain Gorillas from Volcanoes National Park (PNV).

The PNV attracted 23,800 visitors in 2012 and generated substantial revenue which contributed to the country development. The park offers also several non-timber forest products (NTFP) to local people including honey.

Apart from the VNP, the country has many other potential and growing protected areas which are generating economic and financial benefits in addition to ecological ones. These are the following:

- The Akagera National park (ANP) and its prolonged wetlands play an important hydrological role (fresh water, fresh air, climate mitigation) in the Akagera-Nile system and contribute to water cycle and the reduction of water loss by evaporation. Economically, ANP alone, tourism revenue was approximately US$ 246,000, mostly from park fees, in 2010, the first year of management of the park by AMC. This revenue was generated from approximately 15,000 visitors per annum, half of which were Rwandan citizens. Subsequently by the end of 2013 revenue has increased to US$

518,000 and annual visitor numbers now exceed 23,000 (AMC, 2011). In addition, the wetland complex constitutes an important fishing area, with high catch yield, in lakes Ihema, Rwanyakizinga, Mihindi, Nasho, Cyambwe and Rwampanga plus other marshland products.

- Nyungwe National Park (NNP) provides vital watershed protection for Rwanda and important hydrological network for the Akagera-Nile system. It includes an important wetland, Kamiranzovu, which contributes to high biodiversity maintenance, water cycle and the reduction of water loss by evaporation. For tourism industry NNP is attracting almost 8,000 visitors per annum. NNP offers opportunity for income-generating activities, i.e. beekeeping cooperatives generated 18,000,000 Rwf in 2012.

Beside biodiversity in protected areas, agro-biodiversity also contributes to the national economy. According to the United Nations Food and Agriculture Organization, 40% of the world's economy is based directly or indirectly on the use of biological resources (CBD, 2010).

In Rwanda, the agriculture sector, through the utilization of agro-biodiversity contributed 32.7% of GDP and 28% of total growth (EDPRS II, 2013). The table 1 illustrates the extent to which agriculture sector contributed to the growth of national economy.

Table 1: Contribution (in billion Rwf) of Agriculture sector to national GDP

Sector	2006	2007	2008	2009	2010	2011	2012	2013
Gross Domestic Product	2,649	2,851	3,170	3,368	3,579	3,846	4,127	4,316
Agriculture	965	990	1,053	1,135	1,193	1,244	1,278	1,317
Foods crops	634	660	701	767	805	845	872	899
Export crops	86	61	79	67	76	79	71	76
Livestock	104	107	109	113	118	122	128	129
Forestry	159	165	171	175	180	185	192	197
Fisheries	12	12	13	13	14	14	14	15

Source: NISR, 2014

2.2. BIODIVERSITY STATUS, TRENDS AND MAJOR CHANGES

2.2.1. Status and trends of biodiversity

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. The section below presents the current status of biodiversity for main ecosystems.

2.2.1.1. Akagera National Park

The Akagera National Park (ANP) covers an area of 112,000 hectares and is situated in the eastern province of Rwanda on the border with Tanzania. The ANP includes savannas intersected by strips of forests and important wetlands of the Akagera River, and its depression dotted with lakes and floating swamps. A subtle mix of mountainous terrains and humid environment rests the character, the beauty and richness of the landscape (Kanyamibwa, 2001).

The Akagera National Park is endowed with different species of fauna and flora, inhabiting its different ecological zones which include mountainous terrains, woody and savannah areas, galleries, lakes, wetlands etc. Woodland covers no more than 5% of the total area, especially colonized by *Albizia amara and Albizia petersiana.* Forest formations cover only about 1% where *Acacia kirkii* and *Acacia polyacantha* fringe along the Akagera river and lakes. Grassland occupies about 10% of the total areas and includes especially savannas *Themeda – Hyparrhenia* but also savannas *Sporobolus-Botriochchloa* plains. Vegetation in humid areas is composed mainly by Papyrus, *Miscanthidium violaceum, Cladium mariscus and Typha australis* as well as floating fern meadows and medium sedges formations.

In ANP, wildlife censuses have been conducted in different periods, including an aerial one conducted by Akagera Management Company (AMC) during August 2013.

Table 2: Summary of wildlife census results for ANP

Wildlife species	Years			
	1998	2002	2010	2013
Olive baboons	n/a	20	19 troops	61 troops
Vervet monkey	-	-	1 troop	7 troops
Blue monkey	-	-	1 troop	2 troops
Elephant**	n/a	n/a	27	88
Leopard	-	-	-	3
Buffalo**	680	309	882	2093
Giraffe	n/a	20	n/a	54
Eland	59	114	n/a	193
Bushpig	n/a	n/a	n/a	25
Bushbuck	n/a	n/a	n/a	55
Sitatunga	n/a	74	150	3
Duiker	n/a	n/a	n/a	37
Shoebill	n/a	n/a	n/a	1
Hyena	n/a	n/a	n/a	1
Oribi	n/a	n/a	n/a	20
Roan	n/a	n/a	n/a	83
Waterbuck	80	141	1144	948
Zebra	580	390	571	999
Topi	770	531	235	560
Impala	1890	982	948	1057
Reedbuck	n/a	74	n/a	47
Warthog	240	262	669	741
Hippopotamus**	n/a	552	n/a	885

Source: AMC (2013)/Aerial census

Notes

1. Results of all surveys refer to the current area considered to be Akagera National Park
2. Survey method for 2002 & 2010 was SRF. Survey method for 1997/8 & 2013 was total area count

3. ** Species counted both inside and outside sample transects in 2010
4. 2010 estimates for Elephant and Buffalo considered to be total counts
5. 2010 count of hippo considered to be undercounted and therefore not a valid estimate

a. Primates' troops trends

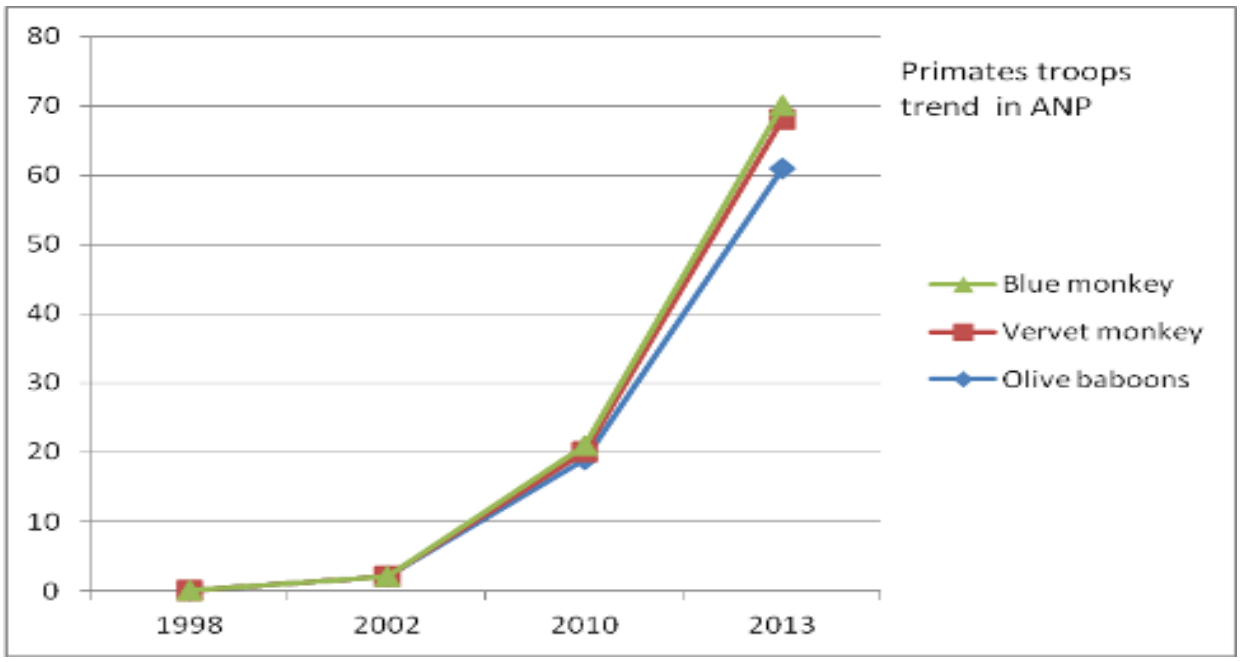

Figure 1: Trends of primates' troops

b. Ungulates' population trends for ANP

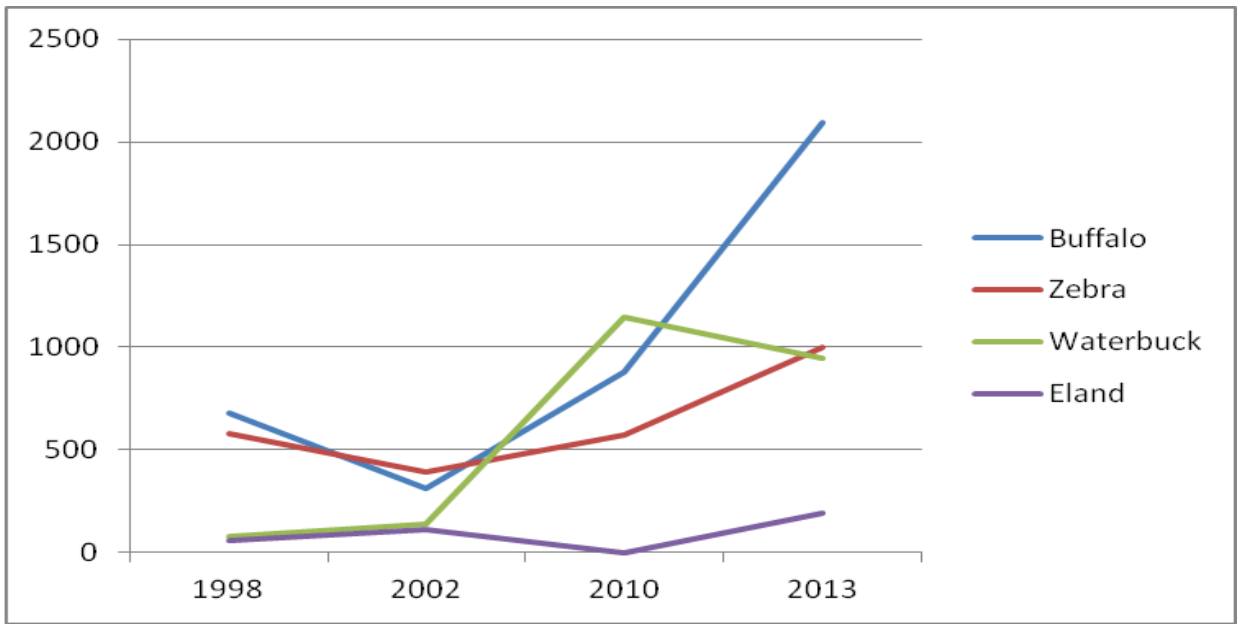

Figure 2: Ungulates' population trends

Furthermore, in relation to key species, Table 3 summarizes current population estimates and trends, threats posed and the long-term targets that are embodied in the twenty tear vision for the park.

Table 3: Wildlife population estimates, trends and threats posed

Species	Current estimate	Trend	Current threat	Long-term targets
Black rhino	**0**	**Extinct**	**Poaching**	**30**
Buffalo	**1000**	**Increasing**	**Poaching/community land**	**2000**
Bushbuck	**300**	**Stable**	**Poaching**	**500**
Common duiker	**350**	**Stable**	**Poaching**	**500**
Eland	**100-150**	**Increasing**	**Poaching**	**400**
Elephant	**80-100**	**Increasing**	**Poaching / community land**	**300**
Giraffe	**60-80**	**Increasing**	**Poaching / snares**	**200**
Hippo	**900**	**Stable**	**Poaching / crop raiding**	**1500**
Hyena	**30**	**Stable**	**Poisoning, snares**	**100**
Impala	**2500**	**Increasing**	**Poaching**	**5000**
Klipspringer	**60**	**Stable**	**Poaching**	**100**
Leopard	**20**	**Stable**	**Snares, hunted**	**30**
Lion	**0**	**Extinct**	**Poisoned, hunted**	**25**
Oribi	**500**	**Increasing**	**Poaching**	**700**
Reedbuck	**400**	**Stable**	**Poaching**	**900**
Roan antelope	**15-35**	**Stable or decreasing**	**Poaching**	**150**
Sitatunga	**100-200**	**Decreasing**	**Poaching**	**500**
Topi	**1000**	**Increasing**	**Poaching**	**3000**
Waterbuck	**450**	**Increasing**	**Poaching**	**3000**
Zebra	**700**	**Increasing**	**Poaching**	**2000**

Traditionally, Akagera National Park (ANP) had healthy populations of a wide range of wildlife animal species; these were depleted through extensive habitat loss, heavy illegal hunting or poisoning to the point of extinction for some species. Considering the wildlife census results for ANP, it would appear that most animal species numbers are on the rise; although poaching is still a serious threat for all species.

Historical records have shown some species which are now extinct such as Lion, Black rhino, African wild dogs, etc. Reference to previous records, ANP once had in the region 90 black rhinos. The current assessment has shown that the black rhino have all been poached and are now extinct in the Park. Re-introduction of that species is under consideration by the current Akagera Management Company (AP/RDB, 2011 in AMC Business Plan Report, 2013). Other endangered species are facing extinction in a near future, such as Shoebill, Hyena, Sitatunga etc.

Overall consideration of wildlife status in ANP highlights about a serious disequilibrium in faunal communities at different trophic levels. The predator/prey relationship is unbalanced; there are outnumbered preys, especially herbivorous, in comparison with available few predators. The prey species base under the current management would be sufficient to sustain the re-introduction of some predators such as Lions, after deep feasibility studies.

The restoration of the biodiversity and fully repopulating the park is an essential prerequisite for ecological and financial sustainability.

The avifauna is very rich and includes 530 species, two thirds of them inhabiting the wetland complex within the park (Kanyamibwa quoted by EXPERCO, 2003). Several bird species are protected by international conventions: 8 species by IUCN, around 100 species by CMS (Vandeweghe 2011) and about 10 species by CITES. *Lybius rubrifacies,* the red-faced barbet constitutes the only endemic species to ANP.

Concerning fish biodiversity, it was found that 21 species inhabit in the upper Akagera sub-basin, of which 15 are known from Lake Cyohoha South itself. In this lake, nine (9) species were introduced and two (2) are endemic to the sub-basin (Ntakimazi, 2007).

Among these fish species reported in the upper Akagera sub-basin:

- Two (2) are endemic to upper Akagera system *Barbus acuticeps* and *Synodontis ruandae);*
- Six (6) are native to the sub-basin Barbus kerstenii, Barbus acuticeps, Haplochromis Sp, Synodontis ruandae, Clarias liocephalus and Mastacembelus frenatus;
- Nine (9) were introduced in the sub-basin Astatoreochromis alluaudi, Haplochomis burtoni,Oreochromis leucosticus, Oreochromis macrochir, Oreochromis niloticus, Tilapia rendalli, Clarias gariepinus, Cyprinus carpio and Protopterus aethiopicus;
- Two (2) are probably going to be extinct in the lake *Oreochromis macrochir* and *Barbus kerstenii*;
- One (1) is currently not seen in the lake although still in the neighboring Akanyaru River *Synodontis ruandae*;
- Three (3) are of economic importance in fisheries, namely *Oreochromis niloticus, Clarias gariepinus* and *Protopterus aethiopicus*.
- Four (4) Tilapiines species are recorded in the sub-basin, namely: *Oreochromis niloticus*, *Oreochromis macrochir*, *Oreochromis leucostictus* and *Tilapia rendalli*.

Other species identified in the region are *Barbus kerstenii* PETERS, 1868 which decreases in abundance, *Cyprinus carpio* introduced in Rwanda through aquaculture development, *Clarias liocephalus* which populations have seriously decreased, probably due to fisheries pressure and the competition of introduced larger piscivorous species *Clarias gariepinus.*

Protopterus aethiopicus HECKEL, 1851, is a lungfish which was introduced in Lake Muhazi and widely spread in all lakes and swamps located in southern and eastern parts of the country. Its dramatic extension in all biotopes is an indication that there was an available ecological niche for it, notably food and appropriate spawning areas. Unfortunately, this voracious species is eliminating all indigenous species and causes serious impact on fisheries development in the country

2.2.1.2. Akagera wetland complex

The Akagera wetland complex constitutes also part of the Akagera/ Nyabarongo system and its lakes. It is situated south of the Akagera National Park, and represents by the fact an important extension of its swamp's flora and fauna.

Status and trends of species diversity

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 so far studied (Fischer, 2011)

With reference to International Union for Nature Conservation (IUCN, 2011) red list status, and degree of endemism of the Anuran amphibians, only *Phrynobatrachus* sp. 2 has been recorded as a local endemic species, 2 others have been recognized to be endemic in Great Lakes region and 14 species widespread in Africa. Furthermore, numerous species which are in Rwanda and do not appear elsewhere have been observed there, e.g. the frogs *Phrynomantis bifasciatus*, *Hylarana albolabris* and a possibly new species of *Phrynobatrachus* (Fischer, 2011).

With reference to IUCN (2011) red list status, and degree of endemism of the reptiles, thirteen (13) species have been recorded in Akagera wetland complex, which include 12 widespread in Africa and only 1 endemic in Great Lakes region.

2.2.1.3. Nyungwe National Park (NNP)

Nyungwe National Park (NNP) is located in the south-west of Rwanda along the Congo-Nile divide. The park, which covers a total area of 1,019 km², falls within the Albertine Rift 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 Natural Forests.

Status and trends of species diversity

Nyungwe forest contains rich floral community which consists of over 1100 species with 137 endemic species (Troupin, 1992; Plumptre *et al.*, 2002), among them more than 260 species of trees and shrubs have been identified (Dowsett, 1990). Nyungwe National Park is harboring 47 local endemics as well as 218 Albertine Rift endemics among flowering plants (Fischer and Killmann, 2008).

Nyungwe is also one of the most important sites for bird conservation in Africa with a total of 299 species. 27 species are endemic to the Albertine Rift and 173 are true forest species (Nerissa, 2008). In Nyungwe, there are 96 mammals' species in which 63 are rodents and bats, 13 are primates. Among mammals, at least 16 are endemics including two primates (Nerissa, 2008). While among 43 species of reptiles (8 species are endemic) and 31 species of amphibians with 15 endemic species (Menegon, 2008). The park has innumerable invertebrate species, but the ecosystem is especially known for its abundant butterfly populations with 21 Albertine Rift.

2.2.1.4. Gishwati National Forest reserve

Gishwati forest reserve is located in North-western part of Rwanda, from longitude 29^0 21'40'' to 29^0 28'50''East and from latitude 1^0 36' 52"to 1^0 52'17". The reserve has been subjected to the loss of natural forest patches during the last decade, the 28,000 ha of Gishwati forest in 1970 has been dramatically reduced after the genocide of 1994 and is actually estimated at 700 ha. Many habitats and their biodiversity have disappeared due to forest destruction.

Status and trends of species diversity

Before its destruction, Gishwati forest reserve harbored 16 big trees species, which constituted a luxuriant forest. The remaining part of Gishwati natural forest still contains a limited number of plants species like *Symphonia globulifera, Dombeya torrida, Hagenia abyssinica, Maesa lanceolata, Vernonia auriculifera, Cyathea manniana, Chrysophyllum gorungosanum, Clutia abyssinica* (Barakabuye, 2005).

Gishwati natural reserve contains several plants endemic to Albertine Rift such as *Vittaria reekmansii* an epiphytic fern distributed in mountain rainforest up to 2700 m, *Rytigynia bugoyensis, Chassalia subochreata* which are shrubs or small trees, endemic epiphytic orchids such as *Rhipidoglossum bilobatum,* a prostrate creeping herb *Octomeron montanum* and *Impatiens mildbraedii* a perennial herb both found also in Gishwati.

In total, 101 bird species were recorded in Gishwati forest reserve, among them 14 are endemic to the Albertine Rift while 2 are listed as vulnerable on 2009 IUCN Red List. Three species, Black Billed Turaco (*Tauraco schuetti),* Great blue Turaco (*Corythaeola cristata*) and Ross's Turaco (*Musophaga rossae*) were also recorded (Muvunankiko, 2010). Five migrant bird species

were recorded, namely Barn Swallow, Eurasian Hobby (palearctic), European bee-eater (palearctic), Red-capped Robinchat and Red-chested Cuckoo.

Among mammals, the most observable monkeys include the following: *Pan troglodytes schwenfurthii, Cercopithecus l'hoesti, Cercopithecus mitis kandti*, and *Cercopithecus mitis doggetti* (Barakabuye, 2005)

Gishwati forest reserve is a home for not only endemic and the global conservation concern bird species, but also for other threatened species including Golden Monkey (Endangered) and *Pan troglodytes* (Endangered). (Rebecca et al., 2012) found that the entire chimpanzees' population likely numbers between 19 and 29 individuals. The golden monkey is on online index IUCN Red List of Endangered Species (IUCN, 2007). Since 2003, the golden monkey has become a tourist attraction in the Volcanoes National Park (Tuyisingize, 2006).

2.2.1.5. Mukura National Forest Reserve

Mukura, a highland forest located in the Western Province is extending between Rutsiro (Mukura and Rusebeya Sectors) and Ngororero (Ndaro and Bwira Sectors) Districts, at an elevation value ranging between 2300 - 2700 m. Established as natural reserve in 1951 with a total area of 2,000 ha, the ecosystem has been so much jeopardized and about 20.15% of its size was lost.

Mukura has been reduced to a series of small disjointed forest relicts in remote valleys and on steep slopes that are difficult to access. Consequently, many of Mukura's previously important flora and fauna, particularly birds, have disappeared.

Status and trends of species diversity

Reference to the survey done by ARECO and WCS (2006), the remaining patch of Mukura forest hosts an interesting biodiversity, a total of 243 plant species were identified. Dominant tree species included *Macaranga kilimandscharica, Psychotria mahonii* and *Neoboutonia macrocalyx.*

The survey updated the Mukura birds' species list from the previously known 59 species to 77 species (ARCOS, 2012). These include 7 Endemic species to Albertine Rift and 3 IUCN

threatened species namely Grauer's Rush Warbler (EN), Grey Crowned Crane (EN) and Kivu Ground Thrush (VU).

Mammals were dramatically reduced from this forest; their number of species has declined from 14 to 4 species. Three families of mammals and four species were identified in Mukura Forest Reserve; these include Sciuridea, Thryonomydae and Canidae.

2.2.1.6. Volcanoes National Park (VNP)

The park is situated in the north of Rwanda bordering the Democratic Republic of Congo and Uganda, and covers approximately 160km^2 of medium and high altitudes towards the south of the Virunga-Volcanoes chain. In recognition of the park's importance, VNP was added to the International Network of Biosphere Reserves under the UNESCO Man and Biosphere Program in 1983.

Status and trends of species diversity

The park has an ecologically zone which comprises the higher altitude areas and protects the park's sensitive Afro-Alpine habitats. This zone is important for the protection of 13 species of orchids listed by the CITES Convention, including: , *Disa stairssii, Polystachya sp., Arsaena mildbraana, Calanthe sylvatica , Chamaeangis sarcophylla, Cyrtorchis arcuata, Habenaria praestans, Stolziasp,* and *Cucumeria sp.* In addition, swamps and wetlands are sensitive and important habitats of rare and endemic species, including the endangered and endemic Grauer's rush warbler (*Bradypterus graueri*).

The Volcanoes National Park (VNP) is best known for the Mountain Gorilla. Virunga massif Gorilla censuses were conducted from 1971 - 2010 in order to provide a complete count of their populations.

Table 4: Virunga massif Gorilla population census from 1971-2010

Census Year	Total Gorillas Counted	Estimated Population Size
1971-73	**261**	**274**
1976-78	**252**	**268**
1981	**242**	**254**
1986	**279**	**293**

1989	**309**	**324**
2000	**359**	**359-395**
2003	**360**	**380**
2010	**464**	**480**

Source: ICCN-UWA-RDB done by Maryke Gray at all (2010)

The results from census conducted in 2010 estimated the current gorilla population in the Virunga Massif to be 480 individuals. There is 24 habituated groups (349 individuals), an additional 12 un-habituated groups (101 individuals) and 14 lone silverbacks. A correction factor of 16 for missed infants was calculated and included in the total of 480. There has been a 26.3 % increase in the total population since 2003 to 2010, or a 3.7% annual growth rate.

Table 5 illustrates other wildlife species, mostly mammals, which have been recorded in Volcanoes national park.

Table 5: Status of other fauna species of Volcanoes National Park in 2011

Wildlife species Observation	**Total count**	**Total per km**
Buffalos	**1814**	**14.64**
Black-fronted duiker	**1366**	**11.03**
Jackals	**8**	**0.06**
Hyrax	**11**	**0.09**
Squirels	**702**	**5.67**
Elephants	**54**	**0.44**
Duikers	**1039**	**8.39**
Serval	**6**	**0.04843**
Golden monkeys	**7193**	**58.06**

Source: RDB-VNP Annual Report 2011

These statistics were obtained using Management Information System software and they show that buffalos, antelopes and golden monkeys are the most observed and dominant animal species in Volcanoes National Park (VNP).

The park has also 178 recorded bird species, with at least 13 species and 16 subspecies endemic to the Virunga and Ruwenzori Mountains.

2.2.1.7. Buhanga Natural Forest Reserve

The remnant forest of Buhanga also called Gihondohondo is located in Northern Province at 7 km from Musanze District administrative center. It is a site of depression tectonics, originally corresponding to the former Nyabarongo Valley and is bounded on the East by Bugarura Sector and on west by the escarpment fault of Buhoma, in Nyabihu District (REMA, 2011).

Status and trends of species diversity

The vegetation climax of Buhanga calls back to those of Mukura Forest Reserve, Nyungwe and VNP. The dominant species include *Ficus* trees associated with *Dracaena steudneri* and *Rhus* species.

The oviparous fauna is impressive in its variety. Some animal species threatened with extinction appear such as the porcupine (*Hystrix africae)*, the jackal, the partridge and leopard.

Five families of bird species inhabit the reserve, among them, two migratory species, African Pitta (*Pitta angolensis*) and Wahlberg's Eagle (*Aquila wahlbergi*) and four species endemic to the Albertine Rift, three of them species of Nectariniidae Family, were recorded there.

It is said that the forest is home to a big snake (*Python*) with extraordinary power, which is considered as a spiritual guardian of the place (REMA, 2011).

2.2.1.8. Rugezi wetland complex

Rugezi Marshland is located southeast of the volcanoes at around 2050 m and represents a high altitude peat bog. It is a floated valley where the swamp forms a dense mat over floating peat and its deeper waters (Hategekimana *et al.* in Fischer, 2011). In the last decades, Rugezi marshland has been degraded by agriculture and exploitation of plants for animal feeding and construction (e.g. *Cyperus latifolius, Miscanthus violaceus*).

Status and trends of species diversity

Rugezi wetland is an internationally important site, despite the rather low diversity with only 94 species of vascular plants comprising 2 Albertine Rift Endemic species, 16 species of amphibians comprising 2 Albertine Rift Endemic species, 3 species of reptiles, 37 species of

birds with 1 Albertine Rift Endemic species (*Bradypterus graueri*), and 2 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, 2011).

With reference to IUCN (2011) red list status, and on degree of endemism for the anuran amphibians, Rugezi harbors seven species, among these 1 is local endemic to the site, *Phrynobatrachus sp.* and another 1 vulnerable, *Hyperolius castaneus,* endemic to Albertine Rift which has been also recorded in Rugezi wetland.

With reference to IUCN (2011) red list status, and on degree of endemism of the reptiles, among three species recorded in Rugezi marshlands, two are widespread in Africa; another one *Adolfus vauereselli* has been reported to be Albertine Rift endemic species.

2.2.1.9. Rweru - Mugesera wetland complex

The Rweru - Mugesera Complex is part of the Akagera/Nyabarongo system and its lakes, situated in the southeastern plateau at about 1300 m. In three to four last decades, the Rweru - Mugesera swamps have been highly affected by anthropogenic activities and also invasive species of plants and animals, especially the water hyacinth (*Eichhornia crassipes*) and *Protopterus aethiopicus,* which constitute mayor threat to the natural flora and fauna. Actually, the area is not protected (Fischer, 2011).

Status and trends of species diversity

Though no endemic species have been recorded, the complex represents one of the ecologically highly important *Cyperus papyrus* marshes with a typical flora and fauna. The complex revealed 53 species of vascular plants, 14 species of amphibians, 6 species of reptiles, 40 species of birds and 16 species of mammals. A large population of the bird *Laniarius mufumbiri* is still existent within the complex (Fischer, 2011).

With reference to IUCN (2011) red list status and on degree of endemism of the anuran amphibians, a total of fourteen species have been recorded in the Rweru-Bugesera wetlands

complex. Among them, 11 are widespread in Africa, while ***3*** other are endemic in Great Lakes region.

With reference to IUCN (2011) red list status, and on degree of endemism of the reptiles, 6 species have been recorded in Rweru - Mugesera wetland complex, which include five widespread in Africa and only 1 endemic in Great Lakes region.

2.2.1.10. Lake Kivu Islands Biodiversity

In total, seven islands have been surveyed in Lake Kivu: Mapfundugu Islands Complex (Mapfundugu I-IV), Karugaruka, Nyanamo, Karinga, Nyamunini, Mbabara, Mukondwe, Shegesha, Amahoro, Nyenyeri, Mpangara, Ishyute, Ireba and Nyarugaba Islands. The thematic groups studied were birds, plants, invertebrates, small mammals, reptiles, amphibians and socio-economy.

All island ecosystems are threatened; their ecosystems are extremely vulnerable to damage caused by introduced species like the exotic plants which have been introduced, overexploitation of their resources, habitat loss/degradation and fragmentation (REMA, 2011).

Status and trends of species diversity

In total, 142 plant species, 80 species of birds, 52 invertebrates, 6 mammals, 6 reptiles and 5 species of amphibians were recorded in all islands surveyed. Some species of particular interest such as endemic, rare or useful species were described. Concerning fish biodiversity, Lake Kivu is of a great poverty; it harbors 26 fish species of which 15 are endemic Haplochromines (Snoeks *et al.*, 1997 in Isumbusho *et al.*, 2006).

Kivu Islands are home of some endangered species, already registered on IUCN red list, therefore need more attention for their conservation. It is the case of the Marsh Mongoose (*Atilax paludinosus*: inzibyi), some water birds and snakes like *Bitis nasicornis* and *Naja melanoleuca.* Furthermore, more than half of birds' species recorded in Lake Kivu islands are on the IUCN red list.

According to data collected of Kivu islands, it has been identified many water birds species (12 water birds species), more than one fifth of all species recorded. They use islands for

reproduction and Kivu Lake for feeding and resting. Those islands are very important for the survivorship of the above mentioned water birds.

Lake Kivu islands are homes for many bird species and hold three migratory species (*Cossypha natalensis* on Mukondwe Island, *Milvus migrans* on Nyenyeri and Mpangara islands and *Bulbucus ibis* on Shegesha Island). *Cossypha natalensis* seems to use the Kivu islands as one of its stopovers as it was also recorded at Idjwi and Nyamunini islands (UNESCO, 2009).

Lake Kivu Islands constitute also very good areas for speciation of organisms with low capacity of dispersal like small mammals, reptilian, some amphibians and invertebrates because of their isolation over time (REMA, 2011).

2.2.1.11. Remnant natural forests

In addition to the above mentioned ecosystems, a general description of some other remnant natural forests and their characteristics were discussed together with their dominant and remarkable flora and fauna (REMA, 2011):

a) Nyabitukuru Natural Forest

Nyabitukuru, also known as Sanza forest, is a relict forest located in the Western Province, Ngororero District, Muhororo Sector, Sanza Cell. The forest is perched on the hill of Uwintobo between 1600 and 1950 m of altitude and is skirted downwards by the Satinsyi River. Nyabitukuru natural habitats were much degraded by wood cuts, illicit farming and pastures, illicit mining, etc.

In terms of biodiversity, 12 most common tree species are dominants including *Syzygium guineense , Macaranga capensis var. kilimandscharica, Pittosporum mildbraedii*, etc.., and some exotic species such as *Alnus glutinosa, Pinus patula, Grevillea robusta* and *Eucalyptus div. sp*. Herbaceous layers comprise *Acanthus pubescens, Clerodendrum rotundifolium, Eragrostis racemosa,* etc.

The animal diversity is very low, composed by common small reptiles, tropical birds and invertebrates. Some amphibians could be only found near Satinsyi River.

b) Shagasha Natural Forest

This ecosystem is a montane forest covering an area of 6 ha at an altitude of 1950m. It is located in Rusizi District, Giheke Sector and Shagasha Cell, within a depression encompassed in tea plantations near Shagasha Tea Factory.

In term of biodiversity, it is a secondary forest dominated by tree species such as *Macaranga capensis* var. *kilimandscharica* and *Maesa lanceolata.* Some primary tree species are still visible such as *Newtonia buchannani* and *Strombosia scheffleri* and native tree species such as *Syzygium guineense, Albizia gummifera,etc* on which are pending several epiphytes like orchids, mosses, ferns and lichens. Shagasha contains also some endangered species like *Cercopithecus l'hoesti* and a small population of *Cercopthecus dogetii,* both isolated from other groups found in Nyungwe. Therefore, there is a need for further studies aiming strategies and priorities of conservation of that forest and its biodiversity to avoid genetic drift.

c) Mashyuza Natural Forest

Mashyuza Forest is located in Rusizi District, Nyakabuye Sector, at an elevation varying between 1181m and 1213m. It is a patch of approximately 6 ha of natural tree and shrub species covering a hillside above the extent of the famed Bugarama geothermal water sources (Amashyuza). The east-southern side of the hill harbors the source of geothermal water whose natural heat is slightly above 60^0 C. The forest is composed by two parts: hill side which remain almost intact and the flooding plain severely disturbed (REMA, 2011).

Mashyuza forest is in low land ecosystems dominated by *Anthocleista schweinfurthii, Bridelia micrantha* and *Entada abyssinica* covered by dense liana on the hill side. Mashyuza has a rare species in Rwanda, *Sterculia tragacantha*, only found there. The site is characterized by some orchids observed in savannas and dry forests such as *Aerangis kotschyana* and a rare and local endemic plant *Nymphaea thermarum*. Small mammals, doves, crested birds and a lot of snakes have been observed in the site. It is also home to big lizards such as *Varanus niloticus*.

d) Kumbya Peninsula

Kumbya is a peninsula located in Nyamasheke District, Kanjongo Sector, Kigoya Cell, at an elevation of 1,465 – 1,487 m. It harbors a natural forest of about 6 ha and linked to the mainland by a narrow portion of land. It is a peninsula dominated by bush and forest vegetations.

In term of biodiversity, Kumbya is characteristic by the presence of *Phoenix reclinata* palms mixed with impenetrable vegetation dominated by *Rhoicissus revoilii* and *Rhus natalensis* on the shoreline of the peninsula. In some zones of the shore, on rocky areas, only *Ficus cyathistipula* grows there and produce fruits favored by many birds.

Kumbya peninsula is also home of water birds species such as *Phalacrocorax carbo, Ceryle rudis, Nettapus auriatus* and *Ispidina picta* as well as many tropical birds and invertebrates.

e) Ntendezi Natural Forest

This ecosystem is a regenerating riparian forest on two hillsides of about 4 ha, situated in Nyamasheke District, Ruharambuga Sector, Kamabuye Cell at an altitude of 1580m. In term of biodiversity, tree species such as *Bridelia brideliifolia* and *Anthocleista schweinfurthii* surrounded by dense vegetation of *Harungana madagascariensis* and *Acanthus pubescens* are dominant; the latter being an indicator of disturbed site. Some patches made by mountain forest are visible especially along the stream. This small forest is poor in animal species.

f) Ibanda - Makera remnant forest

The ecosystem is located in the depression of the Akagera River in Eastern Province, Kirehe District, Mpanga sector, Nasho cell. It is a gallery forest associated with woodland and Ibanda savannah in the East, and papyrus swamp in the South which extends to the Akagera River. The forest has been under high human pressure and consequently degraded with large areas of bush, thicket and woodland. Actually, Ibanda - Makera gallery forest covers 74 ha surrounded by 7 km contour road and a buffer zone planted with *Caesalpinia decapetala, Senna spectabilis* or *Euphorbia tirucalli*.

In term of biodiversity, fourteen (14) plants species mostly dominate the remnant forest, particularly *Cyperus papyrus* in more central portion which is swampy area. Five (5) species of

Orchids have been recorded there, which indicated that the central forest remains less disturbed. Being located along the Akagera River, aquatic wildlife is well represented by *Hippopotamus amphibius, Hylochoerus meinertzhageni, Potamochoerus porcus* and *Felis aurata.* Two species of primates have been recorded which include *Cercopithecus mitis* and an isolated population of *Papio Anubis (baboons)* plus several reptiles mostly snakes. Concerning birds, the forest harbors several tropical species; the most significance record is a *rare Purple-banded Sunbird* (*Cinnyris bifasciatus)* and different migratory bird species including *Merops apiaster.*

The importance of Ibanda Makera forest is that it contains many endemic and rare species. Added to this is the fact that many of these species are used in traditional medicine essentially *Blighia unijugata, Grewia forbesii, Rhus vulgaris, Ficus acuta* and *Ficus thoningii*.

g) Nyagasenyi Natural Forest

Nyagasenyi forest is a remnant valley forest in eastern province which is intermediate between low land and mountain forests. It is located in Eastern Province, Kirehe District, Gahara Sector. It is shared between 2 cells: Nyagasenyi in the North and Nyakagezi in the South. In the western part, it is associated with a wetland which is connected to Cyunuzi marshland in East and Rwagitugusa wetland in the North; which in turn is connected to Akagera wetland in the extreme South. The remnant forest is now under destruction by being cleared for agriculture.

In term of biodiversity, Nyagasenyi hosts very rare tree species in the region like *Anthocleista grandiflora* and *Syzygium cordatum,* also known to be medical. The forest contains also a ticket of sub shrubs with various species like *Blighia unijugata, Trimeria grandiflora* etc.., and lianas like *Paulinia pinnata, Tacazzea floribunda*, etc.

The forest is especially known for its richness in reptiles particularly venomous snakes like cobras, *Naja melanoleuca* and *Naja nigricollis* and green mambas represented by *Dendroaspis jamesoni kimosae*. Nyagasenyi forest is also home to very big snakes like *Pithon sebae*. Monkeys dominating the forest are composed by 35 individuals of *Cercopithecus dogetii*. Ecologically, beyond the biodiversity richness, Nyagasenyi forest protects water source for Rwagitugusa swamp. It plays the role of water cleaner and retention before it is drained into the swamp.

h) Nyenyeri Natural Forest

This large farm of more than 200ha is situated along Akagera River from Munini to Mwoga cells located in Eastern Province, Kirehe District in Mahama Sector. The forest is delimited in the east by Akagera River which constitutes the border with the neighboring Karagwe District.

In term of biodiversity, the forest is characterized by xerophytic vegetation scattered in a wide open shrub savannah. Dry forest patches and semiarid savannas are made up of mostly deciduous and broad-leaved species, dominated by *Acacia - Combretum* association, often accompanied by *Euphorbia candelabrum*, interspersed with grassland. Several other plant species have been recorded such as *Acacia senegalensis, Acacia sieberiana, Albizia petersiana,* etc. Short grasses comprise mostly *Panicum maximum, Hyparrhenia filipendula* and so on. It is also important to mention the presence of *Lantana camara* which has invaded a big part of the forest edges.
The fauna of this forest is mostly dominated by rabbits. Among the birds, *Francolinus nobilis, Streptopelis senegalensis, Colius striatus* and other water bird species were recorded. Some reptiles (*Naja melanoleuca* and *Python sebae)* were recorded too.

i) Bukora Natural Forest

Bukora forest is located in Bweramana village in the Eastern Province, precisely in Kirehe District, Nyamugali sector, Bukora cell and covers about 4.5 ha of area. The ecosystem is a disturbed semi-arid open forest characterized by scattered patches of tree groves.

Bukora hosts a rich biodiversity composed of many plant and animal species. Among dominant plant species are indigenous fruit trees such as *Pappea capensis, Rhus natalensis, etc..,* and other common trees including *Pericopsis angolensis, Combretum collinum* and so on. In addition, orchid species belonging to *Bulbophyllum, Cyrtorchis, Polystachia* and *Tridactyle* genera are also very dominant. In the pile of rocks there is a distinctive leafless flora dominated by *Sensevieria cylindrica* and *Scadoxus multiflorus* which is a rare species. The fauna is dominated by mammals including rabbits, *Dendrohyrax arboreus* and *Philantomba monticola*.

Other mammals include *Canis mesomelas*, *Panthera pardus* and *Cephalophus silvicultor*. With regard to birds, *Bubucus ibis*, *Streptopelis senegalensis*, *Francolinus nobilis*, *Lagonostica*

rhodopareia are found. Reptiles which find their refuge in the rocks include *Thelotornis capensis, Naja melanoleuca* and *Bitis arietans.*

j) Rujambara Natural Forest

Rujambara forest (also known as Rugomero) is an isolated ecosystem within areas of extensive agriculture, which constitutes refugia for many plant and animal species. With regard to biodiversity, Rujambara forest hosts both mountain plants species like *Prunus africana* and *Pittosporum spathicalyx* and low land species like *Acacia polyacantha* and *Vangueria volkensii. Prunus africana* is under CITES protection, as a very much sought-after species due to its pharmacological properties especially in treating prostate cancer. Many epiphytes orchids can also be observed on *Pterygota mildbraedii* and *Acacia polyacantha*. The most common orchids are represented by *Tridactyle anthomaniana* and *Aerangis ugandensis*.

Rujambara accommodates also the former biodiversity of the region such as large reptiles like *Pithon Sebae, Varanus niloticus,* cobras like *Naja melanoleuca* and *Naja nigricollis* etc. It also shelters some mammals especially monkeys like *Chlorocebus aethiops* which form very large populations totalizing more than four hundred individuals.

Many birds' species have also been recorded, dominated by tropical species with ability to survive in disturbed habitats. However some particular migratory birds have also been observed: *Cuculus solitarius, Merops apiaster, Lanius collurio* and *Lanius minor.*

k) Muvumba Natural Forest

Muvumba gallery forest is located in Eastern Province, in Nyagatare District. It is extended in Karama, Gatunda, Tabagwe, Nyagatare, Rwempasha, Musheri and Matimba sectors. The forest shelters a relict gallery forest constituted mainly by *Acacia kirkii*. The later species is endemic to Rwanda and it is not occurring elsewhere in the Great Lakes Region. Apart from predominant *Acacia kirkii* (REMA, 2011), some accompanying species like *Pavetta ternifolia*, *Dovyalis macrocalyx* and *Acanthus pubescens* have been observed.

Photo 1: *Acacia kirkii* vegetation alongside Muvumba River

The fauna living in Muvumba Forest are mainly mammals such as Velvet monkeys, Baboons and antelopes, as well as reptiles such as *Naja nigricollis, Naja melanoleuca*, *Thelothornis*, *Trachylepis varia* and *Trachylepis striata*. Muvumba Forest accommodates also various birds species and the most dominant birds species are *Anastomus lamelligerus*, *Leptoptilos crumenofurus*, *Falco concolor* and *Balearica regulorum*. The latter is threatened and endangered species and therefore deserves special protection.

l) Karama Natural Forest

Karama Forest is located in Gashora Sector within Bugesera District in the Eastern Province. It is shared between Mwendo and Ramiro Cells, at an altitude of 1,337 m. This forest makes part of the Bugesera savanna relicts and is adjacent to Gako military domain. It is bordered by Kirimbi and Gaharwa Lakes in the South-eastern side, where the gallery forest is dominant. The main patterns are composed of xerophytic plants and tiger bushes.

In term of biodiversity, Karama forest is rich in plant species dominated by more than 30 trees and shrubs among others *Rhus natalensis, Grewia similis, Grewia bicolor, Acokanthera schimperi, Vepris nobilis, Afrocanthium lactescens etc*. Most of these species are used for

various purposes particularly in traditional medicine. This forest is also rich in orchid species among which *Microcoelia* is the dominant genera. Some herbaceous species characteristics of low altitude savannas and xerophyllous forest are also abundant such as *Themeda triandra, Hyparrhenia filipendula, Sporobolus pyramidalis, etc*. Alongside the Kirimbi Lake, many species of *Cyperus sp*. have been observed.

Concerning the wild fauna, the forest is home to mammals like rabbits, monkey (*Chlorocebus aethiops)* and *Herpestes ichneumon.* Karama forest plays an important role as a refuge to many grassland and woodland snakes among others *Naja nigricollis, Naja melanoleuca, Vipera aspic, Opheodrys vernalis* and *Python sebae*. Some bird species were also recorded (*Ceuthmochares aereus*, *Streptopelis senegalensis*, *Lamprotornis purpuropterus*, *Francolinus nobilis*, *Bulbucus ibis*, *Pycnonotus barbatus*, *Ceryle rudis* and *Cossypha caffra*).

m) Gabiro, Gako and Nasho military domains

Gabiro military domain is located in Gatsibo District, Kabarore Sector in the Eastern Province. Concerning biodiversity, it is divided into two main vegetation types of planted forest dominated by *Eucalyptus* species and wooded savannah dominated by A*cacia* species. This natural forest provides habitat to a large fauna of tropical birds, some small mammals and snakes.

Gako domain is located in Bugesera District, Mayange Sector in the Eastern Province. The forest shares the same topographic, ecological and biodiversity features with the neighboring Karama natural forest (see above).

Nasho forest and related ranches and farms are located in Kirehe District, Mpanga Sector in the Eastern Province. These hills conserved the natural vegetation composed by dense shrubs characteristic of dry forests. The site shelters also many tropical birds' species, small mammals *Papio anubis*, *Cercopithecus doggetti*, *Chlorocebus aethiops* as well as many snakes.

n) Busaga Natural Forest

This montane rain forest is located in the Southern Province, Muhanga District, Rongi Sector and Ruhango Cell. It is limited at the north by Sumo stream and the chains of Ndiza in the West, has an estimated area of 151 ha, at an elevation of 1,900 – 2,000 m.

In term of biodiversity, the 21 dominant plant species have been recorded. They include: *Macaranga neomildbraediana*, *Maesa lanceolata*, *Dombeya torrida*, *Chrysophyllum gorungosanum*, *Albizia gummifera*, etc.

The forest is also habitat to animals including *Cercopithecus doggetti*, *Cephalophus nigrifrons* and *Profelis auratua* endemic to central Africa, and some jackal species. Busaga also hosts some birds like Turaco and many species of reptiles such as *Bitis arietans* and *Thelotornis capensis*.

2.2.2. Major changes

There is a variety of changes that occurring in the biodiversity status in Rwanda as it happens around the world. These include both positive and negative changes though the latter are those raising concerns. Many of them are human induced with socio-economic motivations or drivers leading to the encroachment and overexploitation of biodiversity resources as well as other natural resources (REMA, 2011). However, other changes are naturally induced.

Photo 2: Agriculture encroachment and clays exploitation in Busaga forest

2.2.2.1. Negative changes

The main negative changes in biodiversity status occurred or occurring in Rwanda are the following:

- Converting process of Karama savannah natural forest covering an estimated area of 1,000 ha (REMA, 2011) into farming, grazing lands and other economic activities;

- Massive logging of Nyungwe buffer zone forest for charcoal and timber production where New Forest Company (NFC) is exploiting for poles around 11000 ha of plantations;
- Mukura forest reserve degradation due to mining exploitation;
- Water hyacinth invading lakes including lakes of Bugesera, Gisaka, Nasho and other water bodies, especially in Nyabarongo-Akagera rivers system and Akagera wetland complexes;
- Decreasing or extirpation of native fish species in lakes of Nyabarongo-Akagera rivers system due to the invasion and increase of predators species among which are *Protopterus aethiopicus* and *Clarias gariepinus.* The most threatened and disappearing species are: *Barbus kerstenii* PETERS, 1868; *Clarias liocephalus* BOULENGER, 1898; *Mastacembelus frenatus* BOULENGER, 1901*; Oreochromis macrochir* BOULENGER, 1912 (Ntakimazi, 2007);
- Drying of water bodies (small lakes) in the summit of volcano mountains of VNP and altitudinal upward migration of species distribution possibly due to climate change effects; and
- Underutilization and disappearance of landraces and local breeds due to crop intensification policy that favors high yields varieties and races.

2.2.2.2. Positive changes

The most existing case of positive change is the ongoing Gishwati forest reserve rehabilitation which is proposed to be upgraded as a national park in future. In addition, the consecutive flooding disasters to Gishwati forest degradation are now controlled due to the rehabilitation of the area.

Other positive changes include among others:

- Increased of Primates troops and Ungulates populations in Akagera National Park form 1998 to date **(***see table 2 above***)**;
- Increased number of Mountain Gorilla population in Virunga Mountains from *1971 to date (see table 4 above)*;
- High participation of local communities around Akagera National Park, which are fully integrated and involved in restoring Akagera lakes by removing alien/invasive species

(Water Hyacinth) and employed by the new management company of the ANP, in construction works, maintaining firebreaks and roads. This has boosted the local economy by an injection of over US$ 260,000 (African Parks/Annual Report 2012).

- Erection of the electrical fence completed in South-Western parts of Akagera National Park, that eradicated the local communities' crops raiding by wildlife hence efficiently contributing to prevent conflicts between local people and park managers and establishing tolerance and positive attitude among local communities. Furthermore, positive initiatives around ANP are: (i) the environmental education continued to be a major focus and over 16,000 children participated in environmental education classes, of which 480 were taken on a tour of the park; (ii) boreholes, solar surface water pumps and small dams were provided for communities at 12 different locations outside the park, as the erection of the fence has denied access to previous sources of water in the park. However, it appears that for some species such as buffalo, their dispersal possibilities has been limited by the erected fence and this may impact negatively the behavior of affected species.
- A Special Guarantee Fund has been established by the Government of Rwanda to deal with compensation of losses caused by wildlife.

All these positive initiatives are contributing to ensure sustainable conservation of the biodiversity of Akagera National Park.

2.3. MAIN THREATS TO BIODIVERSITY IN RWANDA

2.3.1. Threats to biodiversity in natural ecosystems

Threats are those factors that affect negatively natural and anthropogenic induced ecosystems. Biodiversity has over the years been subjected to various threats and currently the country is losing its biodiversity due to human interventions, mainly out of protected areas where agriculture expansion constitute the main threat to remnants forests. However, since the early 1990s, Rwanda has made tremendous effort to address these threats through national programmes and also through international cooperation including ratification of the Convention on Biological Diversity (CBD) and related protocols.

During the process of revising and updating the NBSAP, number of threats has been highlighted. Some of them have been reported in the fourth report though in different way and others are not. They include among others: poaching and other illegal activities, fires, alien invasive species, deforestation, mining, illegal grazing, damming , dropping water levels, commercial fishing, lack of connectivity, tourism use and infrastructure development, wetlands encroachment and pollution, high population density, promotion of small range of high yielding crop/breeds and genetic erosion, etc.

2.3.1.1. Poaching and other illegal activities in NNP and ANP

Monitoring statistics from Rwanda Development Board (RDB)/tourism and conservation department indicate that the rate of poaching and other illegal activities increased in Nyungwe National Park (NNP) from 2003 to 2013 as it appears in the figures 3 & 4 below (RDB, 2014):

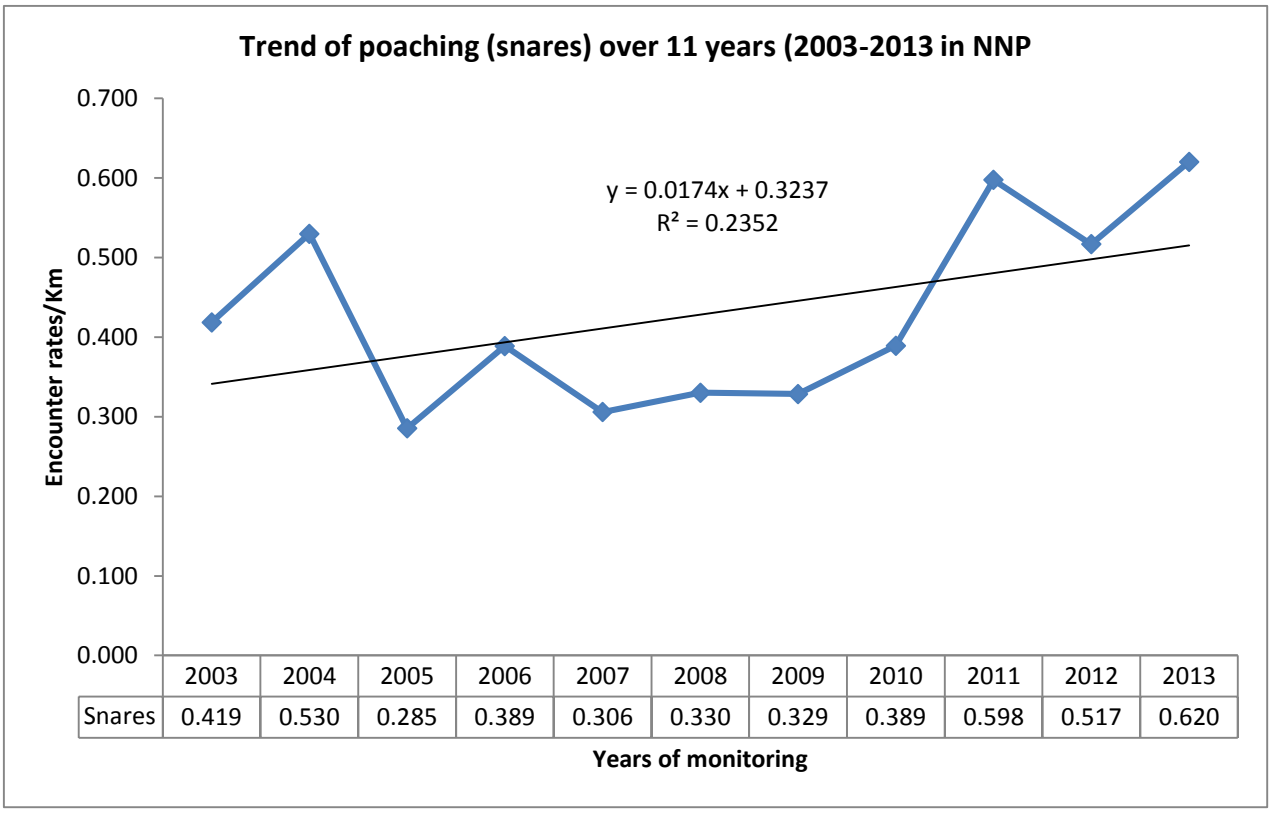

Figure 3: Rates of poaching in NNP

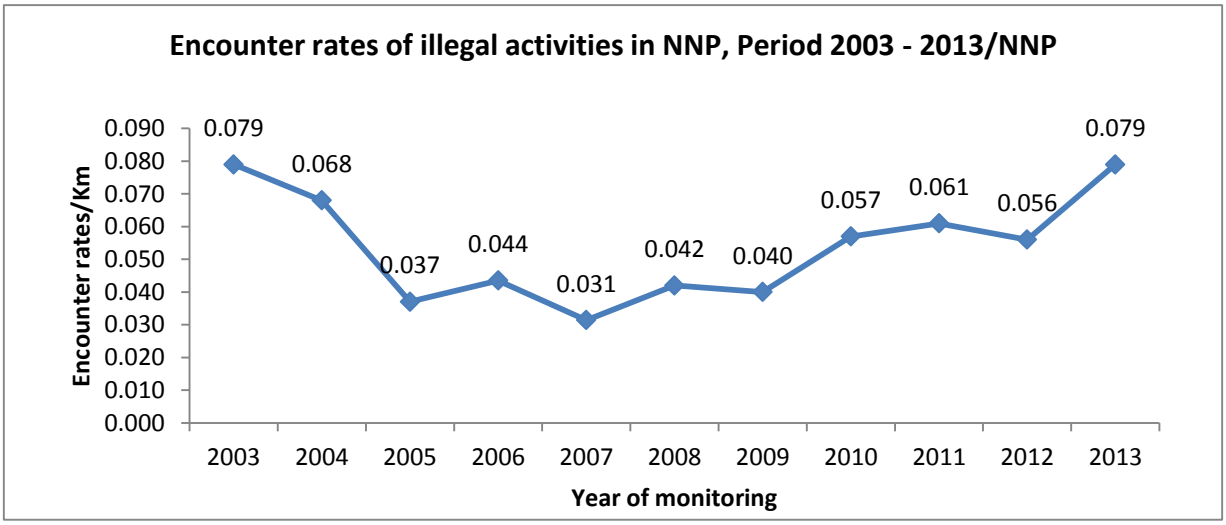

Figure 4: Rate of other illegal activities in NNP

In general, the above figures show an increase in the rates of poaching and other illegal activities form 2003 up to 2013, with the highest rates years 2003, 2011 and 2013. However, the increased rates for the two last years, especially for 2013, find its explanatory in the fact that patrol coverage within NNP has been expanded to many others new areas of the forest so that staffs were able to discover as many previously hidden uncontrolled illegal activities. In addition to this, the current incentives package or budget allocated to the communities, mostly very poor people, surrounding the park is insufficient to cater for their needs thus illegal activities conducted by them in the park persist. Furthermore, poachers from Burundi used to cross the border from Kibira National Park and encroach on the southern side of Nyungwe National Park.

At Akagera National Park (ANP) level, bush meat trade is a huge concern for the park management, since it is on an International boundary and poachers are from both Tanzania and Rwanda, using snares, hunting with traditional weapons like spears and bow and arrows, dogs or guns such as high powered rifles, shotguns or assault rifles such as the AK47. Around six elephants and many other animals including Sitatunga in Akagera swamp have been reported killed in the park within a period of less than a year for ivories and meat respectively. Some remnant bones are found at the ANP reception (photo 3).

Photo 3: Bones of killed wild animals in ANP

Shoe-bill is also diminishing because of hunters' presence around wet areas, where it used to feed on frogs. Hippopotamus populations are being decreasing due to illegal hunting.

Regarding plant species, there are those having high value and located in small patches and are in danger of extinction due to their intensive exploitation for multiple uses and degradation of natural habitats. *Osyris lanceolata* with *Pterygota mildbraedii are* two species massively and illegally exploited in the Eastern Province despite the fact that they are endemic in the province. In the ANP there is an increasing infringement of *Osyris lanceolata* for illegal exportation. This tree species locally called "Kabaruka" is of multipurpose use including for food, medicine, timber, essential oils, tannin, basketry and source of firewood.

2.3.1.2. Fires

Uncontrolled fires continue to pose a threat during the dry season usually started by poachers or as a result of fire crossing from the Tanzania side where the papyrus is being purposely burnt in the ANP. Forest fire as well as mining have been a major source of habitat degradation in NNP in recent years and remains one of the greatest threats to the conservation of NNP habitats, although significant progress have been made in preventing forest fires through community awareness raising and controlling them once they occur.

2.3.1.3. Alien invasive species

A part from the worst worldwide known *Eicchornia crassipes (*Water hyacinth*)*, there are other invasive species both on terrestrial and aquatic ecosystems of Rwanda, such as the following:

- ✓ *Lantana camara* is the main invasive plant and prolific especially along roads and around human habitations where it is planted as an ornamental plant, but also in some croplands where it became a weed with other introduced alien invasive species propagated without enough studies on their ecology.
- ✓ Jointed cacti of the *Opuntia* Genus are used as hedges by cattle farmers adjoin the park and these have also spread to many areas within the park. Sisal plants *Agave sisalana* are also found as well as stands of Blue Gum *Eucalyptus spp.* and some Jacaranda trees.
- ✓ The indigenous Sickle Bush *Dichrostachys cinerea* has also encroached in grassland areas because of over grazing by cattle in the past and no fire management policy.
- ✓ The Lake Kivu islands biodiversity has also suffered from a high degree of extinction in the past and many threatened species are island endemics, principally due to invasive species, climate change, natural and environmental disasters, land degradation and pollution. Currently, invasive species are considered to be the main threat to island species although climate change is predicted to be a major threat to islands in the future. The most invasive species recorded on Kivu islands are *Lantana camara* and *Caesalpinia decapetala*. Some islands could be shortly invaded if no conservation measure is undertaken. Conservation and restoration of Kivu islands should therefore not only contribute to biodiversity conservation but also to mitigation of impacts of climate change.
- ✓ The *Protopterus aethiopicus* and *Clarias gariepunus* are also currently eliminating indigenous fish species in Eastern and South-Eastern swampy, lakes and rivers systems.

Photo 4: *Clarias* (right hand) and *Protopterus* (left hand) from lake Cyohoha North

2.3.1.4. Deforestation

Remnant forest such as Karama savannah forest (in Bugesera District), Ibanda - Makera forest (in Kirehe District) and many others across the country have been under high human pressure and degraded due to agriculture expansion, trees cutting for firewood collection, charcoal production, poles and timbers production.

Some tree species with high value exist in small patches and in danger of extinction due to their intensive exploitation for multiple uses and degradation of natural habitats. *Osyris lanceolata* with *Pterygota mildbraedii are* two main species massively and illegally exploited in the Eastern Province despite the fact that they are endemic in the province.

2.3.1.5. Mining

Mining development within Mukura forest is currently seen by local stakeholders as a very serious and permanent threat to the survival of the forest and it contributes to the disruption of hydrological cycle of the region (REMA, 2011).

Photo 5: Mining exploitation degrading Mukura natural forest

Mining activities have various and accumulative negative effects on the biodiversity, water system of the Mukura landscape and local community well-being. Trees from the forest are cut; streams and rivers are upstream diverted for mining activities whilst downstream water users for crop production and domestic needs suffer either from water shortage or water quality due to heavily trusted rivers with soil form upstream mining sites and uncontrolled soil erosion. Furthermore, downstream wetlands and streams are drying, since the forest that used to serve as natural sponge feeding downstream water system is being disrupted.

The degradation of the forest has also negative impacts on its animal species richness and relative abundance, since their natural habitats are being destroyed coupled with poaching activities. Recent study conducted by ARCOS (2012) indicated that the number of Mammals species was tremendously reduced from 14 to 4 species due to forest encroachment and hunting. The remaining species belong to *Sciuridea*, *Thryonomydae* and *Canidae* families.

2.3.1.6. Illegal grazing

Cattle herds are continually being observed on the boundaries and at times inside protected areas such as at Akagera National Park (ANP), Mukura and Gishwati forest reserves. Besides the consequences on the integrity of the protected area, there are also serious implications in terms of potential disease transmission between wildlife and livestock.

2.3.1.7. Damming of the Akagera River

There is a proposed project of building a dam on the Rusumo falls, hence 50 km upstream on Akagera River will be inundated by water. This project has been under review for the last 21 years, and could have a serious impact on the wetlands situated in the park and across the border if it goes ahead.

2.3.1.8. Lack of connectivity

This is reported as "High" threat for Chimpanzee population located in patched Cyamudongo forest, since there is not yet an ecological corridor linking Cyamudongo to the main part of Nyungwe National Park in order to avoid inbreeding of the small population of chimpanzees. This is also the case for some chimpanzees located in Gishwati Forest Reserve.

Futhermore, Ruhondo Lake which is part of RAMSAR site complex made of Rugezi – Bulera - Ruhondo, used to over flooding and cover bordering areas over far and beyond the protected space and invading crop and other properties belonging to local communities.

2.3.1.10. Tourism use and Infrastructure development

These are considered as "High" threats to Afro-Alpine Habitat and Mountain Gorilla due to potential disease transmission, encroachment on suitable habitat and over-habituation of Mountain Gorilla.

2.3.1.11. Wetlands encroachment and pollution

This is mostly the case of Eastern Province where wetlands complex with a very richness in biodiversity are encroached by agriculture development both in the vicinity of wetlands and on surrounding hill shades, causing erosion and siltation downstream.

Wetlands are also threatened by sedimentation and pollution from upstream mining and quarries exploitation as well as from wastes and industrial effluents from cities such as Kigali city, due to poor sewage and wastes treatments systems. Recent studies (Nkuranga, 2007 and Uwonkunda, 2009) indicated that wastewater loadings from industrial area into Nyabugogo swamp are polluted by heavy metals especially Chromium (Cr), Lead (Pb) and Cadmium (Cd). While in urban pollutants are heavy metals and some nutrients, organic matters and sediments brought by erosion predominate as water pollutants in rural sub-catchments zones.

Moreover, development of sugarcane plantations and rice fields have contributed to biodiversity loss in Nyabarongo wetland which used to receives an exceptionally large number of migratory birds species in addition to its native fauna including birds, reptiles, hares, jackals and fishes.

2.3.2. Threats in Agro-ecosystems

2.3.2.1. High population density

This is related to the increase in food demand and other social services such as education, medical facilities, infrastructures, urbanization and energy, leading to change of existing land use systems.

Rwanda has the highest population density in Africa, about 343 people per sq.km, and agriculture is the main activity, with 0.6 ha of land/household in average, providing the livelihood for about 80% of rural population (USAID, 2008). In this situation, economic growth strategies (promotion of intensive agriculture, promotion of industries often environmental damaging, etc.) are given priorities and neglecting of some species which are exposed to the disappearance resulting in environmental disturbance and ecological disequilibrium.

2.3.2.2. Environmental degradation

Environmental degradation is mostly expressed by desertification that is currently more intensive problem than deforestation. It consists of cropland degradation, deforestation, draining of marshes…, resulting in a range of negative impacts including alteration of vegetation which constitute habitats for native species, loss of soil moisture, loss of soil organisms and soil erosion, disturbance of agro-ecosystems process and functions. All these are major factors constraining agriculture productivity in Rwanda.

2.3.2.3. Promotion of small range of high yielding crop/breeds and Genetic erosion

Food security, as part of MDGs, is a goal at the world level. Agriculture and livestock intensification are major mechanisms to ensure food security and enhance livelihoods in developing countries. In this context, farmers are encouraged to use improved varieties, with emphasis on few key crops, and improved animal races instead of landraces and local animal races in order to fulfill food security requirements. Very few efforts focus on conservation and use of local varieties, leading to genetic erosion. For ex situ conservation, crops of less interest in food security are not given priority at the level of main crops for food security. However, in some areas, farmers still grow landraces following their traditional systems and preferences and due to difficulty access to improved seeds, not available or not affordable (Gapusi *et al*., 2013).

Underutilized crop species in Rwanda includes Taro (*Colocasia esculenta*), Yam (*Dioscorea quadrata*), Pigeon pea (*Cajanus cajan*), Finger potato (*Plectranthus esculenta*), Indigenous vegetables including Woolly nightshade (*Solanum villosum*), Isogi (*Cleome gynandra*), Isogo (*Solanum nigrum*), Imbogeri (*Amaranthus spinosus*), Cow pea (*Vigna unguiculata*), Finger millet (*Eleusine corocana*), etc.

Sustainable crop production intensification uses crops and varieties that are better adapted to ecological based production practices than the existing ones (FAO, 2011). The replacement of local varieties by improved or exotic varieties and species is the main cause of genetic erosion in agro-biodiversity. Genes and gene complexes, found in many farmers' varieties, are not contained in modern agriculture. Once local varieties are underutilized and many of them not used in genetic improvement, they are at risk of disappearing with their genetic value that will be lost, or not found in any other genetic material in concerned areas and even in the world.

2.3.2.4. Climate change

Climate change threatens agro-biodiversity, as many plants, animals and microorganisms are unable to adapt to changing temperatures and moistures gradients caused by global warming. Therefore, interaction and processes in agro-ecosystem are disturbed and ecological equilibrium affected. Climate change may be the cause of other constraining factors to agro-biodiversity such as pathogens, drought, floods, and erosion, among others.

The limited size of the fields and their depletion resulting in continued over striping led to reduction of production of seasoned varieties and breeds, a result of natural selection which generally fosters the most resistant and less productive genotypes (FAO, 2003).

2.4. IMPACTS OF BIODIVERSITY CHANGES FOR ECOSYSTEM SERVICES: SOCIO-ECONOMIC AND CULTURAL IMPLICATIONS

Considering the biodiversity on its three levels including ecosystem, species and genetic diversity, it provides various and useful ecosystems services and goods such as clean water, air purification, climate regulation, prevention of soil erosion, nutrients cycling, food and medicinal plants, timber and firewood, pollination of crops as well as the meeting of spiritual, cultural, aesthetic and recreational human needs. All these are fundamental elements on which country economy is based especially Rwanda as well as other developing countries that mostly rely on natural resources for their development and for their population welfare. Therefore, negative changes in ecosystems process can make unable to provide such services with serious implications on the society and economy development, since main sectors such as tourism, agriculture and energy are heavily dependent on biodiversity and ecosystem services. The following three cases illustrate cumulative negative or positive effects for ecosystem services related to loss or recovery of biodiversity in national ecosystems:

a. In Mukura and Gishwati natural reserves, deforestation and biocover clearing as well as mines exploitation activities have caused drastic reduction in water flow of upper streams and lowlands drying, because the forest that used to serve as natural sponge feeding downstream water system has been disrupted. Furthermore, downstream water users for crop production and domestic needs have suffered either from water shortage or loss of quality, because of heavily cumulated soil sediments carried out from upstream by uncontrolled soil erosion. The recent management and conservation programs planned and in execution have halted Gishwati forest reserve's degradation and substantially contributed to reduce flooding phenomenon, landslides, decreased soil fertility, improper water quality, and heavy river siltation, all of which aggravating poverty within local population.
b. In another case, Rugezi wetland has been invaded and seriously degraded by human activities, including vegetation clearing for domestic use and livestock development,

encroachment for crops production, livestock free grazing within the wetland, bricks making as well as poaching for wild meat consummation. All those anthropogenic activities, plus an abnormal drainage of the swamp for hydropower production had as consequences: drying of marshland areas with accompanied loss of important biodiversity, reduction of ecosystem services and drastic water flow decreasing which strongly impacted on Ntaruka plant hydropower production with its associated socio-economic effects. Currently, management and conservative initiatives have been planned and executed in order to restore hydrological and ecological functions of the Rugezi wetland, which have raised water table and permitted gradual flora and fauna recoveries.

c. In Eastern part of the country, especially Umutara and Bugesera regions, intense clearing of biocover has led to changes in climate conditions, causing other constraining factors to agro-biodiversity such as drought and pathogens to crops. Inversely, in the last decade, an intense reforestation and other agriculture practices aiming biocover recovery have restored better climatic conditions (regular rain, increased soil humidity, etc.) which favored agriculture and livestock development, by the way reducing hunger and poverty in both regions.

Socio-economically, the loss of agro biodiversity leads to fewer options for ensuring more diverse nutrition, enhancing food production, raising incomes, coping with environmental constraints and sustainably managing ecosystems (FAO, 2004).

Genetic resources and agro-biodiversity constitute the foundation of upon which agriculture development and food security is based. Thus, the loss of agro-biodiversity due to changes in climate conditions undermines such foundation, poses serious threats to food security and poverty alleviation, by the way, increases the economic risk for human community.

III. NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN: ITS IMPLEMENTATION AND THE MAINSTREAMING OF BIODIVERSITY

3.1. NATIONAL BIODIVERSITY TARGETS

Nineteen national targets for biodiversity conservation were defined in line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020, as presented in table 6 below:

Table 6: National Targets for Rwanda

National Targets	Corresponding Aichi Targets of the CBD
Target 1: **By 2020, at the latest, Rwandan people are aware of the values of biodiversity and ecosystems services as well as apprehend the steps for use and conserve them sustainably.**	**Target 1**
Target 2: **By 2020, the values of biodiversity and ecosystems' services have been integrated into planning processes, poverty reduction strategy and into national economy.**	**Target 2**
Target 3: **By 2020, at the latest, positive incentives for biodiversity conservation and sustainability towards local communities' development are boosted and applied. Harmful incentives are eliminated.**	**Target 3**
Target 4: **By 2020, public and private sectors and civil society have promoted and implemented plans that consider ecosystem carrying capacity.**	**Target 4**
Target 5**: By 2020, natural ecosystems, especially identified "Alliance for Zero Extinction (AZE)" sites are safeguarded, their degradation and fragmentation reduced.**	**Target 5**
Target 6: **By 2020, fishing and aquaculture, agriculture and forestry are managed sustainably, legally and taking into consideration ecosystem specificities to ensure biodiversity conservation.**	**Target 6 and Target 7**
Target 7**: By 2020, environmental pollutants including those from excess nutrients are controlled and their harm has been brought to levels that are not detrimental to ecosystem function and biodiversity.**	**Target 8**

***Target 8*: By 2020, invasive alien species, their pathways, spatial distribution are identified. Harmful species are controlled or eradicated, and related mitigation measures are put in place.**	**Target 9**
***Target 9:* By 2020, at least 10,3 per cent of land area is protected to maintain biological diversity**	**Target 11**
***Target 10*: By 2020, the extinction of threatened species are prevented and their conservation status improved, particularly for those that are most endangered of extinction.**	**Target 12**
***Target 11*: By 2020, the genetic diversity of local animal breeds and landraces as well as their wild relatives are conserved, thus in order minimizing genetic erosion.**	**Target 13**
***Target 12:* By 2020, the potential risks resulting from biotechnology use and placement on the market of its products have been minimized and/or eliminated.**	**-**
***Target 13:* 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.**	**Target 14**
***Target 14*: By 2020, 30% of the country is covered by forests hence increasing carbon stocks and contributing to climate change mitigation and adaptation.**	**Target 15**
***Target 15:* By 2017, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is integrated into national legislation and administrative practices and enforced.**	**Target 16**
***Target 16:* By 2016, Rwanda has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan (NBSAP).**	**Target 17**
***Target 17:* By 2020, values of traditional knowledge, cultural heritage and practices of local communities relevant for sustainable use and conservation of biodiversity are enhanced, fully integrated into national policy and legal framework and reflected in the implementation of the NBSAP.**	**Target 18**

***Target 18*: By 2020, knowledge in biodiversity status, values, causes and consequences of biodiversity loss, is enhanced, shared across the country and reflected in the implementation of the NBSAP.**	**Target 19**
***Target 19:* By 2020, at the latest, the mobilization of financial resources for an effective implementation of NBSAP from all potential sources, and in accordance with agreed process in the strategy for resource mobilization, is reinforced and reach an appreciable level.**	**Target 20**

3.2. CROSS-SECTORAL PROCESS FOR THE NBSAP REVISION AND UPDATING

The nineteen national targets have been developed in line with the Aichi Biodiversity Targets, but also based on needs and priorities identified during the recent stocktaking exercise conducted across the country through broader consultations with different stakeholders from various institutions and organizations, both at central and decentralized levels. In addition to consultations meeting and focus group discussion with stakeholders, a huge documentation has been collected from various sectors involved directly or indirectly in biodiversity management (conservation and utilization). It comprised *inter alia*, sectoral plans, annual reports, project documents and evaluation reports, strategic and development plans, policies and laws, study reports, etc. The results of an in-depth documentation review coupled with information received for consultations meeting, facilitated to get the current status of biodiversity both in natural and agro-ecosystems as well as related causes and consequences of biodiversity loss.

Particularly, the review of sectoral policies and regulations highlighted their compliance or conflicting state with the National Biodiversity Policy and Biodiversity law. Thereafter, revision and updating of those policy and legal instruments were proposed for them to be more inclusive in regards to biodiversity conservation and sustainability. In addition, proper institutional arrangements were also proposed for effective sustainable management of the biodiversity across the country. This was that the National Centre of Excellence (CoE) for Biodiversity Conservation should be strengthened and legally mandated to oversee the cross-sectoral implementation of the NBSAP and biodiversity mainstreaming into sectoral plans and policies.

In addition, proposal has been made through the revised NBSAP that partnership and collaborative mechanisms should be developed between the CoE and others institutions involved either biodiversity conservation or biodiversity utilizers such as the Ministry of Agriculture and

Animal Resources (MINAGRI), the Ministry of Infrastructure (MININFRA), the Ministry of Trade and Industry (MINICOM), the Ministry of Finance and Economic Planning (MINECOFIN), the Ministry of Local Administration (MINALOC), the Ministry of Disasters and Repatriation (MIDIMAR), the Ministry of Education (MINEDUC), the Ministry of Health (MINISANTE), Rwanda Agriculture Board (RAB), National Agricultural Export Development Board (NAEB), Rwanda Natural Resources Authority (RNRA), Energy Water and Sanitation Authority (EWSA), Rwanda Transport Development Authority (RTDA), Rwanda Biomedical Center (RBC), Gender Monitoring Office, Cities and Local administrations, Judiciary, Parliament and Senate.

3.3. ACTIONS UNDERTAKEN SINCE THE FOURTH NATIONAL REPORT AND RELATED OUTCOMES

From the time the fourth report has been prepared and submitted to the CBD, numerous achievements have been accomplished towards biodiversity conservation and socio-economic development though trends and projections are not yet modeled. Table 7 illustrates some of those achievements and related outcomes:

Table 7: Actions undertaken since the Fourth National Report and related outcomes

Actions	Outcomes
Development and implementation of National Park Management Plans (for NNP and VNP)	**Improved conservation of protected areas and wetlands**
Restoration of degraded forests (i.e Nyungwe National Park, Gishwati forest reserve)	
Erection of the electrical fence completed Southern-Western of Akagera National Park that eradicates the crop raiding by wildlife, hence contributing efficiently to prevent conflicts between local people and park managers and creating positive attitude among local communities.	
Development forest management plans	
Inventory of biodiversity on critical wetlands and islands	
Mapping of threatened remnants natural forests	
Restoration of lakeshores and riverbanks	

Development of communication-education and public awareness, capacity building	**Environmental conservation awareness raised among people**
Awareness raising through media, TV and radio broadcasts, celebration of environment, biodiversity and wetland days	
Creation of schools environmental and nature clubs around protected areas	
Implementation of the greening schools project	
Establishment of an internship programme to improve environmental mainstreaming at central(sectoral ministries and private sector federation) and decentralized levels (Districts)	
Using the community approach in restoration and rehabilitation of ecosystems and maintenance	**Community-based biodiversity conservation improved**
Establishment of District environmental committees	
Revenue sharing program representing 5% of income generated from national parks based tourism are allocated for funding socioeconomic activities that benefit to local communities living around national parks	
A Special Guarantee Fund was established by the Government to deal with compensation cases resulting from human-wildlife conflicts.	
Development of National Bio-safety Framework (NBF) including: (i) the National biotechnology and bio-safety policy; (ii) National bio-safety bill, and (iii) institutional framework. However, adoption of those instruments has not yet been completed but this provides an opportunity of updating and matching with evolving legal and institutional framework.	**Rational use of biotechnology: on track to be achieved)**
New key policies, laws, decrees and strategies have been adopted by the Government	**Biodiversity-based policy, legal, and strategy**

New Policies: Rwanda Biodiversity Policy (2011), Rwanda Wildlife Policy (2013), Rwanda Protected Areas Concessions Management Policy (2013), National Forestry Policy (2010), National Policy for Water Resources Management (2011), National Energy Policy and National Energy Strategy 2008-2012, National Industrial Policy (2011), etc.	**framework developed**
New Laws and Decrees: Biodiversity law (2013), Forestry law (2010), Protected areas law draft (2013), New Land law (2013), FONERWA Law, N° 53/2010 of 25/01/2011 Law establishing Rwanda Natural Resources Authority (RNRA) and determining its mission, organisation and functioning, PES regulatory framework preparation, regulatory buffer zones for lakes and rivers, Decrees related to protect biodiversity, wildlife, forests, wetlands, threatened species, to ensure environmental impact assessment is conducted for any project susceptible to have adverse impact on environment	
New development strategies: EDPRS 2, National Climate Change and Low Carbon Development Strategy (known as the Green Growth and Climate Resilience Strategy), Rwanda Environmental Education for Sustainable Development Strategy (EESD), etc.	
Creation of the following institutions: Rwanda Natural Resources Authority (RNRA), FONERWA, CBD steering committee, and Centre of Excellence on Biodiversity in course of establishment	**Biodiversity-based Institutional framework established**
Ratification of Nagoya Protocol	**Benefits derived from the use of biological resources shared equitably: on track**
On track development of enabling regulatory framework for domestication of the protocol	
Establishment of Clearing House Mechanism	
Under process of genetic resources valuation	

3.4. FIRST NBSAP IMPLEMENTATION LEVEL AND GAPS

Rwanda has developed its first National Biodiversity Strategies and Action Plan (NBSAP) in 2003 after identification of major threats to biodiversity conservation in Rwanda and targeted the following five major outcomes:

i. Improved conservation of protected areas and wetlands, Sustainable use of the biodiversity of natural ecosystems and agro-systems
ii. Rational use of biotechnology
iii. Development and strengthening of policy, institutional, legal and human resource frameworks
iv. Equitable sharing of benefits derived from the use of biological resources.

3.4.1. Improved conservation of Protected areas and wetlands: outcome 1

On the outcome 1, the following are some of the main achievements:

a. The managements of Volcanoes National Park (PNV) and Nyungwe National Park (NNP) have been improved through: (i) development of their management plans, (ii) monitoring of threats and implementation of preventive measures, (iii) improving scientific knowledge on biodiversity in those parks, awareness raising of communities surrounding the parks on biodiversity conservation and support alternative livelihoods to avoid encroachment.

b. Rehabilitation of degraded areas, especially within Nyungwe National Park. The main intervener in the rehabilitation of this park was a completed project titled "*Strengthening Biodiversity Conservation Capacity in the Forest Protected Area System of Rwanda Project* (PAB)", a GEF funded project through UNDP and operated under REMA.

c. Protection and rehabilitation of banks and shores for four wetland complexes, lakes and riverbanks and associated watersheds.

d. Biodiversity inventory for four main wetland complexes in order to inform decision makers on policy actions for their conservation.

e. Rehabilitation and land reallocation for Gishwati and Mukura Forest Reserves, and development of related legislations for their better conservation. For each one of the two forests, three main parts were separated including: area reserved for the natural forest conservation and its biodiversity conservation; grazing land for cattle breeding; and crop land for cultivation. People previously inhabiting Gishwati were displaced and relocated.

f. Biodiversity inventories and mapping for Lake Kivu islands

g. Remnant forests inventory and mapping, their biodiversity and threats assessed, etc.

3.4.2. Rational use of biotechnology : outcome 2

The achievements for this outcome are not so many and comprised mainly the development of National Biosafety framework (NBF) including: The National biotechnology and Biosafety policy, the National Biosafety bill and related Institutional framework.

3.4.3. Strengthening policy, institutional, legal and human resource: outcome 3

For this outcome, the achievements are:

- **a.** Key policies have been approved including the environment policy, Biodiversity policy, forestry policy, wildlife policy and law.
- **b.** Key legislations adopted to support biodiversity conservation include biodiversity law enforcing the already existing "Environment Organic Law", a set of decrees for protection of biodiversity, FONERWA law, PES regulatory framework preparation,…
- **c.** Institutional frameworks established, like Centre of Excellence on Biodiversity, CBD steering committee, Department of Forestry and Natural Conservation under RNRA, RDB/Tourism and conservation, etc.

3.4.4. Equitable sharing of benefits derived from the use of biological resources : outcome 4

The Nagoya Protocol for access to genetic resources and equitable sharing of benefits derived from the use of biological resources has been ratified. Domesticating steps via development of enabling regulatory Framework, Communication-Education and Public Awareness, capacity building, establishment of Clearing House mechanism and GR of valuation will follow.

3.5. BIODIVERSITY MAINSTREAMED INTO SECTORAL AND CROSS-SECTORAL STRATEGIES, PLANS AND PROGRAMMES

3.5.1. Biodiversity mainstreaming into national sectoral strategies, plans and programmes

The Rwanda Vision 2020 provides guidance for the development of the overall national policies, regulations, strategies and programmes including those related to biodiversity conservation. It states that Rwanda will implement adequate land and water management techniques, coupled with a sound biodiversity policy, in order to ensure sustainable development. Cross-sectoral environmental, including biodiversity mainstreaming has been initiated from 2005 with the

support of the "Poverty and Environment Initiative (PEI)" country project and has been strengthened through inclusion of an annex on environment and climate change mainstreaming in the budget call circular from 2011 by the Ministry of Finance and Economic Planning. In addition, various sector ministries in charge of Local Government and Good Governance, Agriculture, Natural resources, Infrastructure, Energy, Transport, Communications, Trade and Industry are supported to integrate environmental sustainability in their policies and plans. Furthermore Rwanda has decided to take the Green Economy pathway as safer and sustainable approach to economic development and human well-being. The green economy approach is one of the priorities of the Second Economic Development and Poverty Reduction Strategy that take into account the preservation of biodiversity and ecosystem services.

Moreover, the country has promoted a Sector Wide Approach (*SWAP*) for mainstreaming environmental (including biodiversity) sustainability into all development processes. The approach also contributes to strengthen sector coordination and build synergy in mobilizing and allocating funding, bring together stakeholders and enhance effective planning and follow-up. However, specific knowledge for biodiversity is still at a very low level among sectors stakeholders, even though environment awareness has been improved in general. Thus, specific contribution of biodiversity to poverty reduction and community wellbeing is not well accounted in sectoral planning due to a number of issues that needed to be addressed, such as:

i. Insufficient institutional capacity to efficiently and effectively manage wildlife and conservation;
ii. Insufficient skills in conservation management;
iii. Key stakeholders are not systematically involved in conservation, and
iv. Weak national level conservation-planning framework, especially conservation of the biodiversity outside of protected areas.

However some sectors or institutions or policies integrate well the biodiversity whilst others do not and others partly integrate the biodiversity considerations. The following table 8 presents some of the main sectors whose interventions integrate well or not or partly the biodiversity conservation needs.

Table 8: Sectors integration of biodiversity conservation needs

Sectors	Biodiversity integration *(Yes, No or Partly)*	Positive Actions/Outcomes	Negative actions/outcomes	Tools/Mitigation
Tourism	**Yes**	**- PAs management plans** **- PAs rehabilitation** **- Poaching control** **- Support to community conservation** **- Revenue sharing scheme** **- Transboundary management mechanisms** **- Establishment of Special Guarantee Fund (SGF) for compensation** **- Wildlife policy** **- Protected areas concessions management policy**		**Ecosystem approach**
Agriculture	**Partly**	**- Gene bank, agro-forestry, erosion control and land husbandry,** **- Zero grazing policy, Organic farming system, SEA in agriculture sector,** **- Erosion control baseline survey, Fish restocking in**	**- Conversion of natural ecosystems to agro-ecosystems** **- Biodiversity degradation** **- Pollution though Pesticides and**	**- EIA/SEA,** **- Fishing regulations and guidelines,** **- Regulation on pesticides use**

		lakes and fish farming, **- Apiculture/Beekeeping** **- Ratification of ITPGRFA** **- Initiation of water users organizations at national level**	**fertilizers** **- Threats to landraces and local breeds**	
Land use	**Partly**	**- Buffer zone** **- Zoning** **- Terracing** **- Relocation of people from high risk zones and wetlands** **- Trees planting** **- Beautification and greening of cities** **- Promotion of construction in height** **- Imidugudu (Planned rural settlements)**	**- Rural settlement** **- Urbanisation** **- Infrastructures development** **- Natural resources degradation** **- Wastes' production** **- Pollution**	**- National Land Use Master Plan (NLUMP)** **- District land use master plan** **- EIA/SEA**
Forestry	**Yes**	**- Trees planting and agroforestry,** **- Soil retention and erosion control** **- Rehabilitation of degraded forests** **- Establishment of buffer zones around natural forests,**	**- Monoculture** **- Clear cutting**	**- EIA/SEA** **- Guidelines and regulations for forest harvesting** **- Phyto-sanitary**

		wetlands, river banks and lake shores. **- Protection of threatened tree species** **- Protection and promotion of indigenous tree species** **- Elimination of high water consuming tree species (e.g. *Eucalyptus ssp*) in wetlands** **- Control of imported exotic species** **- National forestry policy**		**certificate**
Water Resources Management	**Yes**	**- Catchment protection: erosion control and preventing siltation of rivers and lacs** **- Water allocation by maintaining environmental flow.** **- Monitoring water quality to maintain biodiversity survival.** **- Control of water hyacinth in water bodies** **- Partnerships, incentives and benefit sharing to enhance water resources conservation and management**		**- Integrated approach to water resources management (IWRM)** **- Integrated watershed management**
Water supply and	**Partly**	**- Waste water treatment plants**	**- Soil degradation**	**EIA/SEA**

Sanitation		**- Establishment of ecological sanitation toilets (ECOSAN)** **- Awareness of selective waste collection**	**- Weak solid waste management** **- Lack of sewage treatment network**	
Energy	**Partly**	**- Promotion of renewable energy sources *(e.g. biogas, solar…)*** **- Promotion of energy resource use efficiency and cleaner production (*e.g. improved cooking stoves*)**	**- Ecosystem transformation/degradation through dams/hydropower plants construction** **- Traditional charcoal making** **- High dependency on fuel wood**	**EIA/SEA**
Mining	**No**		**- Ecosystems degradation** **- Soil erosion** **- Downstream water bodies' siltation**	**EIA/SEA**
Industry	**Partly**	**- Environmental friendly Industry policy** **- Relocation of industries from wetlands to Special Economic Zone** **- Promotion of energy resource use efficiency and cleaner production**	**- Pollution** **- Weak waste management systems**	**EIA/SEA/ISO**

Urbanization and rural settlements	**Partly**	**- Relocation of people from high risk zones and wetlands** **- Trees planting** **- Beautification and greening of cities** **- Promotion of construction in height** **- Imidugudu (Planned rural settlements)**	**- Environment /biodiversity degradation**	**EIA/SEA/ NLUMP (National Land Use Master Plan)**

3.5.2. Synergies achievements in relation to Rio+20 and other relevant conventions

Concerning the synergy in the implementation of Rio+20, the Government of Rwanda (GoR) has, since 2006, implemented many projects in the framework of Multi-lateral Environmental Agreements (UNFCCC, CBD and UNCCD). This has been conducted providing financial and technical support to youth and women associations, schools projects, etc. Rwanda synergy project' activities included : training implementing associations in projects development and provide support to projects implementation that contribute at the same time to protect and conserve the biodiversity, combat desertification and contribute to climate change impact mitigation.

The recent review of the current sustainable development trends, incorporated environmental sustainability and climate change as key components of the national sustainable development pursuit. This serves as a key message for Rio+20 as the world reviews the path from 1992 to today on the sustainable development front.

It became apparent that climate change had far reaching implications in influencing national economic development and the GoR has developed a renewed commitment to address climate change following data and information that was gleaned from the first and second communications in the framework of UNFCCC. This is achieved in the framework of the green growth and climate resilient strategy: The Climate Change and Low Carbon Development

(LCCLCD) Strategy and one other key feature of the strategy is embedding the fund for environment and climate change "FONERWA" which is a multi-sectoral sustainable financing mechanism that provides an opportunity for sectors to climate proof development and open up sector specific green jobs.

More other synergy projects have been implemented in Rwanda as follows:

i. ***The AAP-LDCF Projects*** (REMA-GEF and Embassy of Japan): "Supporting Integrated and Comprehensive Approaches to Climate Change Adaptation in Africa" - Building a comprehensive national approach in Rwanda" and "Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness System and Support for Integrated Watershed Management in Flood Prone Areas". Some of targets include in one hand e.g. "Leadership and institutional frameworks to manage climate change risks and opportunities in an integrated manner at the local and national levels strengthened" and in another hand e.g. degraded land (in Gishwati target area) rehabilitated in each sector at least up to 60%". The AAP project had the following outputs (1) Output 1: long-term planning for CCA; (2) Institutional framework setting; (3) CCA measures in priority sectors; and (4) Knowledge sharing. While LDCF had the following outcomes (1) Early Warning System in Gishwati; (2) CCA incorporation into Nyabihu District Development Plan (DDP); (3) Pilot land-use management in Gishwati and (4) Knowledge sharing. These two projects have been implemented by REMA, RAB and districts.

ii. ***The Landscape Approach to Forest Restoration and Conservation (LAFREC) Project (REMA - GEF)***, is also another example of synergy projects. It is has a clear forest focus and was developed with the Multi-Focal Area/Sustainable Forest Management objectives at its core and also around a landscape approach which will bring the forest ecosystems into better management and develop multiple benefits. They will be achieved through the conservation and sustainable use of biodiversity, increased forest cover, climate change adaptation efforts together with combating land degradation. The project will support activities to help reduce the negative impacts of human activities on forested landscapes and wetlands that depend on them. But also transform degraded areas into a healthier, more fertile and productive working landscapes to meet the needs of local communities and natural ecosystems. More specifically, in the Gishwati forest area the GEF resources

could support activities to increase and conserve the area of protected forests as habitat for native biodiversity, as well as encourage farmers to establish diverse agroforestry plots and woodlots using native trees that provide benefits to food security and decrease pressure on forests as sources of livelihoods, including fuel wood.

iii. ***The Sustainable Land use Management (SLM)*** implemented by RADA (5 November 2009 End Date: 30 April 2011): The objective of this service contract is to build capacity of Rwanda Agricultural Development Authority (RADA) and any other institutions dealing with land degradation in Sustainable Land Management (SLM). The activities included (1) Design a communication strategy for SLM clearly identifying target groups and information to be disseminated to each target group; (2) Implement the strategy; delivering training /awareness raising; (3) Develop a system of Knowledge Management and establish an interactive knowledge data base for the pilot sites to be integrated into training; (4) Establish a network of all SLM stakeholder; (5) In collaboration with institutions of higher learning, use the material to develop curricula for Extension agents at sector and District levels, based on the compiled suite of intervention package; and (6) Monitor effectiveness of the training and use information in adaptive feed-back mechanisms to fine tune the training programme and field manual of techniques.

iv. ***The National Monitoring System and Measurement, Notification and Verification (MNV)*** following a regional approach aimed at contributing to the ownership of the REDD+ process and of the national system of forest monitoring "S*NSF*" which is funded by FAO through COMIFAC-CBFF.

3.5.3. Transboundary management mechanisms

Concerning the establishment of transboundary management mechanisms, there exists:

i. ***Greater Virunga Transboundary Collaboration (GVTC)*** which is a strategic management system for the Greater Virunga landscape, through transboundary and collaborative mechanisms, which help to address both conservation and socioeconomic and political issues, in a landscape defined by ecosystems rather than administrative boundaries. This is in accordance with the Convention on Biological Diversity that advocate for the use of landscape and ecosystem approaches for managing biodiversity in the region, in recognition of the need for increased regional cooperation.

At East Africa level, there are also some initiatives including:

ii. ***Transboundary Ecosystems Management and Conservation in East Africa***. Initiatives of organizing workshops at regional level have been launched. The East African Community (EAC), in collaboration with the Wildlife Conservation Society (WCS) and the United States Forest Service (USFS) through support from the USAID Africa Bureau organized a regional workshop with support and cooperation from EAC partner states and the collaboration and participation of neighboring countries.

The overall objective of the workshop was to provide a forum to trigger and promote conservation and management activities for the Trans-boundary ecosystems for enhanced socio-economic development. The specific objectives include but are not limited to:

- Increase awareness and appreciation of the challenges and opportunities for TBC in East Africa
- Review current state of TBC in East Africa and highlight best practices and lessons learned
- Develop a roadmap and identify structures and mechanisms to promote, develop & coordinate TBC
- Determine mechanisms for future information sharing and collaboration on TB initiatives and experiences

iii. ***East Africa's protected area management agencies*** (Kenya Wildlife Service, Uganda Wildlife Authority, Tanzania National Parks Authority, Rwanda Development Board, Institut National pour l'Environnement et la Conservation de la Nature) are tasked by national governments with promoting economic development by safeguarding and enhancing environmental services provided by protected areas, including tourism development, watershed management, biodiversity conservation and other ecosystem services. Where protected areas lie on either side of an international frontier, different policies and legislation, planning and management structures, as well as the movement of wildlife, pastoralists, water, fire, and tourism across frontiers, challenges these national authorities to coordinate their planning and activities in order to achieve their aims. Within East Africa, many important protected area systems are transboundary in nature. The lack of such coordination can result in serious setbacks to national conservation and

development strategies. The workshop developed a critical analysis focusing thematic pertaining to:

- Policy, institutional and legal frameworks for conservation in the EAC
- Biodiversity conservation and protected areas management
- Land use planning and watershed management
- Fire management
- Regional tourism development
- Community participation and benefits-sharing
- Extractive industries

In agro-biodiversity sub-sector there are also number of positives initiatives such as:

iv. ***Strengthening RAB's Capacity to Develop Climate Change Adaptation Interventions and Policy recommendations*** that ensure their Adoption (RAB-Rockefeller Foundations) and "Improving Rwandan farmers' climate change adaptive capacity through enhanced climate research skills and institutional collaboration" are two projects one after another which were implemented in RAB.

v. ***The East African Community (EAC)'s Agriculture and Rural Development Strategy (2005-2030)***, states cleary that the EAC has made good effort towards establishing coordination mechanisms for the prevention and control of Trans-boundary Animal Diseases (TAD) and zoonoses.

At Secretariat level, a Regional Highly Pathogenic Avian Influenza (HPAI) Emergency Preparedness Plan was elaborated and it was further supported through the implementation of a regional Avian Influenza project funded by the European Union. The EAC has also developed preparedness and response plans targeting epidemics of Rift Valley Fever, Ebola Hemorrhagic Fever and "Peste de Petits Ruminants" (PPR) that have affected the region. Cognizant of the role of EAC regional economic integration and in view of the importance animal resources to the people of the region, the EAC is partnering with African Union Inter-african Bureau for Animal Resources (AU-IBAR), United Nations Food and Agriculture Organization (FAO), Office international des Epizooties (OIE), United Nations World Health Organization (WHO) and the African Union's Department of Social Affairs, to develop of an integrated regional coordination mechanism (IRCM) for the prevention and control of TADs and zoonoses. So far the participation of most players along the value chains is weak. In order to ensure stakeholders'

compliance with biosecurity measures and regulations, it is crucial to ensure their participation in the design and implementation of disease prevention and control initiatives.

IV. PROGRESS TOWARDS 2020 AICHI TARGETS AND MDG TARGETS

In general, Rwanda is in high and good progress in achieving the implementation of both CBD Aichi and MDG targets, yet, some areas need more efforts given natural and socio-economic constraints.

4.1. PROGRESS TOWARDS THE IMPLEMENTATION OF THE CBD 2020 AICHI TARGETS

Until now, there was no common Action Plan for the implementation of the NBSAP's activities including those planned in different programs of other development sectors. However, many actions have been achieved or are ongoing in different sectors which are in line with the NBSAP's activities implementation.

Therefore, the evaluation of the progress of national achievements towards CBD 2020 Aichi targets implementation has been done by estimating the level of relevant sectoral achievements. A rough estimation on the progress in the achievement of those specific actions executed in different sectors has been highlighted with regard to each Aichi target as presented in the table below.

Table 9: Progress towards CBD Aichi Targets

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	Campaigns for sensitization of local authorities and communities surrounding protected areas	-Awareness raising through sensitization of local authorities and communities surrounding the parks on biodiversity conservation				
	Development of efficient communication and outreach tools	-Efficient communication and outreach tools on environmental management have been developed (websites, newspapers, brochures, leaflets …				
	Development of simplified learning and teaching materials	-Simplified learning and teaching materials have been produced (handbook, starter pack, theme parks etc..) related to biodiversity and their distribution in some schools neighboring protected areas;				
	Organize study tours in schools surrounding protected areas	- Study tours have been organized for schools surrounding national parks				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
	Raising awareness on biodiversity conservation in schools through different communication tools	- Some competitions in drawings, songs, drama organized in schools surrounding parks and nature reserves				
	Community development for sustained conservation" Organize yearly ceremony for naming new born gorilla	-Yearly Kwita Izina (Naming) ceremony for new born gorilla babies				
	Campaigns to sensitize general public on different environmental issues	-Public awareness has been raised on environmental issues and management				
Target 2: By 2020 at the latest biodiversity values have been	Total economic valuation of ecosystem services in Nyungwe watershed and Mukura forest reserve	-Ecosystem services have been evaluated in Nyungwe watershed and Mukura natural forest				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting as appropriate and reporting systems	Include natural capital accounts into national accounting system	-Some initiatives are undergoing to include natural capital accounts into national accounting system				
Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed, and positive incentives for the conservation and	Development of composting technologies to promote the use of organic fertilizers	-Promotion of organic fertilizers use (through Girinka program), a policy of one cow per poor family; composting technologies dissemination to replace harmful chemical fertilizers in order to minimize or avoid negative impacts to soil fertility and human well-being				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	Promotion of Zero Grazing at National level	-Breeding ruminants zero grazing has been extended at country level				
	Raising community conservation partnership with local communities	-Community programmes have been developed around PAs aiming at reducing encroachment in search of forest products, water, beekeeping etc. For example, support to planting bamboos as raw material that people use to harvest in parks…				
		-Cooperatives surrounding lakeshores, riverbanks have received incentives for developing alternative livelihoods. In exchange, they ensure maintenance of rehabilitated buffer zones on lakeshores and riverbanks				
	"	-Water supply facilities in the vicinity of protected areas				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 4: By 2020, at the latest, Rwandan Government, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	Promotion of new alternatives for improving sustainable use of natural resources	-Energy, Water and Sanitation institution has promoted energy use efficiency in public buildings but also at household level.				
	"	-For sustainable use of natural resources different stakeholders promoted use of energy saving stoves, biogas and other alternative energy				
	"	-National program for sustainable consumption and production has identified priority projects for SCP				
	Organize technical workshops and short term training on different environmental issues	- Capacity building on cleaner production and sustainable consumption and production (SCP) being planned for industries for 2014/2015				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
	"	-Promotion of green and climate resilient villages and green schools (rainwater harvesting systems, biogas, reforestation and agroforestry, sustainable management of soil and water, use of organic manure…)				
Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying	Elaboration of integrated management plans of 17 inland water bodies	-Seventeen integrated management plans of national inland water bodies have been produced which include, fishing capacity and regulatory fishing effort.				
	Restoration of fish stocks and increasing fishery yield	-Fish restocking in the lakes has been done				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Promoting sustainable use of fish resources through stock recovery	- Each year, a fixed period for fishing ban in lakes is respected				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
***Target 7*: By 2020,** environmental pollutants including those from excess nutrients are controlled and their harm has been brought to levels that are not detrimental to ecosystem function and biodiversity	- Establish legal framework preventing and protecting environment degradation	- Organic Law N° 04/2005 of 08/04/2005 Determining the modalities of protection, conservation and promotion of environment in Rwanda - Law N°57/2008 of 10/09/2008 relating to the prohibition of manufacturing, importation, use and sale of polythene bags in Rwanda - Ministerial Order of 2008 establishing modalities of inspecting companies or activities that pollute the environment - Ministerial Order N° 003/16.01 of 15/07/2010 preventing activities that pollute the atmosphere - Ministerial order (2008) Relating to the requirements and procedure for environmental impact assessment - Ministerial Order Nº 006/2008 of 15/08/2008 regulating the importation and exportation of ozone layer depleting substances products and equipment containing such substances				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
***Target 8*:** By 2020, invasive alien species, their pathways, spatial distribution are identified. Harmful species are controlled or eradicated, and related mitigation measures are put in place	- Policy and legal framework establish - Water hyacinth control in lakes of Akagera National Park (ANP)	- Environment Organic Law, Environment Policy - Water hyacinth removal from lakes in ANP through community participation				
Target 9: By 2020, at least 10,3 per cent of land area is protected to maintain biological diversity	- Protected biodiversity out of protected areas - Increase the area of protected areas	- Buhanga forest being part of VNP for its effective protection - Gishwati and Mukura upgraded to the status of Protected areas - Remnants forests and Lake Kivu Islands and their respective species' diversity inventoried and mapped, and a law is being prepared to confer them the status of protected areas				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
***Target 10*:** By 2020, the extinction of threatened species are prevented and their conservation status improved, particularly of those most in very endanger of extinction	- Establish of policy and regulation protecting biodiversity	- Biodiversity Policy (2013) - Wildlife Policy (2013) - Biodiveristy Law (2013) - Environmental Policy (2003) - Environmental Organic Law (2003) Ministerial order N0 007/2008 of 15/08/2008 establishing the list of protected animal and plant species				
Target 11: By 2020, at latest 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem *services, are conserved through effectively and*	Increasing superficies of protected areas to maintain biological diversity	- Increasing of protected area to maintain biological diversity (from 10,1 to 10,3%) and forest cover (up to 30%) have been set in Vision 2020				
	Development of integrated management plans of three parks (ANP, NNP and VNP)	-Management plans of the three principals protected areas: ANP, VNP and NNP have been elaborated, including ecosystems' rehabilitation				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.	Elaboration of policy, legal and institutional framework related to biodiversity conservation	-Key policies, legislations and a set of decrees have been adopted to support biodiversity conservation (i.e. biodiversity policy and law, FONERWA law etc…				
	"	-Wildlife policy adopted and wildlife law as well as PES regulatory framework under preparation				
	"	-Rwanda Forest Landscape Restoration Initiative set as a national policy				
Target 12: By 2020, minimize and/or eliminate the potential risks resulting from biotechnology use and placement on the market of its products.	Development of national Biosafety framework	-National Biosafety frame-work (NBF) has been developed which comprises 3 draft components not yet been adopted: -National biotechnology and biosafety policy; -National biosafety bill; -Institutional framework.				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
	"	- A new project to revise and implement the NBF is under implementation and it includes acquiring equipments for GMOs' detection				
	Organize short and long term training programs on biotechnology development	- Building capacity towards rational use of biotechnology				
Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Development of a program for genetic resources conservation in agriculture sector	-Program for conservation of selected genetic diversity of crop varieties, livestock breeds and races.				
	"	Program for improving natives species by crossing for more agro-pastoral productivity or saving genetic resources are being implemented by MINAGRI				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable	Rehabilitation of critical ecosystems in Rwanda	- 4 wetlands complexes, lakeshores and riverbanks and related watersheds have been rehabilitated.				
	Rehabilitation of Gishwati and Mukura natural forests reserves	-Rehabilitation of natural forests reserves (Mukura & Gishwati) through removal of exotic species and extension of land to be reforested preferably with indigenous species. Rehabilitation of Gishwati has tremendously contributed to reduce flooding and landslides				
	Creation of water users organizations	-Water users Organizations initiated by MINAGRI are under operation				
Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization	Ratification of Nagoya protocol and development of its regulatory framework	-The Nagoya Protocol for access to genetic resources and equitable sharing of benefits from the use of biological resources has been ratified in February 2012.				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
is in force and operational, consistent with national legislation.	"	- Development of regulatory framework, to domesticate the Nagoya Protocol has started and will be adopted in 2015				
	"	-Capacity building on negotiation skills and identification of GR of economic importance is in planning				
Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	Development of the first NBSAP and its implementation	-In 2003, Rwanda has developed its first NBSAP which is a key tool for the implementation of the CBD.				
	Produce National Reports to CBD	- 4 national reports have been already prepared and submitted to the CBD Secretariat, the last one being of 2008				
	Revision and updating of NBSAP and production of the 5th National Report to CBD	-The revision and updating of NBSAP has been done and NBSAP is scheduled to be adopted by 2015				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	Elaboration and adoption of environmental legal framework	-Key legislations have been adopted to support biodiversity conservation: Environment organic law, biodiversity law, a set of decrees for protection of biodiversity etc….				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	Conducting research on biodiversity status in 3 main parks (ANP, NNP and VNP)	-Improved scientific knowledge on biodiversity in 3 main parks (ANP,NNP & VNP)				
	Updating biodiversity inventory in 4 national principals wetlands	-Biodiversity in 4 principals wetlands complexes has been inventoried, this information is necessary for actions to conservation				
	Conducting research on inventories of Kivu Lake's Islands biodiversity	-Other inventories of biodiversity have been undertaken for Kivu islands, and Remnant forests.				
	Research on species inventory and mapping of threatened remnant terrestrial ecosystems outside protected areas	-A flora and fauna species inventory and maps of threatened remnants natural forests have been conducted.				
	Production of biodiversity catalogue	-Biodiversity catalogue has been developed				
	Creation of a National Centre of Excellence in Biodiversity	-Centre of Excellence on Biodiversity has been established (University of Rwanda/MINEDUC).				

Aichi Targets	National actions	National Achievements	Estimated progress of achievement			
			Fully achieved	Advanced progress	Low achievement	Not started
Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011-2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.	Financial resources mobilization for the conservation and sustainable use of biodiversity	-An appreciable step in the implementation of the first NBSAP has served as sound tool for leverage of new and additional funds for the conservation and sustainable use of biodiversity (GEF projects such as Protected Areas biodiversity, Landscape approach to Forest restoration and Conservation etc...); Capacity building for development of proposals to be submitted for FONERWA funding is planned in 2014, this will help to develop proposals related to biodiversity and ecosystems conservation/wise use for funding				

4.2. CONTRIBUTION OF IMPLEMENTED ACTIONS TOWARDS THE MDG RELEVANT TARGETS

In general sub-Saharan African countries are showing excellent progress on average. The top ten performers in 2013 are Mali and Rwanda (scoring 6.0). Rwanda's commitment to achieving the MDGs is demonstrated by our Economic and Poverty Reduction Strategy (EDPRS). National achievements in regards of relevant 2015 Targets of the Millennium Development Goals are illustrated through the table below.

Table 10: National achievements towards relevant 2015 MDGs

MDG Goal 7: Ensure Environmental Sustainability	**1990**	**2008**	**2012** ***Actual***	**2015** ***Targets***	**National Achievements**	**Status**	
						FA*	**AP***
Target 7A: Integrate the principles of sustainable development into the country's policies and programmes and reverse the loss of environmental resources **Target 7B:** Reduce biodiversity loss Proportion of land covered by forest C02 emissions total per capita Consumption of ozone depleting substances Proportion of total water resources used Proportion of terrestrial areas protected	**18.5**	**10.0**	**24.5**	**25.0**	- Poverty-Environment indicators integrated into national planning processes - Conducting EIA and SEA are regulated and are integrated into sectoral and projects planning - Environment and climate change issues integrated into planning and budgeting processes (an annex on mainstreaming environment and CC issues is part of the annual budget call circular) - Agro-forestry, alternatives sources of energy rather than biomass , use of improved cooking stoves that reduce firewood consumption, …are promoted across the country - Cross-country reforestation program		

						through PAREF project of RNRA - Driest areas of the country (Bugesera and Umutara) have been greened through successful tree planting programs - Ministerial order 2008 regulating the importation and exportation of ozone layer depleting substances, products and equipments containing such substances - Gishwati and Mukura forests Reserves, - Buhanga cultural forest attached to PNV	
Proportion of species threatened with extinction			**12**		**10**	- Inventory of the biodiversity of four main wetland complexes - Inventory of biodiversity of remnant forests Inventory of Lake Kivu islands biodiversity	
Target 7C: Halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation	Proportion of population using an improved drinking water source		**59.9**	**74.2**	**82.0**		
	Proportion of population using an improved sanitation facility		**56.3**	**74.5**	**82.0**		

***FA**: Full Achievement; **AP**: Advanced Progress

Sources: ***Millennium Development Goals Progress Report, Rwanda Country Report 2010/UNDP & EICV, 2012/EDPRS 2, 2013.***

4.3. LESSONS LEARNED FROM THE NBSAP IMPLEMENTATION

4.3.1. Success Stories

During the implementation phase of the first NBSAP, there has been number of successful actions that are presented below:

1) The Gishwati Forest Reserve

In the period between 1933 until the mid of 1970s, Gishwati natural forest reserve constituted the relic of the ombrophyllous montane forests (Fisher, E. and Hinkel, H., 1992). It was covering in its extent approximately 280km^2. In the early 1980s (Plumptre et *al.*, 2001), Gishwati has lost 100km^2 converted to pasture and another 100km^2 to pine plantations. Beside the developing projects, the main cause of deforestation was the increase in population in the Gishwati area during the 1980s which led to an increase in livestock numbers, hence increasing demand for grazing, settlement, crop land and fuel food (MINECOFIN, 2002).

Thereafter, Gishwati has been deforested for cattle ranching development, followed by resettlement of refugees after the 1994 genocide from when land has been degraded due to free-grazing of livestock, over crop farming exploitation and plantations of non-native trees species. In 2005, more than 90% of Gishwati was cultivated (Blondel, 2006), the remaining remnant forest was 600 hectares.

Consequently, the forest reserve has lost most of its natural habitats and rich biodiversity, plagued with flooding, landslides, erosion, decreased soil fertility, decreased water quality and heavy river siltation, all of which aggravated poverty within population surrounding the ecosystem.

Recently, through different management plans, Gishwati natural forest reserve is gradually restored. In 2005 - 2006, with efforts of PAFOR to restore the forest, 286 hectares were added.

From 2008 to 2011 the Great Ape Trust/Gishwati Area Conservation Program (GACP) worked on conservation and restoration of the Gishwati Forest Reserve and reforested more 598 hectares using indigenous species. This increased the current Gishwati Forest Reserve superficies, estimated to 1484 hectares (Oliver et *al.*, 2014).

Building on GACP achievements, a grassroots organization called "Forest of Hope Association (FHA)" has been initiated in Rutsiro District in order to facilitate local community to play an active role in the protection of Gishwati forest, through the establishment of a Community Forest Protection Initiative (CFPI), (Oliver et *al.*, 2014). Since then, illegal use of forest resources has been prevented due to the commitment and collaboration of all stakeholders including local communities.

Currently, the area has been divided into three main parts which are: Natural forest area, Cattle ranching farms and Cultivated area for crop production. People settlements are supposed to be shifted out of the area for ecosystem restoration and biodiversity conservation purpose.

Successful restoration interventions initiated from 2002 to date contributed efficiently to halt flooding and loose of human life, control of erosion and diminution of siltation phenomenon in streams and marshlands areas.

The cultivated site is now regenerating with the plantation of nursed trees and the forest fallow is composed mostly by *Neoboutonia macrocalyx* and *Polyscias fulva* (Banamwana, 2008). The introduced trees, including Eucalyptus, Reeds, Avocadoes, Cyprus and Acacia are growing as well.

2) Rugezi Wetland

Rugezi wetland has been invaded and seriously degraded by human activities including agriculture development in the vicinity of the wetland, diverting and using water from swamp for crop irrigation, livestock free grazing within the wetland, bricks making, vegetation clearing, pollution and sedimentation due to erosion from unprotected surrounding hill shades, poaching targeting mammals species, and abnormal drainage of the swamp and the river in order to maximize the flow for hydropower production. This last threat had as consequence, drying of

marshland areas with accompanied loss of important biodiversity, as well as drastically river flow decreasing.

This alarming situation has pushed the Government of Rwanda to take all necessary measures dedicated to the restoration of Rugezi wetland. The UNDP-UNEP Poverty-Environment Initiative had been instrumental in providing the necessary economic analysis and data on which the restoration efforts of Rugezi were based.

In fact, an economic analysis of environmental degradation ("Economic Analysis of Natural Resources Management in Rwanda") which focused on two case studies, the Rugezi wetland and the Gishwati forest was conducted. The study has generated significant findings which in turn where used by policy-makers to improve environmental decision-making.

Some of the significant findings from the study were:

- ✓ The high electricity prices were significantly correlated with the reduced water levels in the lakes and the hydropower reservoirs downstream from the Rugezi wetland;
- ✓ The degradation of the Rugezi wetland had significantly reduced the water flows, and thus electricity production was severely affected, and
- ✓ The detrimental cost of the wetland degradation on local communities' livelihoods.

Consequently, this powerful evidence attracted attention from the highest political level and resulted in a political commitment to restore the Rugezi wetland. The wetland complex has been declared Ramsar site and got status of protected area. Then, a large scale program was put in place to resettle farmers and introduce more sustainable farming techniques and other income generating activities. Support from other donors was also introduced, among others support for eco-tourism in the wetlands.

Today, less than 6 years since the economic study was released, the wetland has been restored, water flow levels increased and a new hydropower station has been constructed and is operational.

Photo 6: Hydropower station constructed on Rugezi falls

This successful restoration has gained international recognition and REMA, on behalf of the Government of Rwanda, received the Green Globe Award in October 2010 (issued by the World Wetland Network) in recognition of efforts to restore the Rugezi wetland. This case has also informed other national policies, such as energy policy and agricultural policy to integrate more environmental practices, amongst others, sustainable watershed management *(accessed on http://www.unpei.org/our-stories/rwanda.*

3) Buhanga

For reasons of culture or adherence to the traditions, Buhanga has not yet been strongly affected by anthropogenic activities. In fact, the site is still marked by the presence of giant *Ficus sp.* and old houses used as places of spiritual investiture for the various monarchs of Rwanda. The monarchs were required to make the pilgrimage before they took office.

But, some years ago, before its inclusion within the conservation status of Volcanoes national park, as natural reserve, its borders have been encroached for agriculture development and trees cleared for domestic use.

Today, the tendency has reversed, Buhanga natural reserve is managed by Rwanda development Board as protected area, and local people respect this sacred place and ensure its ecological integrity.

With its touristic assets, Buhanga mini Park presents natural and cultural opportunities for the promotion of scientific cultural and ecological tourism. It is with a greatest originality by the fact that it is seen by history and folk traditions as the cradle of Rwandan civilization.

4) Akagera National Park protection

Akagera National Park was first gazetted in 1934 at which time the park covered an area of 2,700 km² or nearly 10% of the total surface area of Rwanda. The park had a rich biological diversity including six forest fringed lakes, a large protected wetland, savannah plains, the Akagera River and the Mutumba hills in the west which reach an altitude of nearly 2,000 m. All of these attributes make Akagera one of the most scenic parks in Africa.

From 1994 onwards, the park came under severe pressure from returning refugees and their cattle. Semi-permanent settlements were built in the park, and significant anthropogenic actions increased pressure on the park and its biodiversity, as a result, Akagera was reduced in 1997 to its current size of 112,000 hectares.

During more than two decades, conflicts between human and wildlife increased, animals would cross over from the park into the neighboring villages and destroy crops, occasionally kill humans, which factor was threatening the human-wildlife co-existence since people settled near the park saw the wildlife as enemies. Furthermore, beside animal raids on local communities and their goods, the past was also characterized by intense activity of poachers, who due to lack of a boundary would hunt animals in the Akagera National Park for meat and other commercial purposes. Such conflicts continued so that many animals have been killed, even some species

disappeared (lion, rhinoceros etc.). This situation also qualified people as enemies of wildlife in the park.

For a better management of the Park, since 9th February 2010, African Parks (AP) and the Rwanda Development Board (RDB) agreed to jointly manage Akagera National Park via the formation of Akagera Management Company (AMC). For that purpose, a business plan has been set out supported by a detailed 5 years budget spreadsheet prepared accordingly.

Since 2010, the first year of management of the park by AMC, an appreciable step in solving the numerous operational and financial constraints has been made, so that tourism revenue has already increased to US$ 400,000 in 2011, aided by the intervention of AMC. This revenue was generated from approximately 15,000 visitors per annum, half of which being Rwandan citizens.

Development of the park will continue, with the key objective of continuing to develop tourism infrastructures, raising revenue and associated employment (AP/RDB, 2011). Nowadays, the management of ANP constitutes a successful example of a public-private partnership, and the park will be in a near future an integral and successful component of the local, regional and national economy.

As a result of AMC's long-term involvement in the management and protection of ANP, as well as in line with Government's strategy to reduce major human-wildlife conflicts, the western boundary of the park has been electrically fenced. The fence situated on the western side of the park in the three Eastern Province Districts of Kayonza, Nyagatare and Gatsibo covers 110 km, has 1.8 m highline of metallic posts with 8 horizontal electrified wires. It is powered with solar energy and power energizers.

The setting up of this fence constitutes a controversial issue:

- ✓ on one side, the fence comes as a solution to security of both people living in the vicinity of the park and their goods, as animals like buffaloes, elephants, hippos, wild pigs and monkeys often destroyed crops or even killed people since there was nothing to keep their evasion from the park. At the same time, the fence also prevents poaching that has

led to loss of some key animal species in the Park as well as encroaching for agriculture development;

- ✓ on the other side, the establishment of that fence limits the foraging areas of some species, especially herbivorous, thus limiting ecological niches essential for their feeding and breeding habits.

More detailed surveys are needed in order to identify preferred specific habitats for each species living in the park and adjust the limits accordingly.

The establishment of electric fence may constitute a successful story only in case it comes as a solution to security of people, their goods and biodiversity conservation of ANP. At the same time, the proposed fence will also contribute to the reduction of encroachment although the ecological zone has been compromised, especially for species like Buffalo with an increasing population (AMC/ANP Aerial Census, 2013).

Photo 7: Buffalo population estimated at over 2,000

5) Community Conservation around Volcanoes National Park (SACOLA)

The SACOLA (Sabyinyo Community Livelihood Association) has been created in 2004 by Kinigi District authorities in collaboration with the former Rwanda Office of Tourism and National Parks that is currently a department of RDB.

SACOLA has the following objectives: (i) improve and promote the lives of population surrounding the park who were suffering heavily from the consequences of the guerilla war of 1997-1998; (ii) protect the park against human activities and disease transmission from humans to gorillas.

SACOLA uses, supports and synchronizes services provided by local organizations and communities. It promotes profit sharing with surrounding communities. It uses as tools community cooperatives such as UNICOPAV (i.e. ex-poachers), ANNICO (i.e. producers of tourism products from bamboos), etc. By offering, positive incentives to local communities and jobs to vulnerable people, SACOLA prevents them to invade protected areas for poaching and commit other illegal threats.

SACOLA has recorded many achievements: construction of houses for genocide survivors and other vulnerable; revenue sharing from Silver Back Lodge; Gorilla naming ceremony introduced in 2005 to create awareness for safeguarding of the mountain Gorillas that are in danger of extinction etc.. With all revenues, SACOLA invests back in the community and by the way contribute to biodiversity conservation in protected areas.

Photo 8: SACOLA, a community-based biodiversity conservation success around VNP

6) Remnant Forests' biodiversity conservation

In Rwanda, the remnant terrestrial ecosystems are scattered across the country, often located between farmlands and human settlements areas. Although, remnant terrestrial ecosystems are considered as natural habitats with rich biodiversity (flora and fauna), they are given less importance in conservation effort, given that they are located outside protected areas and some of them are less known. They are threatened through trees cutting, vegetation clearing, encroachment for agriculture development, search of woody products and their extinction would

result in loss of threatened species and the associated effects would be an imbalance of ecological functions.

Recently, the inventory of all remnant terrestrial ecosystems and their mapping has been of great importance, because it constituted the first step forward for their protection and conservation (REM, 2011). For their effective management and conservation, all remnant forests inventoried are under process to be gazette as Protected Areas.

4.3.2. Challenges

Although important step in NBSAP implementation activities has been highlighted, many unsuccessful and challenges or gaps were encountered, *inter alia*:

- There has been inefficiency in coordination of the first NBSAP implementation activities and lack of key permanent staff to manage and monitor the overall program;
- The level of mainstreaming and integrating biodiversity considerations into development sectors as well as land-use planning procedures and environmental assessments has been weak;
- The country faces insufficient technical capacity in biodiversity related fields including development of research and applied projects, ecosystems services valuation and production of instruments to alleviate threats on biodiversity. There has been insufficient link with other international instruments for complementarities, although some regulatory systems have been initiated;
- Conflicting priorities have been noticed between some public institutions in regard to biodiversity management and conservation (i.e. MINAGRI & MINIRENA) depending on institutional mandates;
- Lack of new appropriate financing mechanisms necessary to raise sufficient funds for the NBSAP implementation activities;
- There has been weak mobilization and coordination of donors in order to avoid sector-driven donor & technical oriented support;
- There has been absence of established benefits sharing mechanisms in agro-ecosystems production and initiation of new stimulating incentives to protect agro-biodiversity.

4.3.3. Proposed actions to overcome challenges

- To make operational the Centre of Excellence for biodiversity conservation, with well-balanced programs, good laboratories and competent scientific and administrative staff;
- To establish a strong national Network and coordinate all stakeholders' activities in biodiversity conservation;
- To clearly define mandates of different institutions in charge of biodiversity management and conservation in order to avoid duplication works and encourage complementarities;
- To build technical capacity in biodiversity related field at different levels (short-medium-long term training);
- To develop and make operational new innovative financing mechanisms and facilitate voluntary schemes dedicated to harness their potential for protecting and enhancing ecosystem's services as well as contribute to pilots actions for biodiversity conservation;
- Considering Rwanda's good climate and rich biodiversity opportunities, our country should set up a business - led Ecosystem Markets, based on expanding green goods, services and various products;
- To establish a strong partnership with all stakeholders within the country and with regional organisms in order to help the biodiversity sector make the most of existing sources of funding and support the NBSAP's priorities.

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