REPUBLIC OF RWANDA




NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

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FOREWORD

Rwanda is endowed with rich biological diversity comprised of a great diversity of plants, animals and habitats which make our country unique. Biodiversity is the foundation of human well-being and a big percentage of Rwandans depends on goods and services provided by the ecosystems. The Government of Rwanda is committed to the conservation and sustainable utilization of biodiversity for the prosperity of its people and the nation.

The revised National Biodiversity Strategy and Action Plan (NBSAP) is a key tool for the implementation of the Convention on Biological Diversity (CBD) objectives and the Aichi Targets. It has been developed based on national needs and priorities for biodiversity conservation, in response to threats that are facing biological resources at country level.

This revised NBSAP lists 5 objectives and 19 national targets that aim to stop biodiversity loss and increase the economic benefits associated with the biological resources utilization and ecosystems services. It reflects the country's vision for biodiversity and the broad strategic mechanisms that Rwanda will take to fulfil the objectives of the CBD. This strategy has a long term vision of ensuring that by 2040, national biodiversity will be restored and conserved and hence contributing to economic prosperity and human well-being through delivering benefits essential for Rwandan society in general.

Rwanda has made great achievements in conserving its biological diversity during the two past decades. These include the process of gazetting Gishwati and Mukura Forest Reserves as the 4th National Park, an increase in the number of primate troops and ungulates in the Akagera National Park, endangered mountain gorilla population in Volcanoes National Park as well as protection of remnant natural forests. However, so much remains to be done to ensure we bequeath healthy nature to the next generations.

Finally, conservation goals cannot be attained without a high participation of local communities and all stakeholders involved in a way or another in biodiversity management. In this regard strong emphasis has been put on community and stakeholders engagement.

I would like to take this opportunity to thank all conservation partners and local communities for their invaluable support during the elaboration and development of this NBSAP. I also commend their tremendous efforts to conserve and sustainably use the country's biodiversity.

Vincent BIRUTA
Minister of Natural Resources

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ABBREVIATIONS & ACRONYMS

ABAKIR :	Autorité du Bassin du Lac Kivu et de la Rivière Rusizi
ABS :	Access and Benefits Sharing
ACNR :	Association pour la Conservation de la Nature au Rwanda
ADB :	African Development Bank
DNA :	Deoxyribonucleic Acid
AK-47:	Avtomat Kalashnikova
AMC :	Akagera Management Company
ANP :	Akagera National Park
ARCOS :	Albertine Rift Conservation Society
ARECO :	Association Rwandaise des Ecologistes
AZE :	Alliance for Zero Extinction
AWC :	Akagera Wetland Complex
BZ :	Buffer Zone
CAVM:	College of Agriculture and Veterinary Medicine
CBD :	Convention on Biological Diversity
CBNRM :	Community-Based Natural Resources Management
CBOs :	Community Based Organizations
CEPA :	Communication Education Participatory Awareness
CITES :	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CHM :	Clearing House Mechanism
CoEB :	Centre of Excellence in Biodiversity and Natural Resources Management
COP :	Conference of Parties
CST :	College of Science and Technology
DDP :	District Development Plan
DFGFI :	Dian Fossey Gorilla Fund International
DRC :	Democratic Republic of Congo
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 of the United Nations
FONERWA	:	Rwanda National Environment and Climate Change Fund
GACP	:	Gishwati Area Conservation Program
GDP	:	Gross Domestic Product
GEF	:	Global Environment Facility
GEF –SGP	:	Global Environment Facility – Small Grants Program
GHU	:	Germplasm Health Unit
GIS	:	Geographical Information System
GMOs	:	Genetically Modified Organisms
GO	:	Gorillas Organization
GR	:	Genetic Resources
GVTC	:	Greater Virunga Transboundary Collaboration
ICRAF	:	International Center of Research in Agro-Forestry
IGCP	:	International Gorilla Conservation Program
INES	:	Institut National d'Enseignement Supérieur
INATEK	:	Institute of Agriculture, Technology and Education of Kibungo
IRST	:	Institut de Recherche Scientifique et Technologique
ICCN	:	Institut Congolais pour la Conservation de la Nature
IPR	:	Intellectual Property Rights
ITPGRF	:	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	:	International Union for Conservation of Nature
IWMS	:	Integrated Watershed Management System
IWRM	:	Integrated Water Resources Management
KCCEM	:	Kitabi College for Conservation and Environmental Management
KRC	:	Karisoke Research Center
LODA	:	Local Administrative Entities Development Agency
MGVP	:	Mountain Gorillas Veterinary Project
MIDIMAR	:	Ministry of Disaster Management and Refugee Affairs
MINAFET	:	Ministère des Affaires Etrangères
MINAGRI	:	Ministry of Agriculture and Animal Resources
MINALOC	:	Ministry of Local Administration

MINECOFIN	:	Ministry of Finance and Economic Planning
MINEDUC	:	Ministry of Education
MINEACOM	:	Ministry of Industry, Trade and East African Affairs
MINICOM	:	Ministry of Trade and Industry
MINIJUST	:	Ministry of Justice
MININFOR	:	Ministry of Information
MININFRA	:	Ministry of Infrastructures
MINIRENA	:	Ministry of Natural Resources
MINISANTE	:	Ministère de la Sante
MINISPOC	:	Ministry of Sports and Culture
MINITERE	:	Ministère des Terres et Ressources Environnementales
MTN	:	Mobile Telecommunication Networks
NAEB	:	National Agriculture Export Board
NAFA	:	National Forestry Authority
NBF	:	National Biosafety framework
NBSAP	:	National Biodiversity Strategy and Action Plan
NGOs	:	Non-Government Organizations
NCA	:	National Competent Authority
NIRDA	:	National Industrial Research and Development Agency
NISR	:	National Institute of Statistics of Rwanda
NNP	:	Nyungwe National Park
PAs	:	Protected Areas
PCFN	:	Projet pour la Conservation de la Forêt de Nyungwe
PCR	:	Polymerase Chain Reaction
PES	:	Payment for Ecosystem Services
PRA	:	Participatory Rapid Appraisal
PRS	:	Poverty Reduction Strategy
PSTA	:	Strategic Plan for the Transformation of Agriculture in Rwanda
RAB	:	Rwanda Agriculture Board
RBC	:	Rwanda Biomedical Center
RBM	:	Ranger Based Monitoring
RDB	:	Rwanda Development Board
RECOR	:	Rwanda Environment Conservation Organization

RECO	:	RECO Rwanda Nziza
REG	:	Rwanda Energy Group
REMA	:	Rwanda Environment Management Authority
RNRA	:	Rwanda Natural Resources Authority
RNP	:	Rwanda National Police
RPSF	:	Rwanda Private Sector Federation
RRA	:	Rwanda Revenue Authority
RRECPC	:	Rwanda Resource Efficient and Cleaner Production Centre
RS	:	Revenue Sharing
RSB	:	Rwanda Standards Board
RTDA	:	Rwanda Transport Development Agency
SAP	:	Strategy and Action Plan
SCBD	:	Secretariat of the Convention on Biological Diversity
SMTA	:	Standard Material Transfer Agreement
STAR	:	System for Transparent allocation
TIGO	:	Transportable Integrated Geodetic Observatory
UN	:	United Nations
UNDP	:	United Nations Development Program
UNEP	:	United Nations Environment Program
UNFCCC	:	United Nations Framework Convention on Climate Change
UR	:	University of Rwanda
UWA	:	Uganda Wildlife Authority
VNP	:	Volcanoes National Park
WASAC	:	Water and Sanitation Corporation
WCS	:	Wildlife Conservation Society
WHC	:	World Heritage Convention
WHO	:	World Health Organization

ACKNOWLEDGEMENT

The revised and updated National Biodiversity Strategy and Action Plan (NBSAP) is the output of the valuable contributions from key actors directly or indirectly involved in biodiversity management and conservation activities. These include experts and representatives from relevant sector ministerial departments, public institutions, private sector, national and international organizations and NGOs as well as the community based organizations.

The revision process was carried out by Rwanda Environment Management Authority (REMA) on behalf of Government of Rwanda. The financial support for this activity was from the Global Environment Facility (GEF) through United Nations Environment Program (UNEP). REMA, on behalf of Government of Rwanda, is grateful to GEF and UNEP for the financial support.

In order to ensure the adequate orientation required in the revision process and safeguard the cross-sectoral character of biodiversity issues, a technical working group was set up with representatives from Government ministries, departments and agencies as well as private sector and NGOs involved in biodiversity management and conservation. The group worked tirelessly while carrying out the stock taking and assessment for the review and update of the NBSAP for Rwanda. REMA highly acknowledges the overall technical guidance provided by members of the Project Steering Committee during the preparation and revision of the NBSAP. Their inputs were critical and helped the technical working group and the consultant to address gaps. REMA commends members of the Steering Committee for their support and dedication.

REMA extends appreciation to authorities at both central and decentralized levels for their collaboration and useful information provided during consultations.

The revision of NBSAP required effective coordination and guidance on the COP decisions and this task was carried out by the National CBD Focal Point.

EXECUTIVE SUMMARY

- Biodiversity is key to human survival and livelihood, especially in developing countries such as Rwanda, where a large proportion of the population depend on natural resources for their livelihood.
- The present National Biodiversity Strategy and Action Plan (NBSAP) reflects a framework for conservation, sustainable use and equitable sharing of benefits from biodiversity use and ecosystem services of the country. It also provides a framework for maintaining the necessary environmental conditions to reduce poverty, ensure sustainable development and food security in the country.
- In Rwanda, root causes of biodiversity loss range from natural processes to anthropogenic actions. Results from recent research have shown that threats to biodiversity arise from loss of habitat due to encroachment for agricultural activities, over-harvesting of resources through poaching and deforestation, as well as increasing socio-economic activities such as mining, urban development, etc.
- Underlying causes are predominantly related to issues of land tenure and poor management of natural resources. In addition, a long-standing focus on increasing crop production at the expense of natural resources conservation also constitutes a key factor leading to intensive biodiversity loss.
- Nowadays, partnership between different stakeholders including government institutions, development partners, private sector, civil society (NGOs) and local communities' organizations, is playing vital role in sustainable use and conservation of biodiversity.
- The NBSAP preparatory process was highly participatory, involving broad stakeholders' consultations. Three national workshops were organized which provided the basis for the national priorities for conservation, targets and strategic actions that collectively constitute the NBSAP substance.
- More emphasis has been oriented towards awareness building among stakeholders, in order to ensure that ownership of the NBSAP is widespread among them, and that responsibility for its implementation is widely shared. Furthermore, modalities for improving biodiversity policy and legal framework have been emphasized as well as capacity building for a better management of natural resources.
- The overall objective of the NBSAP development has been worked out as to preserve the national biodiversity in order to ensure that its various components are utilized in a

sustainable manner for reaching socio-economic development of the nation and ensuring better livelihood of Rwandans.

The major objectives of the NBSAP are:

- to improve environmental stability for natural ecosystems and their biodiversity;
- to restore degraded ecosystems and maintain equilibrium among biological communities;
- to establish an appropriate framework for access to genetic resources and equitable sharing of benefits arising from biodiversity use and ecosystems services; and
- to improve policy, legal and institutional framework for a better management and conservation of national biodiversity.

- Nineteen national targets have been developed to shape and direct the strategic actions towards achieving the above objectives of the NBSAP implementation and they are as follows:
- **Target 1:** By 2020, at the latest, Rwandan people in at least Districts that are adjacent to protected areas are aware of the values of biodiversity and ecosystem services and understand the steps for its sustainable use and conservation.
- **Target 2:** By 2020, the values of biodiversity and ecosystem services in the key natural ecosystems for at least two selected protected areas have been determined and integrated into planning processes, i.e. poverty reduction strategies 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 and harmful incentives are eliminated.
- **Target 4:** By 2020, public and private sectors and civil society organizations have promoted and implemented plans that consider ecological limits.
- **Target 5:** By 2020, at least 50 percent of natural ecosystems are safeguarded, their degradation and fragmentation significantly reduced.
- **Target 6:** By 2020, fishing and aquaculture, agriculture and forestry are managed sustainably taking into consideration ecosystem specificities to ensure biodiversity conservation.

- **Target 7:** By 2020, 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, are identified and prioritized invasive alien species controlled or eradicated, and related mitigation measures are put in place.
- **Target 9:** By 2020, at least 10.3 percent of national territory holding particular biodiversity and ecosystem services is protected taking into account the landscape approach in order to maintain biological diversity.
- **Target 10:** By 2020, the extinction of threatened species is prevented and their conservation status improved, particularly for those identified as "Alliance for Zero Extinction (AZE)".
- **Target 11:** By 2020, the genetic diversity of priority 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.
- **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 women, local communities especially the vulnerable groups.
- **Target 14:** By 2020, the ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through increase of forest cover up to 30 percent of the country and restoration of other ecosystems thereby contributing to Climate Change adaptation and mitigation.
- **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, innovations and practices of 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 international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of local communities, at all relevant levels.

- **Target 18:** 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, applied and reflected in the implementation of the NBSAP.
- **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 increased substantially from the current levels.
- The Ministry of Natural Resources through Rwanda Environment Management Authority (REMA) will participate in the implementation of the NBSAP, with other government agencies, academic institutions, non-governmental organizations and community based organizations taking responsibilities for activities that fall within their mandate. These institutions will incorporate the proposed relevant activities into their work programs.
- It has been proposed that a national institution such as the Centre of Excellence on Biodiversity Conservation and Natural Resources Management (CoEB) will be strengthened to contribute to the implementation program of the NBSAP.
- To achieve the assigned objectives and biodiversity conservation commitments set in the NBSAP will mostly depend on the availability and efficient use of financial resources. In this line, a financing strategy has also been proposed for the sustainable and successful implementation of the NBSAP. The strategy focuses on initiating innovative financial mechanisms in order to increase public and private budget contributions as well as development partners' support.
- A communication and outreach strategy has also been proposed which suggests development of a stronger and more effective Clearing House Mechanism using as many channels of communication as possible. In order to reach more audiences, support development of media plus folk theatre has been suggested as well as establishing links to the on-going activities on awareness raising and information dissemination.

- The NBSAP constitutes a ‘living document’ in the sense that it shall be responsive, flexible and practical. Its implementation and monitoring will run simultaneously with provisions for periodical reporting and reviews.

I. INTRODUCTION

- Rwanda ratified the Convention on Biological Diversity (CBD) on 18th March 1995. Reference to Article 6 of the Convention which states that each Contracting Party should develop national strategies, plans or programs for the management, conservation and sustainable use of biodiversity, Rwanda developed its first NBSAP in 2003 and five National Reports, the last one was submitted in 2014. These acts set out Rwanda's formal framework for the implementation of the provisions of the Convention especially its three objectives.
- Although significant progress has been made towards the accomplishment of five major outcomes targeted in the first NBSAP, a lot of programmed actions have not been achieved on a sufficient scale to address the pressures on national biodiversity. Moreover, there has been insufficient integration of biodiversity conservation issues into broader policies, strategies, development programs and actions and therefore, the underlying drivers of biodiversity loss have not been sufficiently reduced.
- The revised and updated NBSAP, as a key tool for the implementation of the CBD objectives and its Aichi Targets, has been developed based on national needs and priorities for biodiversity conservation, in response to threats that are facing biological resources at country level as it has been highlighted during the stocktaking exercise. This framework document should address challenges and fill gaps encountered in the implementation of the first NBSAP. It will create more coherence in understanding biodiversity conservation and serve as a reference for the development and updating of biodiversity strategies and actions implemented in other development sectors.
- The revised and updated strategy spells out a range of 5 objectives and 19 national targets that aim to stop biodiversity loss and increase the economic benefits associated with the biological resources utilization and ecosystems' services.
- Finally, the revised NBSAP reflects the country's vision for biodiversity and the broad strategic mechanisms that Rwanda will take to fulfil the objectives of the Convention, while the action plan comprises the concrete actions to be taken to achieve the strategy.

II. VALUES OF BIODIVERSITY AND ECOSYSTEM SERVICES IN RWANDA AND THEIR CONTRIBUTION TO NATIONAL DEVELOPMENT AND HUMAN WELL-BEING

2.1. VALUES OF BIODIVERSITY AND ECOSYSTEM SERVICES IN THE COUNTRY AND THE REGION

- 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 an under-developed country, for which close to half of the annual governmental budget is gained from foreign support, the need to articulate the clear link between biodiversity use, ecosystem services and economic benefit is of great importance to boost the national economy.
- Actually, in Rwanda, while there is now a good understanding of the linkages between biodiversity, ecosystem services and human well-being, the value of biodiversity is still not reflected in broader policies and incentive structures. In fact, little is still known about the economic cost of biodiversity loss as well as the benefits associated with its utilization and ecosystem services. Until now, many of the benefits associated with biodiversity use have no price, or are undervalued in the market. Thus, without accurate baseline data, it is actually very difficult to conduct an environmental economic analysis.
- The country is endowed with favourable and less variable climatic conditions and the natural ecosystems might provide important goods and services to support the national economy and improve populations' livelihood. Rwanda has key assets such as protected areas like national parks and reserves, sites of scenic and scientific importance which can be utilized to further support tourism efforts. Time has come that biodiversity conservation strengthens other important economic sectors, supporting employment and local communities' welfare.

2.1.1 Tourism

- Tourism development has often been concentrated in and around protected areas. Many governments consider tourism as a source of income, poverty alleviation and employment. Rwanda is one of the countries whose tourism is one of the fastest growing sectors and has shown significant potential for future growth. Rwanda's tourism industry accounts for a significant portion of foreign revenue. Estimates for tourism revenue in

2008 make up almost as much as the entire export base - US$ 202 million in 2008 compared to US$ 262 million for official exports. This makes the industry very important for Rwanda's macroeconomic stability and prospects of economic growth. Local investment was also significant in tourism, with 140 billion FRW or 16 per cent of total local investment between 2000 and 2009 going to hotels and restaurants. Again, this contribution of the sector to investment, totalling approximately $700 million in a ten-year period demonstrates the large role the tourism industry is now playing in the Rwandan economy (MINICOM, 2009). Tourism revenue has over time increased due mainly to the creation of new tourism attractions i.e. birding and Nile trails, improvement of facilities and infrastructures, customer care and marketing Rwanda as an excellent tourism destination in international exhibitions and fairs.

Figure 1: The canopy walk in Nyungwe National Park. Source: RDB

- The National Parks (NPs) visits accounted for 51,208 in the three first quarters of 2014 corresponding to 8% increase compared to 2013 for the same period (47,310 visits). In terms of revenues from January to September, the NPs generated around 12.6 million USD in 2014,
- compared with around 11.1 million USD generated in 2013 in the same period, which corresponds to 13% increase.
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- Considering the revenues generated by each of the three NPs from January to September for 2013 and 2014,
- there was an increase of:

- 13% from 457,683 USD in 2013 to 516,576 USD in 2014 by Akagera NP,
- 45% from 207,784 USD in 2013 to 302,161 USD in 2014 for Nyungwe NP and

- 13% increase from 10.4 Million USD in 2013 to 11.8 Million USD in 2014 for Volcanoes NP.
- Volcanoes NP generated 93% of all park revenues (RDB, 2014).
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2.1.2 Other environmental services

- Additional to tourism as one of the main environmental services contributing to the country's development, national parks and other natural ecosystems offer several services to local people such as agriculture, energy, etc.., not only contributing to their economy but also their daily livelihood and welfare. The natural ecosystems in Rwanda contribute to the water for households consumption, local, regional and international water bodies. They also provide medicinal plants, firewood, supporting services and non-direct consumable services i.e. carbon sequestration, erosion control, nutrient cycling etc.
- To mention but a few, the services include:

- The Akagera National Park (ANP) is a mix of vegetation and varied types of habitat including savannah, flood-plain and marsh vegetation in the Akagera river valley. The extensive wetlands play an important hydrological role (fresh water, fresh air, climate mitigation) of the Akagera/Nile system and contribute to water cycle and the reduction of water loss by evaporation.
- The whole 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 Congo and Nile systems. It includes two important wetlands, Kamiranzovu and Uwasenkoko, which contribute to high biodiversity maintenance. Nyungwe constitutes the main bloc of montane forest remaining in the region and regulates the climate, water cycle and the reduction of water loss by evaporation. Socio-economically, the forest offers opportunity for income-generating activities, i.e. beekeeping and different eco-tourism initiatives. In NNP, Nyungwe Nziza project is working to transform NNP into a viable ecotourism destination, capable of generating employment, sustainable and equitable income for

local communities and other stakeholders, thus providing economic incentives to conserve the rich biodiversity of the Park.

- The remaining montane forests, under forest reserve status, contribute enormously to the human welfare. Mukura and Gishwati Forests, in the western part of Rwanda, are the main sources of different ecosystem services that benefit local communities as water for domestic purposes and livestock watering, food and nutrition security, etc. Gishwati-Mukura forest has been gazetted as the fourth national park. Some ecosystem services such as water catchment protection and carbon storage and sequestration also benefit adjacent and other people beyond the landscapes. The recent Total Economic Valuation of Mukura Forest conducted by ARCOS estimated the monetary value of this forest at a total of US$ 1,692,132 per year (Kakuru *et al*., 2014).
- Wetlands play key roles in biodiversity conservation and human well-being. Wetlands play an important environmental function, such as storing and releasing water and buffering the impacts of floods. In most of cases, wetlands have been threatened by human activities including vegetation clearing for agriculture activities, human settlement and industrial uses, as well as livestock activities and sand quarries (REMA, 2006).

- The main wetlands in Rwanda are Akanyaru on the border with Burundi, Rweru-Mugesera in the South-East, Akagera swamps along the Tanzania border in the East, Nyabarongo and the Rugezi wetlands in the North (FAO, 2000). Rugezi marsh, covering 6,735 ha is listed as a RAMSAR site (Ramsar, 2009) and plays ecological and economical roles at national and international levels. Rugezi is very important as a water source for the surrounding communities and hydro-electric power generation. Rugezi is a reservoir supplying the main hydro-electric power plants in Rwanda namely Ntaruka and Mukungwa. In total, 23.25 MW of 78.73 MW from hydro-electric power plants produced in Rwanda are provided by Ntaruka (11.25 MW) and Mukungwa (12 MW) (Adapted from REG, 2015). Apart from water services, Rugezi acts as a sink for sediment particles and play an important role in the national water purification. It also plays the role of a buffer, thus reducing the maximal flow rates during the rainy season and maintaining a relatively high flow rate during the dry season. The marsh is also a source of fodder, fish and serves as a transportation means (by canoes) to connect different villages on both sides of Rugezi.

- Besides biodiversity in protected areas, agro-biodiversity contributes also to the national economy. According to the United Nations Food and Agriculture Organization (FAO), 40% of the world's economy is based directly or indirectly on the use of agro-biodiversity. In Rwanda, the agriculture sector, through the utilization of agro-biodiversity contributed 32.7% of GDP and 28% of total growth (MINECOFIN, 2013). Table 1 illustrates some elements of agriculture sector which contributed significantly to the growth of national economy.

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Table 1: Contribution (in billion FRW) 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*

- National biodiversity and ecosystem services have a clear link to supporting agricultural sector (e.g. water for irrigation, soil and pollination services, etc.).
- The **total economic value** of national biodiversity will include:

Direct use values: the direct use values from goods such as fish, timber, wild meat, fiber, which are consumed in their original state or used as raw materials for other production processes such as animal feeds, etc. These direct uses have an economic value which is to some extent revealed through market expenditures and sales;

Ecological services: include watershed/catchment protection, climate change mitigation and adaptation, soil erosion control and pollination services, etc. Although these services have no market price, their economic benefits can be quantified by looking at the costs of replacing them with other alternatives, which represents the expenditure saved by their existence and can be

used as a partial proxy of their economic value. For example, it is known that today most agriculture would be doomed without pollinators.

2.2. CONTRIBUTION OF BIODIVERSITY TO HUMAN WELL-BEING

- The World Health Organization (WHO) emphasizes that good human health and productive livelihoods depend upon ecosystem products and services, such as availability of fresh water, fresh air, food, fuel sources, etc.
- Ecosystem goods and services affect positively human health promotion, diseases prevention and cost of public health. On the contrary, biodiversity loss and ecosystem change may limit discovery of new components of biodiversity used in traditional medicine and put at risk community health development. Thus, biodiversity loss can have significant direct impact on human health if ecosystem services are no longer adequate to meet social needs.

III. ANALYSIS OF THE CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS

- To gain a better understanding of the causes of biodiversity loss in Rwanda's main ecosystems and their consequences a literature review, field visits and interviews with key stakeholders were conducted. Threats such as natural habitat degradation, climate change, pollution, encroachment for agricultural development, mining, poaching, fire outbreak and invasive species, were categorized as direct drivers of biodiversity loss.
- During consultations and interviews with key stakeholders, additional information was collected in order to have a better understanding of the origins and causes of threats of biodiversity loss.
- A narrative description of the impacts of declining biodiversity and ecosystems' services on human well-being and poverty reduction has been done. The negative impacts of declining biodiversity and ecosystems' services include: natural disasters (floods and droughts), food production decrease due to an irrational use of ecosystems such as increasing agricultural outputs at the expense of ecosystems' long-term capacity for food production.
- Furthermore, emphasis has been placed on finding out, what kinds of new initiatives and incentive mechanisms have been put in place by the Government and partners to motivate local communities to effectively participate in biodiversity conservation.

3.1. MAIN THREATS TO BIODIVERSITY AND THEIR UNDERLYING CAUSES

3.1.1. Poaching

- Illegal wildlife hunting within protected areas is a big threat to biodiversity conservation in Rwanda. The majority of poaching is done by local people to support their livelihoods. There have also been incidences of poaching by nationals from Rwanda's neighbouring countries as all the three national parks are transboundary in nature. Poachers use snares or traps to catch animals as well as spears, bows and arrows, dogs during hunting. The use of modern weapons such as high powered rifles, shotguns or assault rifles in poaching has been recorded in Akagera National Park (RDB, 2014). In all the three parks, large mammals are the main target of poachers. In Akagera National Park, Sitatunga *(Tragelaphus spekii)*, Buffalo *(Syncerus caffer)*, Hippopotamus (*Hippopotamus amphibious)*, warthog (*Phacochoerus africanus)* are regularly hunted for meat, ivory, skin and other sub-products. However, recent research shows that there is an increase in number of elephants in Akagera National Park (AMC, 2013).
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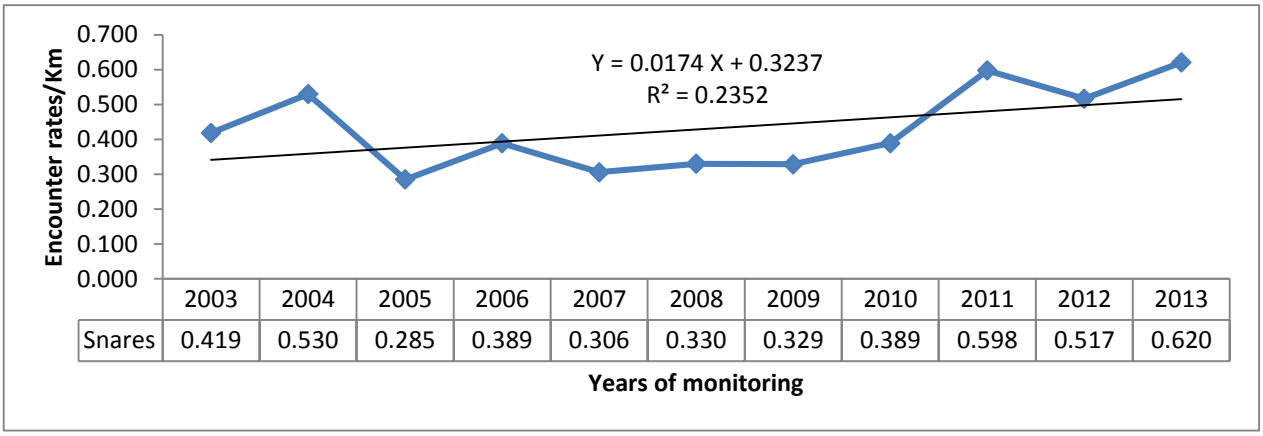
Figure 2: Killed wild animals in Akagera National Park. Source: RDB

- RDB monitoring statistics indicate that rate of poaching and other illegal activities in Nyungwe National Park increased from 2003 to 2013, as it appears in the table below (Table 2). As per respondent interviewed, this situation is explained by the fact that patrol coverage within NNP has been expanded to many other and new areas of the forest so that many other hidden and previously uncontrolled illegal activities were discovered. In

addition, poachers from Burundi used to cross the border from Kibira National Park and encroach on the southern side of Nyungwe National Park.

Table 2: Trends of poaching in Nyungwe National Park over 11 years



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Snares	0.419	0.530	0.285	0.389	0.306	0.330	0.329	0.389	0.598	0.517	0.620

- In Nyungwe National Park poaching has caused the extinction of large ungulates (elephants and buffaloes) from this ecosystem. In the Volcanoes National Park, poachers targeted the black-fronted duiker (*Cephalophus niger*), bushbuck (*Tragelaphus scriptus*) and buffalo (*Syncerus caffer*). However, snares set for these animals easily catch other wildlife including the critically endangered mountain gorillas *(Gorilla beringei beringei),* making poaching in this park a high threat to mountain gorillas. Each year over 1,000 snares are removed from the park during anti-poaching patrols.

Table 3: Number of snares removed from Volcanoes National Park

	2006	2007	2008	2009	2010	2011	2012	2013
Patrols	-1096	-1197	-1175	-1082	-1047	-1598	-1392	-1180
Snares	-1062	-1584	-1805	-2011	-1912	-1170	-1702	-1055
Snares/ Patrols	-0.97	-1.36	-1.68	-1.86	-1.83	-0.74	-1.22	-0.89

Source: RDB

- Great efforts have been made to address poaching in protected areas, through anti-poaching patrols, community sensitization and addressing livelihood issues of communities living adjacent to protected areas by providing them with economic opportunities. The extent of poaching in remnant natural forest and other ecosystems outside of national parks with high biodiversity remains largely unknown. Consequently, there has been little effort in addressing that threat.

ARCOS (2012) reported that in Mukura forest, the number of mammal species was tremendously reduced from 14 to 4 species due to encroachment and hunting. In Volcanoes National Park (VNP), poaching and illegal cutting have been identified as "High" threats for mountain gorilla and Hagenia abyssinica woodland respectively. Poaching in VNP targets other animal species such as antelopes and wild pigs, mostly using snares.

3.1.2. Boundary encroachment

- Statistics from the Forest Department show that natural forests were estimated to cover 659,000 ha in 1960 (MINITERE, 2004). In Rwanda, natural forests areas have declined by 65% between 1960 and 2007 (MINIFOM, 2010). The main threats to forests are mainly due to the rapid increase of population which is leading to forest encroachment and deforestation, mainly in search of settlement, agriculture and grazing land. Other threats include illegal logging, charcoal production, and bushfires. Signs of human activities likely to threaten the forests identified during the national forest inventory conducted in 2007 included illegal tree cutting (78.3%), charcoal making (4.9%), livestock grazing (2.5%), farming activities (1.9%), bushfires (1.9%), stem debarking (0.6%), mining (0.5%) and beekeeping (0.4%) (MINITERE & ISAR, 2007).
- The Volcanoes National Park has been constantly under direct or indirect threat due to pressure from the farming population in search of fertile volcanic soils in its immediate vicinity. The population density here is the highest of the country. In 1958, 700 ha were cleared to settle the population and between 1969 and 1973, 1,050 ha were converted into agricultural lands to grow pyrethrum (ORTPN, 2004).

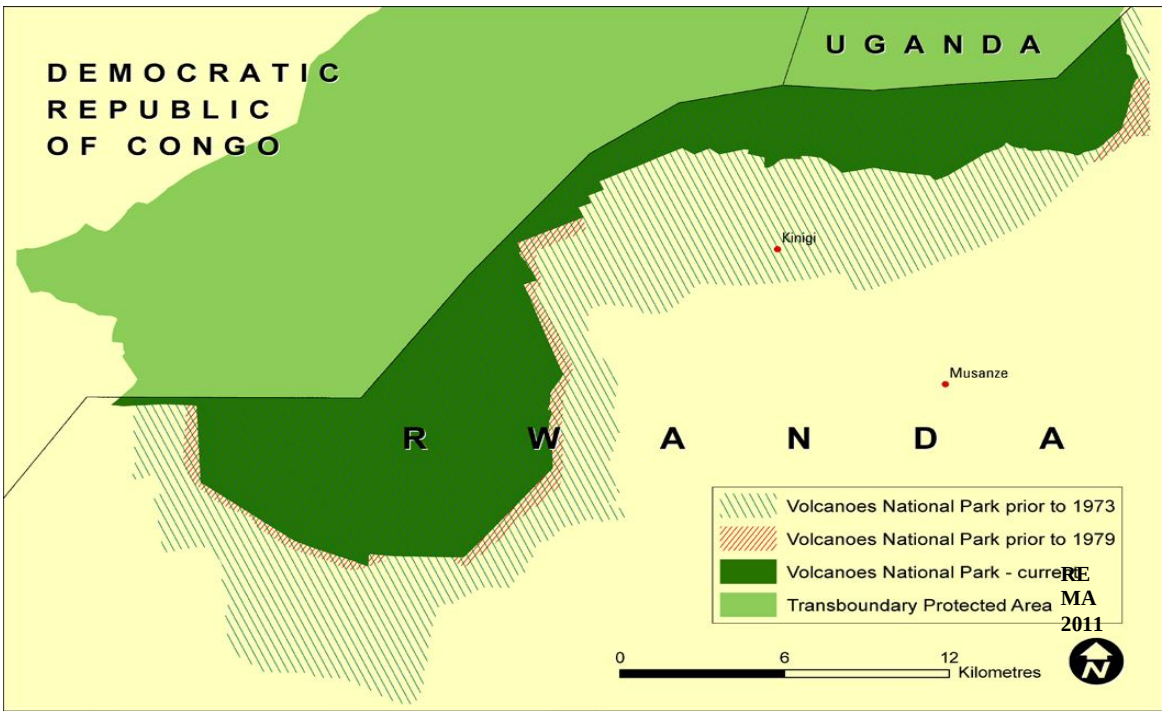
- 

Figure 3: Volcanoes National Park thematic history

- In 1997, the Government of Rwanda decided to reduce the Akagera National Park (ANP) to an area of 108,500 ha or approximately a third of its original area to settle returnees in the aftermath of the 1994 Genocide against the Tutsis (ORTPN, 2005). However, in ANP, there is now hope that the electrical fence built around the park will prevent people to invade inside the park in the future.
- Gishwati forest reserve was established in 1933 and until mid-1970, it covered an area of 280 km^2, it has experienced encroachment for agriculture, cattle ranching development, plantations of non-native tree species and other developing projects, followed by resettlement of returnees after the 1994 Genocide against the Tutsis. More than 90% of Gishwati Forest was cultivated (Blondel, 2006) and the only natural forest, currently estimated at 700 ha, remains in the southern-west reserve.
-


1978
1978 Gishwati Forest
0
Kilometres

-


2010
1978 Gishwati Forest
0
Kilometres

Figure 4: Changes in Gishwati Forest

- The Government of Rwanda, Great Ape Trust of Iowa and Earth park have announced that the Gishwati Forest Reserve is the future site of the Rwanda National Conservation Park.
- Gishwati-Mukura Forest Reserves has been confirmed as the 4th national park and the law setting Gishwati-Mukura National Park was published in the official Gazette.

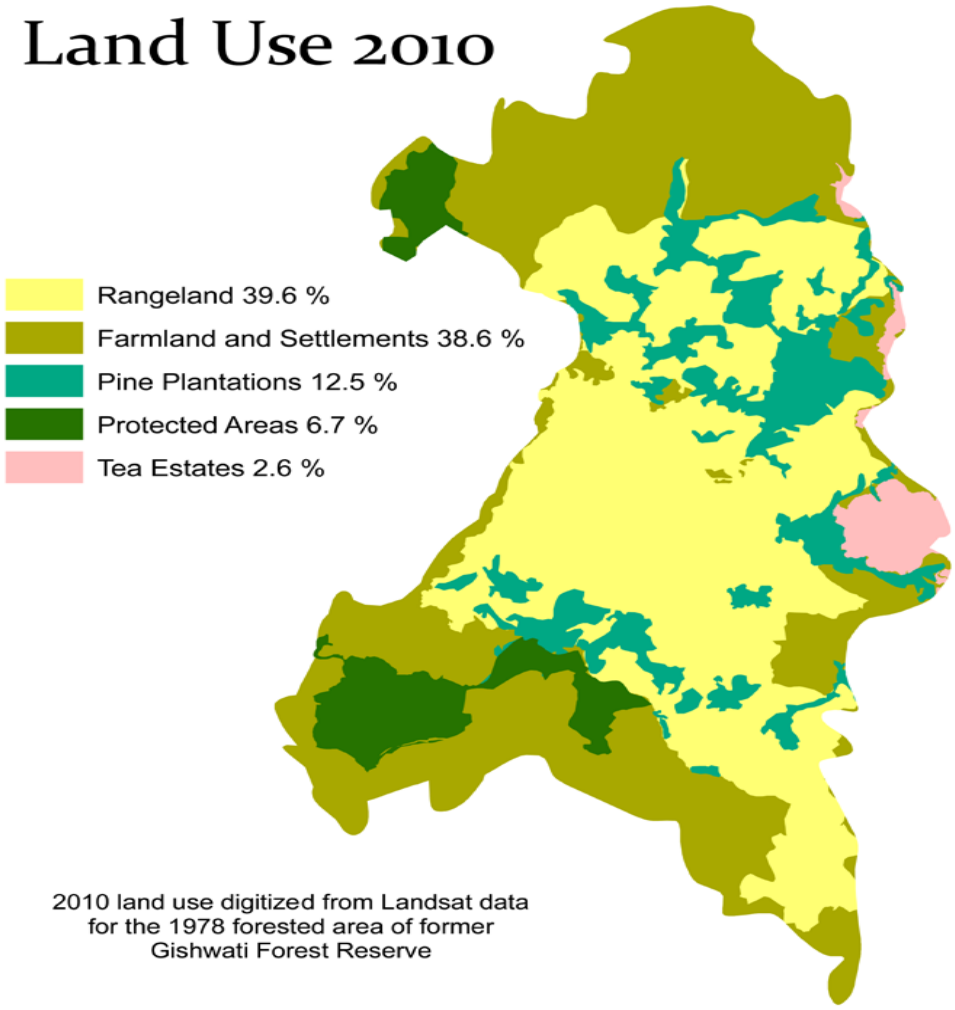


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Figure 5: Gishwati Forest land use in 2010 Source: GACP 2010

- The Mukura forest reserve with an area of about 2,100 ha in 1990, was progressively reduced to 1,600 ha in 2006 (Munanura *et al.*, 2006) due to encroachment for agriculture influenced by the installation of a refugee camp in its vicinity but also for livestock pastures. It is estimated that from 1990 to 1994, approximately 15,000 ha of forest plantations were completely destroyed and 35,000 ha damaged (MINAGRI, 1998).

- However, many efforts are being made by the Government of Rwanda to restore the degraded forests. For example, REMA has initiated a project of reforestation of Gishwati and Mukura forests reserves in support of their new gazettement as the 4th national park of Rwanda. "Gishwati and Mukura area lost most of its natural forest in recent decades, and has suffered from severe soil erosion, landslides and floods. But some patches of native forest remain, alongside important biodiversity, including a small population of chimpanzees," Amb. Gatete, Minister of Finance and Economic planning, said during the signing ceremony of the Landscape Approach to Forest Restoration and Conservation (LAFREC) Project in Kigali[1]. The objective of the Landscape Approach to Forest Restoration and Conservation (LAFREC) Project is to restore the degraded Gishwati - Mukura landscape, increasing tree cover, restoring indigenous woodland in deforested areas, enhancing the biodiversity of the remaining degraded forest reserves and providing global environmental benefits. This project is expected to increase the number and diversity of trees to help improve soil fertility, stabilise slopes, regulate stream flows and expand the resource base for local livelihoods.
- The Ibanda - Makera forest in the environs of Akagera National Park has been under high human pressure and consequently degraded with large areas of bush, thicket and woodland. Only a small remnant mature forest patch still exists.
- 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, brick making, etc. This has caused serious problems of electricity shortage due to insufficient water for hydropower plants. However, this wetland is now a Ramsar site and water levels have now been increased due to the protection of the wetland and its watersheds.
- Rweru - Mugesera wetlands complex harbours a rich biodiversity, however the wetland is highly threatened mainly by human activities, especially for agriculture land reclamation, settlement, improper land use practices that result in siltation. However, many efforts have been made to protect the wetlands in accordance with the Environment Law.

[1] Peterson Tumwebaze, The New Times of October 02, 2014

3.1.3. Alien invasive species in aquatic and terrestrial ecosystems

- Water hyacinth, *Eichornia crassipes* represents a serious problem, as an exotic and invasive species which is in competition with local plant species, but also by worsening the overall water evaporation from the aquatic ecosystems. Lakes and rivers in the hydrological system have been invaded by water hyacinth due to unwanted introduction.
- The *Protopterus aethiopicus,* fish species introduced in Lake Muhazi in 1989 for controlling increasing gastropods' biomass, as well as *Clarias gariepinus*, both big predators have spread to lakes and rivers from Lake Muhazi to water bodies in Akagera basin, including most of wetlands. Though they are exotic species, no further studies have been conducted to assess the status of their invasiveness in Rwanda.
- Among invasive plant species in terrestrial habitats, *Lantana camara* is the main prolific plant especially along roads and around human habitations where it is planted as an ornamental plant. It has become a weed in some croplands. Jointed cactus of the Opuntia family is used as hedges by cattle farmers adjoining the park and these have also spread to many areas within the parks.
- Uncontrolled introduction of plant species has allowed their propagation without enough studies on their ecology. This is the case of Macadamia, Neem, Mulberry-tree, and recently Jatropha (for biodiesel production), etc. In Volcanoes National Park, invasive species include *Solanum aculeastrum*, *Papaya cundinamarcensis*, etc. which should be controlled and/or completely removed. Within the Lake Kivu Islands, invasive species are considered to be the main threat to 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*.

3.1.4. Uncontrolled fires

- Fires continue to pose a threat to biodiversity conservation in Rwanda's protected areas. The majority of the fires recorded in those protected areas occur during the long dry season (June-September). Even though the origin of those fires is generally human (honey collectors and poachers), there have been reports of fires from occasional lightning strikes. As in the case of poaching, fires which originate from Rwanda's neighbouring countries can have a devastating impact on the parks' biodiversity. This highlights the importance of collaboration with management authorities of parks in DRC, Uganda, Tanzania and Burundi in order to prevent fire passage beyond borders.
- Recently, Nyungwe National Park has experienced fires which have caused tree mortality resulting in most burned areas being colonized by ferns (*Pteridium aquilinum*). For example, large areas were burned in 1997, yet in 2011 ferns still dominate the forest with little
- regeneration of the natural forest occurring in many areas (RDB&WCS, 2011). For this reason, fire has been considered as one of the major threats to the conservation of biodiversity and causes of this wildfire loss are almost exclusively from human activities. According to RDB (2014), the main causes of these fires within the last three years (from 2012 to 2014) include honey collection, meat roasting or fires left in camp sites.

Figure 6: Wildfire in Nyungwe National Park
Source: RDB

- Each year, fire outbreaks occur during the dry season (June to September). However, significant progress has been made to prevent fire through community sensitization and also in mobilising community members to join park staff in extinguishing fires when they occur. There are on-going efforts to restore areas affected by fire.
- Fire is rare in Volcanoes National Park, however the risk exists especially during the dry season. In 2009, a large fire inadvertently started by honey collectors, burnt a large area

on the eastern side of the park. This fire which originated in Rwanda crossed the border into Uganda and

- required the collaboration between the two countries and community members to put it out.

3.1.5. Tree cutting and vegetation clearing

- Some tree species with high value exist in small patches and are in danger of extinction due to their intensive exploitation for multiple uses. *Osyris lanceolata* with *Pterygota mildbraedii*, two endemic species in the Eastern Province are massively and illegally exploited. Recent studies on threatened species identified Osyris lanceolata as critically endangered (REMA, 2015). In the ANP there is an increasing infringement on *Osyris lanceolata* for illegal exportation. *Osyris lanceolata* (locally known as Kabaruka) is used for food, medicine, timber, essential oils, tannin, basketry and as a source of firewood but is exported for its essential oils.

3.1.6. Mining

- The mining sector has been consistently identified as a serious threat to local biodiversity due to the sector's significant land clearance, use of local water resources, and decades-long environmental degradation. Mining activity can impact natural drainage systems, pollute waterways, etc. and disrupt local communities by threatening food supply. In the future, this threat is likely to grow as the depletion of resources and technological changes in the mining sector encourage new mining projects in remote, biodiversity rich areas. Local and poor populations, who often inhabit these remote, biodiversity rich areas and rely on them to survive, are especially threatened by any loss of biodiversity. Excessive extraction of boulders, gravel and sand from rivers and streams has posed direct threats to biodiversity. Illegal mining within Nyungwe National Park, Mukura forest reserve and cement materials exploited in Mashyuza site, is currently considered by local population as very serious and permanent threats to the survival of biodiversity in these ecosystems. Furthermore, mining activities contribute to the disruption of hydrological cycle and degradation of water quality in streams of the region.
- The mining sector is using chemicals that pollute the environment. For example, gold miners use Cyanide and Mercury Oxide to extract the metal from earth tailings. How the

effluent waste is being handled is not well/widely known, yet the chemicals being used are highly poisonous and pose significant threat to humans, livestock, wildlife, plants and the environment in general.

- The Government of Rwanda encourages environmental friendly mining and has set up the safeguards and obligations to all entities involved in mining and is concerned with how these entities comply and enforce the safeguards and obligations i.e. at the mining sites.
- To date there has been no overall national approach to rehabilitation of degraded ecosystems, by mining companies, which aims to restore ecosystem functioning and biodiversity.
- However, the Government of Rwanda has finalised the process of revising its mining policies, legislation and institutional frameworks with a view of improving governance of the sector and REMA, is closely monitoring the implementation of EIA conditions and conducting the environmental audit of those mining projects in order to ensure that degraded ecosystems are restored and rehabilitated.
- In order to help mitigate biodiversity loss and uphold the responsibility of the Sustainable Development Goals to leave no-one behind, there is a need to require every mining company/developer to do an Environmental Impact Assessment (EIA) that is biodiversity inclusive for mining proposals and for rehabilitation of post mining environments. These mining companies should show clearly their comprehensive biodiversity restoration strategies in the project development phase and how to strengthen and further develop species recovery plans as a contribution to the conservation and sustainable use of biological diversity.
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- However, The Government of Rwanda recognizes that the rehabilitation of degraded ecosystems is a major but vital task, requiring the commitment of significant resources

from various partners. Urgent attention is required to ensure that biodiversity is conserved not only within protected areas, but across the landscape, and that sustainable development is promoted throughout Rwanda.

- Therefore, special attention should be paid to areas adjacent to protected areas (PAs), given that activities occurring in such areas may be critical to the protected area's success. Furthermore, the ecological landscape is often a continuum between designated protected areas and surrounding regions. The viability of PAs and the maintenance of biodiversity outside them are thus dependent upon the extent to which biodiversity conservation is socially, economically, and ecologically integrated into the entire landscapes.

3.1.7. Human-wildlife conflict

- Increasing human population, the subsequent close proximity of human settlements to protected areas and land use practices have resulted in interaction between people and park animals with negative impacts on people and/or their resources and animals. In Rwanda, the problem can be seen around all four protected areas and it is further exacerbated by the lack of buffer zones around some of those protected areas and availability near protected areas, of crops or plantations that are palatable by forest animals. Elephants, buffaloes, hippopotamus, primates and wild pigs are the main culprits as they regularly move outside of protected areas into adjacent lands for crop raiding and occasionally attacking humans and damaging property. This has induced negative attitudes towards protected areas and reprisal attacks of implicated wildlife. The relationship between parks and neighbouring communities has greatly suffered, leading to a decreased support for conservation from those communities and inevitably to biodiversity loss. In response, a number of initiatives have been implemented by the government and other stakeholders with the aim of addressing HWC and maintain a good relationship with communities living adjacent to protected areas to the benefit of biodiversity conservation. Some of those initiatives (fencing, trenching) have been designed to stop or reduce HWC. Among other initiatives created to mitigate HWC and bring economic development to

Figure 8: Gorillas in potato field near Volcanoes National Park

Figure 7: Fence made of stones around Volcanoes National Park. Source: RDB

communities living adjacent to protected areas, include park revenue sharing, compensation for damages caused by wildlife.

3.1.8. Poisoning

- The use of poison to kill wildlife has been reported in many protected areas in Africa. In Rwanda, cases of wildlife poisoning are known to have occurred around Akagera National Park where carnivores especially lions died after eating cattle carcasses, laced with pesticides such as Temic, 15 years ago. As a consequence of the poisoning and other factors, Akagera National Park has been extirpated of lions with implications on the rest of the park's biodiversity; the last lion was discovered dead in 2006. It has been documented in other parks that complete disappearance of large predators from an ecosystem creates disequilibrium between prey and predator and tend to make herbivorous more abundant in some parks. In some rivers, poisonous plants have been used as fishing method.

3.1.9. Illegal fishing

- A lot of prohibited fishing methods have been utilized in national water bodies, such as small mesh size, beach seine, mosquito nets, poisonous plants, etc. impacting on fisheries resources. For commercial purposes, illegal fishing operations within lakes of Akagera basin constitute an important threat to biodiversity.

3.1.10. Agricultural intensification

- The concept of agricultural intensification is described as a set of patterns aimed at increasing land and crop productivity through increased use of inputs by selected seeds, organic and mineral fertilizers, pesticides and improved agricultural techniques. The increased utilisation of inputs from industries such as fertilisers, pesticides and other agro-chemicals results in a greater pressure on natural resources and a reduction in biological diversity. Since nature is comprised of biological diversity and as agricultural intensification occurs, the regulation of ecosystem functions through soil biodiversity is progressively replaced by regulation through chemical and mechanical inputs. Therefore, the conversion of natural systems to intensively cultivated monoculture results in a loss of biodiversity especially in soil invertebrates and microorganisms. In addition, the use of

pesticides in crop production and protection has been declared to negatively impact on beekeeping by reducing bee populations as key pollinators of plants.

- The replacement of local animal and crop varieties by improved or exotic varieties and species is the main cause of genetic erosion in agro-biodiversity. Therefore, agro and livestock biodiversity in the country are affected with the adoption of high yielding varieties and breeds that are from uniform genetic stock and are relatively vulnerable to pests and disease (REMA, 2009).

3.1.11. Climate change

- Globally, climate change and its consequences present one of the most important threats to biodiversity and the functions of ecosystems. Climate change also threatens both natural and agro-biodiversity, as many plants, animals and microorganisms are unable to adapt rapidly enough to changing temperatures and moistures gradients caused by global warming or cooling.
- The clear cutting of forests such as Gishwati forest has resulted in recurrent landslides and floods. Floods and landslides are the most frequent effects of climate change occurring in Rwanda. The most vulnerable districts prone to floods and landslides are those located in the north and west of Rwanda whereas the east and south east of Rwanda were identified as the most vulnerable to prolonged drought. Steep slopes, soil instability, limited drainage systems, land-use type and land tenure are factors that make an area vulnerable to the effects of climate change.
- The following are some of the likely impacts of climate change on biodiversity:
- (a) The climate change will have differential effects on species. Some species will migrate through fragmented landscapes whilst others may not be able to do so.
- (b) Many species that are already vulnerable are likely to become extinct.
- (c) Changes in the frequency, intensity, extent, and locations of climatically and non-climatically induced disturbances will affect how and at what rate the existing ecosystems will be replaced by new plant and animal assemblages.
- (d) Loss or fragmentation of forest habitat due to climate change is a major threat to biodiversity.
- (e) Climate change negatively affects crop production and cause vulnerable people to depend mostly on ecosystem services.

- (f) Climate change negatively impacts water bodies by increasing or dropping water levels.
- The impacts of climate change are likely to increase in future, which will not only affect biodiversity but also livelihoods of millions of local people who depend on biodiversity. Disruption of ecological services on which they depend due to climate change is expected to especially affect the poorest and most vulnerable communities (UNEP, 2010).

3.1.12. Increasing or dropping water levels

- In the Northern part of Rwanda, Ruhondo lake which is part of RAMSAR site complex composed of Rugezi - Bulera - Ruhondo, use to overflow and flood areas over far and beyond the protected space of 50 meters from the lakeshore, thus, surrounding houses and crop lands are inundated. On the other hand, wetlands and water bodies (small lakes) are drying at the summit of Mount Bisoke causing loss of biodiversity species due to possibly climate change effects. Also, some species changed their original habitats, migrating upward in search of suitable climate conditions. Over the past couple of years water levels of the aquatic systems have significantly dropped in Eastern lakes, a trend that is observed throughout the Great Lakes and Eastern African countries.

3.1.13. Illegal grazing

- Cattle herds are continually being observed on or near the boundaries of protected areas. Besides the consequences on the integrity of the park, there are also serious implications in terms of potential disease transmission between wildlife and livestock. Furthermore, erosion caused by overgrazing by cattle has caused extensive topsoil loss.

3.1.14. Other threats to biodiversity conservation

- High human presence inside the Ibanda - Makera and other remnants forests has resulted in an increase of illegal activities such as poaching, grazing, medicinal plants collection and wood cutting for different uses especially for firewood and cultivation, which constituted the major threats to those species whose number is gradually declining. In addition, the fact that remnant forests are surrounded by agricultural lands has led to many types of encroachments being made inside the forest.

- In Nyungwe National Park (NNP), other threats causing biodiversity loss include infrastructures development (roads, paths and camps) without required authorization, water extraction, climate change, etc. Volcanoes National Park has known nearly the same threats, tourism use and infrastructure development have been considered as "High" threats to Afro-Alpine habitats and Mountain Gorilla; while disease transmission, lack of sufficient suitable habitat and legal/illegal water collection have been categorized as "High" threats to Mountain Gorilla. Lack of regeneration mechanism is a "High" threat to Bamboos forest. In addition, in VNP, low bamboos regeneration and progressively biomass reduction has been attributed to overgrazing. Furthermore, wetlands and water bodies are drying due to anthropogenic activities and climate change.
- The Lake Kivu islands biodiversity has suffered from a high degree of extinction in the past and many threatened species are island endemics, principally due to climate change, natural and environmental disasters, land degradation and pollution

3.2. CONSEQUENCES OF BIODIVERSITY LOSS

- The loss of a part of NNP had as consequence a severe decreasing of biological resources and isolation of a group of Chimpanzee (*Pan troglodytes schweinfurthii*) inhabiting Cyamudongo natural reserve (part of Nyungwe National Park). The lack of connectivity between different populations of Chimpanzee inhabiting the main Nyungwe National Park and Cyamudongo forest reserve will have as consequence, inbreeding causing genetic erosion that may lead to extinction of the isolated chimpanzee group.
- The same problem occurred in Gishwati forest reserve, where the remaining patches of forest host a number of plants and animal species among them a population of the endangered chimpanzees (*Pan troglodytes schweinfurthii*) (IUCN Red List, 2008). This isolated population comprises of only tens of individuals (Barakabuye *et al.*, 2007) and is at risk of inbreeding due to lack of connectivity with other chimpanzee populations in Nyungwe National Park or Cyamudongo forest. The long term viability of such isolated and small populations is very limited.
- Gishwati forest reserve was deforested over a period of 10 years, and consequently, the areas around this reserve have been plagued with flooding, landslides, erosion, decreased soil fertility, decreased water quality, and heavy river siltation, all of which worsen poverty within the local population.

- In Mukura natural reserve, mining activities have various and cumulative negative effects on the biodiversity, water system of the ecosystem landscape and on local community well-being. In fact, streams and rivers are situated in upstream and diverted for mining activities, whilst downstream water users for crop production and domestic needs suffer either from water shortage or poor water quality, because of heavy siltation due to 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 has been disrupted. There is also potential health risk to local communities due to possible water sources contamination by waterborne pathogens.
- In Volcanoes National Park, climate change effects and anthropogenic activities have caused loss of species or upward altitudinal migration.
- The drainage of Rugezi wetland for hydropower production had as consequence, drying of marshland areas with accompanied loss of important biodiversity, as well as drastically reduced river volume. However management initiatives have restored hydrological and ecological functions of the Rugezi wetland at 93%. The over flooding of Ruhondo lake created conflicting situation between local communities and local administration responsible for law enforcement related to aquatic areas, since the regulatory buffer zone on the lakeshore has shifted toward the land.
- Due to water hyacinth introduction by European expatriates as an ornamental plant and later became invasive, some water bodies in Eastern Province such as Lake Mihindi are under serious threats, while Lake Kishanju has completely disappeared. This has as consequence: loss of all biodiversity and serious decreasing of fishery production.

The introduced fish predators (Clarias gariepinus to control gastropods and Protopterus aethiopicus to boost fisheries production) constitute a big threat to other indigenous fish species such as *Tilapiines*, *Haplochromines* and other small native fish species, which are decreasing drastically. The most serious consequence of invasive plant species is the colonization of fertile and productive lands, contributing to decrease of soil fertility and agricultural production. The most common challenge in modern agricultural systems is that attention and efforts are concentrated on a small range of varieties while others are underutilized and neglected, especially indigenous vegetables and landraces in general. Once local varieties are underutilized and many of them not used in genetic improvement, they are at risk of disappearing with their genetic value, or not found in any other genetic material in concerned areas and even in the world. Furthermore, most of these modern varieties and races have low genetic variability and

are susceptible to biotic and abiotic stresses. The consequence of climate change to agro-biodiversity loss is that 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.

IV. NATIONAL POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

- The review of relevant policies, regulations and institutional frameworks has been carried out in order to find out how regulatory instruments and institutional frameworks have been more or less effective and inclusive in the biodiversity conservation process. In this regard, the analysis took into consideration the following aspects: (i) institutional mandates, focusing on complementarities, duplication, overlapping or conflicting mandates (ii) the rationales and objectives of the policies; (iii) the extent to which the policy statements contribute to biodiversity conservation; (iv) whether some policies conflict with the biodiversity conservation and to what extent and what is the motivation behind; (v) specific provisions of sectoral laws relevant or irrelevant for biodiversity conservation; and (vi) analysis of institutional roles and responsibilities in regards to sustainable management of biodiversity.

4.1. INSTITUTIONAL FRAMEWORK

- Institutions involved in biodiversity management in Rwanda are divided into six main categories which are: Government institutions, Higher Learning Institutions, Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs), Local Communities, Private Sector.

4.1.1. Government institutions

- The Ministry of Natural Resources (MINIRENA), Rwanda Environment Management Authority (REMA), Rwanda Natural Resources Authority (RNRA) and Rwanda Development Board (RDB) through its Tourism and Conservation department, are the leading institutions with legal mandate of protecting the overall environment and the biodiversity in Rwanda. Others are those involved in biodiversity use.

The Ministry of Natural Resources (MINIRENA) has the mandate of ensuring the protection and conservation of the environment and promoting optimal and rational utilization of natural resources for sustainable development. Among its assignments is the formulation of relevant policies and laws regulating the protection of the environment.

Rwanda Environment Management Authority (REMA) is the regulatory agency for environment. The institution is legally mandated to promote and ensure the protection of the environment and sustainable management of natural resources through decentralized structures of governance and seek national position to emerging global issues with a view to enhancing the well-being of the Rwandan people. REMA is the focal institution for the Convention on Biological Diversity and other biodiversity related conventions including the United Nations Framework Convention on Climate Change (UNFCCC).

Rwanda Natural Resources Authority (RNRA) is a national institution mandated to lead the management and promotion of natural resources. The institution is dealing with all matters relating to land, water, forests, mines and geology. RNRA is responsible for implementing national policies, laws, strategies, regulations, government resolutions and international conventions on matters relating to the promotion and protection of natural resources.

Rwanda Development Board (RDB) mandate, through its Department of Tourism and Conservation, is to conserve the rich biodiversity of the Protected Areas and to develop a sustainable tourism in collaboration with stakeholders for the benefit of all the Rwandan people. RDB promotes Rwanda as a high quality tourism destination, to serve as a regional hub, and to enhance Rwanda's diverse and unique tourism as well as generate revenues that contribute to the country's overall socio-economic development. In terms of biodiversity conservation, RDB conducts research and innovations, enhances and sustains the ecological integrity, wealthy and productivity of national parks as pillars of environmental stewardship and sustainable development.

The Ministry of Agriculture and Animal Resources (MINAGRI): The mission of the MINAGRI is to initiate, develop and manage suitable programs of transformation and modernization of agriculture and livestock to ensure food security and to contribute to the national economy. One of its key vision pillars is the transformation of agriculture from subsistence to a productive high value; market oriented farming that is environmentally friendly and has an impact on other sectors of the economy. Ten strategic thrusts which have been identified for the transformation and modernization of agriculture and livestock, include among others: (i) diversification and intensification of plant, animal and fish production and (ii) sustainable management of natural resources, particularly soil and water. In some areas, the

MINAGRI's activities may conflict with MINIRENA's in regard to biodiversity conservation, specifically in wetlands zones.

Rwanda Agriculture Board (RAB): RAB's mandate is the overall coordination of countrywide agricultural research activities and driving science based technology generation for sustainable agriculture development. It has carried out research and promoted technologies in crop production, livestock, forestry, agro-forestry, post-harvest management, land conservation and water management. As far as biodiversity conservation is concerned, RAB has to:

- Examine, verify and issue certificates authorizing imports of exotic animals, semen, fertilized eggs, seeds, plants and cuttings and other agricultural and animal husbandry products;
- Ensure and monitor activities of production, control and trade of selected seeds;
- Collect national and international innovations, new and appropriate technologies and refine them for use in agriculture and animal husbandry in Rwanda.

Local administration: Concerning biodiversity conservation, local Government supervises several technical and administrative activities which include: (i) mobilizing community members to participate in project activities, (ii) participating in the consultations leading to the formulation of protected areas' management plans, (iii) planning for and integrating conservation activities in the District Development Plans (DDPs) & Annual performance Contracts known locally as "Imihigo", (iv) mobilizing resources for DDPs implementation, (v) supporting community development activities in their districts, etc.

4.1.2. Higher learning and research institutions

University of Rwanda (UR): Two colleges of the University of Rwanda are directly dealing with biodiversity and agro-biodiversity: College of Agriculture and Veterinary Medicine (CAVM) and College of Science and Technology (CST). The university provides professional skills to suit the National, Regional and Global context encompassing biodiversity management programs. CAVM offers an undergraduate program in Soil Science and Environmental Management with commonalities in soil fertility and watershed management. CST provides a Master's degree in Biodiversity Conservation. Other Higher Learning Institutions deliver courses and trainings related to biodiversity and environmental conservation.

National Industrial Research and Development Agency (NIRDA): It is the leading institution of the knowledge-based and technology-led economy of Rwanda. Among areas of research in connection with Biodiversity, besides hosting the National Herbarium of Rwanda, NIRDA has Environmental Management, Climate Change and Energy Research Division with the main research focus on Biodiversity, Environmental monitoring and analysis, Waste management, Eco-tourism industry, Renewable energies and Biotechnology.

4.1.3. Non-Government Organizations (NGOs)

- Several Non-governmental organizations are involved in different programs/projects in relation with biodiversity management and conservation. Among other activities, they provide support in co-funding for environmental initiatives; transfer skills related to the management of PAs to local organized groups.

International Gorillas Conservation Program (IGCP): the objective of the International Gorilla Conservation Program (IGCP) is to ensure the conservation of mountain gorillas and their regional afro-montane forest habitat in Rwanda, Uganda and the Democratic Republic of Congo (DRC). IGCP operates in the Virunga massif in partnership with the respective protected area authorities of the three countries, which are: the Rwanda Development Board (RDB), the Uganda Wildlife Authority (UWA) and the Congolese Institute for Nature Conservation (ICCN).

Dian Fossey Gorilla Fund International (DFGFI): the Dian Fossey Gorilla Fund International (DFGFI) is dedicated to the conservation and protection of gorillas and their habitats in Africa. In Rwanda, DFGFI operates the Karisoke Research Center, the world's centerpiece for the study and protection of the critically endangered mountain gorillas.

Wildlife Conservation Society (WCS): the work of WCS in Rwanda has been focused on Nyungwe National Park, and sufficient in-depth knowledge and experience were gained in the area through the "Projet pour la Conservation de la Forêt de Nyungwe (PCFN)". WCS participated in co-funding projects, support biodiversity monitoring; threat analysis, conservation advocacy, capacity building at central and field levels, community outreach and support.

Mountain Gorillas Veterinary Project (MGVP): this NGO is involved in surveillance of wildlife health, especially mountain gorilla's, livestock, monitoring of human/wildlife disease transmission, capacity building of protected areas staff.

Greater Virunga Transboundary Collaboration (GVTC): the GVTC brings together Rwanda, Uganda, and the DR Congo for the purpose of conservation and management of the mountain gorilla populations and their habitat. GVTC is a strategic management system for the Greater Virunga landscape, through trans-boundary 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 advocates for the use of landscape and ecosystem approaches for managing biodiversity in the region, in recognition of the need for increased regional cooperation.

Albertine Rift Conservation Society (ARCOS): this is a regional conservation organization with the mission to enhance biodiversity conservation and sustainable management of natural resources in the Albertine Rift region through the promotion of collaborative conservation action for nature and people. ARCOS' programs in Rwanda focus on environmental conservation, promoting sustainable benefits from ecosystem services, economic development and improving community livelihoods.

Association pour la Conservation de la Nature au Rwanda (ACNR): it is a Rwandan non-profit NGO that aims to conserve and promote biodiversity in Rwanda, with a focus on endangered ecosystems in the country, such as wetlands or forest regions.

Association Rwandaise des Ecologistes (ARECO): ARECO is mainly involved in environmental education and awareness raising, community conservation of natural resources and community tourism development.

Rwanda Environmental Conservation Organization (RECOR): RECOR interventions focus on environmental education, promotion of the utilization of renewable energy, soil conservation, reforestation and agro-forestry promotion and execution, water management, wildlife conservation and tourism promotion. It involves community in looking for suitable and sustainable solutions to local environmental challenges in all activities undertaken.

4.1.4. Community Based Organizations (CBOs)

Local community based organizations are effectively involved in biodiversity conservation programs and undertake several activities such as: (i) field implementation of project activities as sub-contractors to the implementing partners, (ii) capacity building for community members. CBOs usually participate only where the implementing NGO has engaged them. In most areas, the NGOs have directly implemented the projects in communities or engaged short-term external contractors.

4.1.5. Local Communities

- In the same line as their CBOs, local communities are effectively involved in biodiversity conservation programs and they are recognized as active partners in biodiversity conservation Local communities undertake several activities such as:

    - Participating actively in identifying their own priorities;
    - Supporting park management through joint patrols and provision of information;
    - Contributing to the formulation of management plans;

4.1.6. Private Sector

The Rwanda Private Sector Federation (PSF) is a professional organization, dedicated to promote and represent the interests of the Rwandan business community, while at the same time providing timely and relevant business development services that lead to sustainable private sector led economic growth and development. In fact, wise use of biodiversity and natural resources is key element for sustainable development. Therefore, private sector has a critical role to play in biodiversity conservation.

4.2. ANALYSIS OF KEY POLICIES AND STRATEGIES

The review of sectoral policies and strategies was part of the stocktaking phase of NBSAP. The purpose of reviewing sectoral policies and strategies was to highlight their compliance or duplication with biodiversity policy. Biodiversity conservation features in some of those policies and strategies though the implementation related measures were relatively poor.

Table 4: Key policies and strategies

Policies	Biodiversity conservation		Key provision in relation to biodiversity conservation	Observations/ Comments
	Complementarities	Duplication		
1.The Rwanda Vision 2020	X		Implementation of adequate land and water management techniques coupled with a sound biodiversity policy, in order to ensure sustainable development	
2.The EDPRS 2	X		Achieving sustainable economic growth in Rwanda requires the prudent use of natural resources and ensuring that climate resilience is built into economic planning.	
3.Rwanda Biodiversity Policy (2011)	X		Conserve Rwanda's biological diversity; sustain the integrity, health and productivity of its ecosystems and ecological processes, whilst providing lasting development benefits to the nation through the ecologically sustainable, socially equitable, and economically efficient use of biological resources.	
4.National Environment Policy (2004)	X		Ensure the conservation and sustainable utilization of biodiversity of natural ecosystems and agro-ecosystems in compliance with the equitable sharing of benefits derived from biological resources.	
5.National Land Policy (2004)	X		Infuse to the public; land use practices that are favorable to environmental protection and good land management. Promote conservation and sustainable use of wetlands Classify as the state's public lands lakes and waterways, natural reserves and national parks, marshlands classified as natural	

			reserves in order to guarantee environmental conservation.	
6.Rwanda Wildlife Policy (2013)	X	X	Ensure that wildlife inside and outside protected areas are managed within a comprehensive national conservation plan. Encourage wide stakeholder participation in the management of wildlife and equitable distribution of economic benefits thereof Build the human capacity for the management of wildlife at all levels of Government, civil society and the private sector.	There is need to see how this policy may be merged with biodiversity policy in order to enhance biodiversity integration.
7.Rwanda Protected Areas Concessions Management Policy (2013)	X		Manage protected areas in accordance with the fundamental purpose of conserving their scenery, wildlife and natural and historic objects. Streamline proper management and conservation of protected areas through concession. Generate revenues to the government that can be channeled for management and conservation of these protected areas.	Strong guidelines and implementation measures should be put in place to minimize potential biodiversity risks.
8.National Forestry Policy (2010)	X		Conservation and wise use of forest biodiversity. Establishment, rehabilitation and conservation of watershed protection forests. Supply of improved high quality tree seed and other germplasm.	
9.National Policy for Water Resources Management (2011)	X		Mainstream protection of the environment and climate change in programs and activities of the water resources management sector.	
10.National	X		Establishment of environmentally	EIAs are done

Energy Policy and National Energy Strategy(2008-2012)			sound and sustainable systems of energy production, procurement, transportation, distribution and end-use.	but should be biodiversity inclusive; Implementation of environmental management plans should be closely monitored to minimize biodiversity risks
11.Mining Policy (2010)	X		Reduction of environmental impact balancing the protection of the flora and fauna and natural environment with the need for socio-economic development is a requirement for sustainable minerals industry development. Formalization and rationalization of mining activities will enable the industry to ensure the protection and, where feasible, rehabilitation of mines and quarries.	The policy emphasizes on increasing productivity and attracting investment which risks to causing biodiversity loss and environmental degradation. Although EIA is a requirement for mining projects, environment sustainability does not come out as a strong component of the policy.
12.National Industrial Policy (2011)	X		Environmental sustainability: • Establishment of industry specific waste management systems • Enforcement of cleaner	Strong environmental monitoring mechanisms should be put in place to ensure

			production systems in all industries	environmental friendly industry development.
13.Rwanda Tourism Policy (2009)			The tourism sector is planned and developed to the benefit of future generations of Rwandans, in terms of the sustainability of resource use, the protection of wildlife and the environment.	
14.National Policy & Strategy for Water Supply and Sanitation Services (2010)			Water use shall abide with environmental regulations and safeguards. Waste disposal shall be planned and managed with a view to minimize environmental impact	
15.Education Sector Policy (2003)	X		Promotion of education for the protection of the environment	
16.Strategic Plan for the Transformation of Agriculture in Rwanda Phase III			Mainstreaming of sound environmental management in agricultural practices.	The use of chemical fertilizers and pesticides as well as large scale irrigation schemes might be threatening biodiversity conservation and ecological functions.
17.Green Growth and Climate Resilience (National Strategy for Climate Change and Low Carbon Development) (2011)	X		Preservation of Biodiversity and Ecosystem Services Ecotourism, conservation and Payment for ecosystem Services; Sustainable forestry, agroforestry and biomass.	

The assessed policies and strategies provide for environmental mainstreaming with more or less emphasis on biodiversity conservation. However, most of the sectoral policies prioritize heavy investment to achieve economic development targets, but there is high risk of undermining biodiversity conservation and environmental integrity if strong mitigation measures and monitoring mechanisms are not put in place.

4.3. LEGAL FRAMEWORK

The legal framework with content of environment and biodiversity conservation starts with the Constitution of the Republic of Rwanda. Further provisions have been provided through the Organic Law determining modalities of protection, conservation and promotion of environment in Rwanda of April 2005, the law determining the mission, organization and functioning of Rwanda Environment Management Authority (REMA) of August 2013 and the Law governing biodiversity in Rwanda of September 2013. All of them underline obligations of the State and individual citizens to protect the environment. In addition, the above-mentioned laws have preventive and punitive provisions for those who harm or destroy the environment in general and biodiversity in particular. However, the most determinant are: the Law governing biodiversity in Rwanda and the Organic Law determining modalities of protection, conservation and promotion of environment, in addition to International conventions and protocols related to biodiversity conservation.

1. Constitution of the Republic of Rwanda of 04/06/2003.
2. Law N° 70/2013 of 02/09/2013 governing biodiversity in Rwanda.
3. The Environment Organic Law N° 04/2005 of 08/04/2005 determining modalities of protection, conservation and promotion of environment in Rwanda.
4. Ministerial Order N^{o} 007/2008 of 15/08/2008 establishing the list of protected animal and plant species.
5. Ministerial Order N^{o}. 004/2008 of 15/08/2008 establishing the list of works, activities and projects that have to undertake an environmental impact assessment.
6. Ministerial Order N° 004/16.01 of 15/07/2010 governing the importation and exportation of wild animals.
7. Law N° 43/2013 of 16/06/2013 governing land in Rwanda.

8. Law N° 57/2008 of 10/09/2008 relating to the prohibition of manufacturing, importation, use and sale of polythene bags in Rwanda.
9. Law N^{o} 25/2013 of 10/05/2013 in the O.G no 27 bis of 08/07/2013 determining the organization and function of beekeeping in Rwanda.
10. Law N^{o} 30/2012 of 01/08/23012 in the O.G. no37 of 10/09/2012 governing use of agrochemicals.
11. Law N° 58/2008 of 10/09/2008 determining the organization and management of aquaculture and fishing in Rwanda.
12. Law N^{o} 31/2009 of 26/10/2009 on the protection of intellectual property.
13. Law N^{o} 26/2011 of 27/07/2011 on compensation for damages caused by animals.
14. Law N° 63/2013 of 27/08/2013 determining the mission, organization and functioning of Rwanda Environment Management Authority (REMA).
15. Law N° 53/2010 of 25/01/2011 establishing Rwanda Natural Resources Authority (RNRA) and determining its mission, organization and functioning.
16. Organic Law N^{o} 53/2008 of 02/09/2008 establishing Rwanda Development Board (RDB) and determining its responsibilities, organization and functioning.
17. Law N°16/2012 of 22/05/2012 determining the organization, functioning and mission of the National Fund for Environment (FONERWA).
18. Law N° 51/2013 of 28/06/2013 establishing the National Industrial Research and Development Agency (NIRDA) and determining its mission, organization and functioning.

V. LESSONS LEARNED FROM THE PREVIOUS NBSAP AND THE REVISION AND UPDATING PROCESS

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

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

5.1. EVALUATION OF THE EFFECTIVENESS OF THE PREVIOUS NBSAP

5.1.1. Improved conservation of protected areas and wetlands

1^0 The management of Volcanoes NP and Nyungwe NP has been improved through:

- Rehabilitation or development of management plans;
- Monitoring of threats and implementation of preventive measures;
- 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; and
- Rehabilitation of critical habitats in Volcanoes NP and Nyungwe NP.

2^0 Wetlands complexes:

- Inventory of the biodiversity of critical wetlands
- Development of laws related to the protection of lakeshores and riverbanks and related watersheds for better conservation and sustainable use of wetlands.

3^0 Forests:

- Inventory and mapping of threatened remnant natural forests;
- Rehabilitation of natural forests (Gishwati & Mukura).

4^0 Biodiversity inventories of Lake Kivu Islands

5.1.2. Rational use of biotechnology

National Bio-safety Framework (NBF) has been developed comprising (1) National biotechnology and bio-safety policy, (2) National bio-safety bill and (3) Institutional framework. Adoption of those instruments has taken long before reaching a consensus.

5.1.3. Policy, legal, institutional and human resources strengthening

Key policies have been approved including the environment policy, biodiversity policy, forestry policy and wildlife policy. Furthermore key legislations adopted to support biodiversity conservation include environment organic law, biodiversity law, a set of decrees for protection of biodiversity, FONERWA (Green Fund) law, Institutional frameworks like Centre of Excellence in Biodiversity and Natural Resources Management still in early stages of development, CBD steering committee, Department of Forestry and Terrestrial ecosystems under RNRA, RDB/Tourism and Conservation Department, etc. have been put in place.

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

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 is underway; Communication-Education and Public Awareness, capacity building, maintenance and improvement of Clearing House Mechanism (CHM) and Genetic Resources (GR) valuation are other key priorities for implementation.

5.1.5. NBSAP success stories

- Unification of biodiversity stakeholders' community through NBSAP development and implementation;

- Identification of key national priorities for action including among others rehabilitation of degraded ecosystems, control of alien species (see policy areas) etc.;
- Creation of awareness on biodiversity issues in different institutions;
- Rising of new conservation NGOs and;
- Leverage of new and additional funds for the conservation and sustainable use of biodiversity (GEF projects, FONERWA, etc.).

5.1.6. Challenges and gaps to be addressed

Although a lot of success has been registered, some gaps remain and challenges were encountered, inter alia:

- Inefficiency in coordination of the NBSAP implementation activities;
- Lack of frequent monitoring and assessment for efficiency;
- Insufficient technical capacity in biodiversity related fields including development of projects;
- Insufficient financial resources to implement NBSAP activities;
- Lack of links with other international instruments for complementarities, though some regulatory systems have been initiated;
- Conflicting priorities depending on institutional mandates;
- Sector-driven donor & technical support;
- Disconnection between legalities and realities;
- Different visions, entry points, modus operandi by different players, despite having the same objectives;
- Lack of integration of biodiversity considerations into land-use planning procedures and environmental assessments; and
- Lack of benefits sharing policy in agro-ecosystems.

5.2. NBSAP updating process and production of the 5th National Report to the CBD

The revision and updating of NBSAP and preparation of the 5th National Report to the CBD has been undertaken through the following three phases:

- Stocktaking assessment and targets setting,
- Development of the strategy, its action and implementation plans,

- Production of the Fifth National Report to the CBD.

The first phase was dedicated to stocktaking exercise during which broader consultations were organized across the country, through interviews in convened meetings, focus group discussion and exchange of views with different stakeholders from public sector, private sector, civil society and local communities both at central and decentralized levels.

A large number of documentations were collected and reviewed. This provided detailed information on the current status of biodiversity in natural ecosystems and agro-ecosystems, threats/causes and consequences of biodiversity loss, institutional, policy and regulatory frameworks, etc. The biotechnology and biosafety status has also been assessed during this exercise. Based on the stocktaking results, national priorities, targets and strategic actions for biodiversity conservation in Rwanda have been set, in accordance with the CBD objectives and its Aichi Targets.

A two days' workshop was organized for the validation of stocktaking results by participants from various institutions, including NBSAP Steering Committee members. Comments, remarks and recommendations were provided by participants to the Consultant and were incorporated in the final version of the stocktaking report.

The second phase concerned the development of Strategy and Action Plan (SAP), along with its implementation plans which include the capacity building plan, communication and outreach strategy, financial resources mobilization strategy as well as institutional, monitoring and reporting issues.

The third phase was dedicated to the elaboration of the fifth national report following the guidelines given by the COP and the SCBD. The development of the report used the data already gathered during consultations for the NBSAP process and other data collected by various experts. This means that the revision and updating of the NBSAP and the development of the Fifth National Report to CBD has been one process but with two different products.

- A final two days' workshop was also organized for the examination of all draft reports, both for the strategy and fifth national report. Participants formulated remarks and comments to be incorporated in the final reports and proceeded with their validation.

VI. NATIONAL BIODIVERSITY PRINCIPLES, PRIORITIES, TARGETS

6.1. LONG-TERM VISION

The revised and updated Strategy has a long-term vision which is in line with the CBD Strategic Plan to 2020 and states that: *"By 2040, national biodiversity will be restored and conserved, contributing to economic prosperity and human well-being through delivering benefits essential for Rwandan society in general.*"

6.2. PRINCIPLES GOVERNING THE STRATEGY

- The National Biodiversity Strategy and Action Plan as a 'living document', responsive, flexible and practical.
- Including biodiversity conservation in economic decisions and turn it into a driver for national development.
- Relevant economic development sectors such as agriculture and animal resources, fisheries, forestry, mining and infrastructures will incorporate biodiversity conservation activities into their planning systems as well as in the annual budgets of upcoming years.

6.3. GOALS AND STRATEGIES

- The National Biodiversity Strategy is built on five (5) goals with nineteen (19) targets that have been defined in line with CBD objectives and its Aichi Targets. In the context of Rwanda, the following goals have been set and are almost in line with the CBD goals:
-
- To address the main causes of national biodiversity loss by mainstreaming biodiversity conservation in the decision making process across all governmental, private and civil society's development programs.
- To reduce anthropogenic pressures on biodiversity resources and promote their sustainable use.
- To improve the status of national biodiversity by expanding and safeguarding priority protected ecosystems and maintaining biological communities in equilibrium state.
- To ensure equitable sharing of benefits arising from the use of biodiversity and ecosystem services.

- To enhance NBSAP implementation through biodiversity knowledge management, participatory planning and capacity building.

The following strategies have been aligned to achieve the above-mentioned goals:

- Partnership development, stakeholders' involvement and strengthening trans-boundary management mechanisms of the biodiversity;
- Promotion of conservation incentives and alternatives sources of livelihoods;
- Establishment of corridors and connectivity between fragmented habitats and extension of protected areas where possible;
- Promotion of Community-Based Natural Resources Management around natural ecosystems;
- Community awareness raising and capacity building in biodiversity conservation and sustainable use.

6.4. NATIONAL TARGETS

- Nineteen biodiversity national targets were set in line with the Aichi Biodiversity Targets and based on needs and priorities highlighted during consultations with stakeholders. These are presented in the table below along with related strategic actions and indicators.
- The targets in this revised and updated strategy bring accountability and demonstrate that the Rwandan Government is making a long-term commitment to biodiversity conservation, and that it recognizes it to be pivotal to national economic development and welfare of the population.
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Table 5: CBD Strategic Goals and its Aichi Targets & National Goals and Targets

CBD Strategic goals and its Aichi Targets	National Goals and Targets
Strategic Goal N°1: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society	***Goal N° 1: To address the main causes of national biodiversity loss by mainstreaming biodiversity conservation in the decision making process across all governmental, private and civil society's development programs.***
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.	***Target 1:*** By 2020, at the latest, Rwandan people in at least Districts that are adjacent to protected areas are aware of the values of biodiversity and ecosystem services and understand the steps for its sustainable use and conservation.
Target 2: By 2020, at the latest, biodiversity values have been 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.	***Target 2:*** By 2020, the values of biodiversity and ecosystem services for at least two selected protected areas have been determined and integrated into planning processes, i.e. poverty reduction strategies and national economy.
Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and 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.	***Target 3:*** By 2020, at the latest, positive incentives for biodiversity conservation and sustainability towards local communities' development are boosted and applied and harmful incentives are eliminated.
Target 4: By 2020, at the latest, Governments, 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.	***Target 4:*** By 2020, public and private sectors and civil society organizations have promoted and implemented plans that consider ecological limits.
Strategic Goal N° 2: Reduce the direct pressures on biodiversity and promote sustainable use	***Goal N°2: To reduce anthropogenic pressures on biodiversity resources and promote their sustainable use***
Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	***Target 5:*** By 2020, at least 50 percent of natural ecosystems are safeguarded, their degradation and fragmentation significantly reduced.
Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are	***Target 6:*** By 2020, fishing and aquaculture, agriculture and forestry

managed and harvested sustainably, legally and applying 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.	are managed sustainably taking into consideration ecosystem specificities to ensure biodiversity conservation.
Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	
Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	***Target 7*****:** By 2020, 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 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	***Target 8*****:** By 2020, invasive alien species, their pathways, are identified and prioritized invasive alien species controlled or eradicated.
Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	
Strategic Goal N^{o} 3: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.	***Goal N^{o} 3: To improve the status of national biodiversity by expanding and safeguarding priority protected ecosystems and maintaining biological communities in equilibrium state.***
Target 11: By 2020, at least 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 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.	***Target 9:*** By 2020, at least 10.3 percent of national territory holding particular biodiversity and ecosystem services is protected taking into account the landscape approach in order to maintain biological diversity.
Target 12: By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	***Target 10*****:** By 2020, the extinction of threatened species is prevented and their conservation status improved, particularly for those identified as “Alliance for Zero Extinction (AZE)”.

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.	***Target 11*****:** By 2020, the genetic diversity of priority 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.
	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.
Strategic Goal N^o 4: Enhance the benefits to all from biodiversity and ecosystem services	***Goal N^o 4*****: *Ensure equitable sharing of benefits arising from the use of biodiversity and ecosystem services***
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.	***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 women, local communities especially the vulnerable groups.
Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	***Target 14*****:** By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through increase of forest cover up to 30 percent of the country and restoration of other ecosystems thereby contributing to Climate Change adaptation and mitigation.
Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	***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.
Strategic Goal N^o 5: Enhance implementation through participatory planning, knowledge management and capacity building	***Goal N^o 5: To enhance NBSAP implementation through biodiversity knowledge management, participatory planning and capacity building***
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.	***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 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.	***Target 17:*** By 2020, values of traditional knowledge, cultural heritage and practices of 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 international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of local communities, at all relevant levels.
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.	***Target 18*:** 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, applied and reflected in the implementation of the NBSAP.
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.	***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 increased substantially from the current levels.

VII. ACTION PLAN FOR BIODIVERSITY CONSERVATION

- A well elaborated strategy by itself is of little use unless it is put into action. As mentioned above, the conceived Strategy in whole reflects the country's vision for biodiversity and the broad strategic mechanisms that Rwanda will take to fulfil the objectives of the Convention, while the following elaborated Action Plan defines the specific actions to be carried out over a certain period of time, that will result in enhanced biodiversity conservation, more sustainable use of national biological resources, more equitable sharing of benefits from its use and better conservation of agro-biodiversity in a bio-safety compromise.
- The prepared action plan includes the following elements:

1) A set of activities, each of them clearly linked to the objective and the national targets aligned to achieve the objective;
2) An appropriate responsible institution to implement the strategic actions;
3) A calendar for the implementation of the proposed action;
4) A ray of indicators for monitoring and periodically evaluating its implementation.

7.1. NATIONAL ACTIONS TO ACHIEVE THE STRATEGY

- Actions that are planned to achieve the strategy are presented in the log frame table below:

Table 6: Actions to achieve the strategy

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
<u>Goal 1:</u> To address the main causes of national biodiversity loss by mainstreaming biodiversity conservation in the decision making process across all governmental, private and civil society's development programs					
Target 1: By 2020, at the latest, Rwandan people in at least Districts that are adjacent to protected areas are aware of the values of biodiversity and ecosystem services and understand the steps for its sustainable use and conservation.	-Strengthening communication and outreach tools	**REMA** CoEB, RDB	Year 1	-Number of communication tools and channels developed and in use	-Communication tools -Reports
	-Raising awareness among stakeholders on the values of biodiversity and ecosystem services	**REMA,** CoEB, RDB, MINEDUC, MINALOC, Media	Years 2 - 3	-Number of people sensitized, trained and engaged in sustainable use of biodiversity resources -Number of newsletters, Radio and TV programs, …produced	-Sensitization and training reports -TV show, CDs, Radio spots produced
Target 2: By 2020, the values of biodiversity and ecosystem services for at least two selected protected areas have been determined and integrated into planning processes, i.e. poverty reduction strategies and national economy.	-Increasing knowledge on methods of biodiversity and ecosystem services valuation.	**REMA** RDB, MINEDUC, UR, CoEB, RNRA, and economic planners	Years 1, 2, 3, 4, 5, 6	-Number of relevant target groups trained in biodiversity and ecosystem services valuation.	-Training reports
	-Integrate biodiversity and ecosystem services valuation and their account into economic planning at national and decentralized levels	**MINECOFIN** MINEACOM, MINAGRI, MINIRENA, RDB & other development Sectors	Years 1,2, 3	-Number of sectoral strategic and action plans integrating accounting of biodiversity and ecosystem services values	-Strategic and action plans -District Development Plans

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
Target 3: By 2020, at the latest, positive incentives for biodiversity conservation and sustainability towards local communities' development are boosted and applied and harmful incentives are eliminated.	-Promote positive incentives for conservation and sustainable use of biodiversity -Sustainable investment to address poverty among communities living around protected areas -Identification of harmful incentives; -Establish measures to eliminate harmful incentives	**REMA** RDB, UR, Local Government, Private sector and Civil Society, NGOs	Years 1, 2, 3, 4,5, 6	-Number of income-generating projects initiated around protected areas and other key biodiversity areas, enhancing their protection and contributing to local communities' livelihoods, -Annual financial value of positive incentives for biodiversity conservation and sustainability. -Number of households benefiting from those positive incentives. -Number and types of harmful incentives identified; -Types of tools developed for eliminating harmful incentives	- Activity reports -Park warden (RDB) reports -Reports on status of incentives for biodiversity conservation
Target 4: By 2020, public and private sectors and civil society organizations have promoted and implemented plans that consider ecological limits.	-Public, private and civil society development plans safeguarded by EIA and environmentally monitored -Biological resources thresholds' utilization respected	**REMA**, Central Government, Districts, Private sector and Civil Society, NGOs	Years 1, 2 Years 3, 4, 5, 6	-Percentage of development plans that encompass EIA -Number of ecosystems whose resources thresholds exploitation is known. -Percentage of development plans implementing properly EMP	- EIA/SEA reports -Environmental Monitoring reports

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
`					
Goal 2: To reduce multiple anthropogenic pressures on biodiversity and promote sustainable use of all renewable natural resources					
***Target 5*:** By 2020, at least 50 percent of natural ecosystems are safeguarded, their degradation and fragmentation significantly reduced	-Evaluation of restoration needs for natural ecosystems, development and implementation of related rehabilitation plans.	**RNRA** REMA, CoEB, NAEB, RDB, UR, Conservation NGO's, CBOs	Years 1, 2, 3, 4, 5, 6	- Number of rehabilitation plans elaborated and implemented	-Study/evaluation reports -Rehabilitation reports -Rehabilitation plans -Implementation reports
Target 6: By 2020, fishing and aquaculture, agriculture and forestry are managed sustainably taking into consideration ecosystem specificities to ensure biodiversity conservation.	-Evaluation of fish stock for each lake and estimate its thresholds fishing yield	**RAB** MINIRENA, MINAGRI, REMA, RNRA, CoEB	Years 1, 2	-Thresholds fishing yield for each lake is defined	- Evaluation reports on fish stock
	-Re-introduction of native fish populations and selective fishing targeting invasive species		Years 3, 4, 3	-Number of lakes whose native fish populations restored and predators/invasive species' populations reduced	-Lakes management reports -Evaluation reports
	-Promotion of integrated management of watersheds around water bodies		Years 1, 2, 3, 4, 5, 6	-Water quality improved in lakes and swamps	
	-Implementation of District land use master plans for sustainable		Years 1, 2, 3, 4, 5, 6	-District Land use master plans implemented sustainably and forest management plans elaborated and implemented	

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
	agriculture and forestry				
***Target 7*:** By 2020, 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.	-Sensitization of industrial and agriculture developers for improving management of wastes and pollutants -Regular monitoring of water quality in sources, small streams, rivers, lakes and swamps	**REMA** UR, RSB, RNRA, RRECPC	Years 1, 2 Years 3, 4, 5, 6	-Number of awareness campaigns organized -Pollution levels	-Awareness campaigns reports -Monitoring reports on pollution
***Target 8*:** By 2020, invasive alien species, their pathways, are identified, and prioritized invasive alien species controlled or eradicated.	-Conducting research on alien invasive species and develop related control action plans -Awareness raising and Law enforcement for the control of exotic species	**REMA** CoEB, RNRA, RAB, MINAGRI, MINIRENA, RDB, UR,NGOs, Customs offices	Years 1, 2 Years 2, 6, 3, 4, 5	-Number of invasive species identified and controlled -Legal instruments in use -Number of programs for the control of invasive alien species -Area of land cleared from invasive alien species	-Reports on invasive species control
<u>Goal 3</u>: To improve the status of national biodiversity by expanding and safeguarding priority protected ecosystems and maintaining biological communities in equilibrium state					
Target 9: By 2020, at least 10.3 per cent of national territory	-Legal designation and establishing new protected areas : (i)	**RNRA** REMA, CoEB, RDB, RAB,Local	Years 1, 2, 3, 4, 5, 6	-Number of new protected areas designated -Percentage of protected areas	-Law, decrees and ministerial orders documents

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
holding particular biodiversity and ecosystem services is protected taking into account the landscape approach in order to maintain biological diversity.	Complex Akagera NP-Akagera Wetland-Ibanda-Makera Forest; (ii)Ecological corridor between main Nyungwe and Cyamudongo; (iii) Ecological corridor between Mukura and Gishwati; (iv) associating the wetland complex Rugezi-lakes Burera-Ruhondo to Volcanoes-Buhanga National Park; (v) Rweru-Mugesera wetland Complex; (vi) Lake Kivu islands; (vii) all remnants forests identified (see Annex 1 for details) -Development, updating and implementation of integrated conservation plans for	Government		-New laws, decrees and ministerial orders enacted related to new protected areas -Number and percentage of critical ecosystems for which management plans have been developed and implemented	-RDB,RNRA, REMA report -National Reports to the CBD -Management plans

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
	critical (terrestrial and aquatic) ecosystems -Finalizing and enforcement of wildlife Law and updating sectoral ones			-Wildlife law finalized and number of other sectoral laws revised and enforced	- Law documents
***Target 10*:** By 2020, the extinction of threatened species is prevented and their conservation status improved, particularly for those identified as "Alliance for Zero Extinction (AZE)".	-Conducting inventory of threatened species, especially those in danger of extinction and propose specific measures for their conservation -Re-introducing some lost species for re-establishing ecological equilibrium -Identify "Alliance for Zero Extinction (AZE)" sites and evaluate their degradation status, -Ex-situ conservation of EN or CR species	**REMA** RDB, CoEB, RNRA, RAB, UR	Years 1, 2 Years 1, 2	-List of threatened species in natural and agro ecosystems, and their respective status established -National Red List Index -Number and types of lost species re-introduced -AZE sites identified and protected; -Number of EN or CR species conserved	- Inventory report -Reports -Study reports on identified AZE sites
***Target 11*:** By 2020, the genetic diversity of	-Conserve plant and animal genetic	**RAB** MINAGRI, CoEB,	Years 1, 2, 3, 4, 5, 6	-Number of crop and animal resources collected and	Reports

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
priority 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.	resources to reduce agro-biodiversity loss as well as culturally and socio-economically valuable species losses	RNRA, UR		conserved	
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.	-Technical capacity development in biotechnology risk assessment including GMOs risks -Monitoring and Evaluation of GMOs impacts on human health, biodiversity and local economy -Elaboration of policy and regulations required in Bio-safety	**REMA** RSB, RAB, RDB, MINAGRI, NIRDA, MINEACOM, UR	Years 1, 2 Years 2, 3, 4, 5, 6 Years 1, 2	-Number of trained people in biotechnology risks assessment -Modern and accurate lab. equipment for GMOs and overall biotechnology control -Number of policies and regulations elaborated and enforced in Bio-safety area	-Training reports -List of available lab equipment -Policy and regulations documents

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
	and particularly in GMOs				
Goal 4*: *Ensure equitable sharing of benefits arising from the use of biodiversity and ecosystem services					
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 women, local communities especially the vulnerable groups.	-Promotion of socio-economic activities, i.e. tea plantation in some areas, with more involvement of local vulnerable groups, mostly dependant to ecosystems' goods and services	**REMA** NAEB, RNRA, CBOs	Years 2, 3, 4, 5, 6	-Number of socio-economic activities involving poor and vulnerable groups	-Activity reports
***Target 14*:** By 2020, the ecosystem resilience and the contribution to carbon stocks has been enhanced through increase of forest cover up to 30% of the country and restoration of other ecosystems thereby contributing to Climate Change adaptation and	-Promotion of afforestation and reforestation programs -Policy and law enforcement in forestry and promotion of forest sustainable management programs -Strengthening institutional capacity	**RNRA** RAB, REMA	Years 1, 2, 3, 4, 5, 6 Idem Idem	-Area afforested -Percentage of forest cover of the country -Appropriate forest management plans and systems in use -Percentage cover of each ecosystem type -Number of laboratories equipped, seed banks and/or	-Forest management reports - Reports

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
mitigation.	for technology transfer in forestry development.			tree nurseries developed by communities	
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.	-Establishing a National implementation plan for Nagoya protocol -Access to natural resources that can be sustainably harvested by neighboring communities (i.e. medicinal plants) -Capacity building on Nagoya Protocol implementation -Enhance share of National Parks' financial revenue earned through tourism or other activities with local communities -Compensate local communities for crop raiding and animals' attacks	**REMA** Central Government and Local administration, RDB, RNRA, RAB, NIRDA	Years 1, 2, 3, 4, 5, 6 Years 1, 2, 3, 4, 5, 6 Years 1, 2, 3, 4, 5, 6 Years 1, 2, 3, 4, 5, 6	-Legal and administrative tools for the implementation of Nagoya Protocol -Number of access permits -Number of benefit sharing agreements -Number of awareness and training workshops -Number of socio-economic infrastructures and income-generating projects initiated through Revenue Sharing (RS) around PAs -Number of people compensated for damages caused by wildlife.	-Implementation report -Activity reports -Local administration reports -RDB and partners reports
	-Construction of needed socio-	RDB, Districts, Sectors and Private	Years 1,2,3,4,5,6	-Number of socio-economic infrastructures constructed	-Visits to constructed infrastructures

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
	economic infrastructures to improve welfare of population using revenue sharing funds.	Sector		-Volume of revenue shared per protected area	-Local administration reports -RDB and partners reports
Goal 5: ***To enhance NBSAP implementation through biodiversity knowledge management, participatory planning and capacity building***					
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).	-Development of revised and updated NBSAP through participatory approach -Monitoring and evaluation of NBSAP implementation status	**REMA**, CoEB and stakeholders	Year 1 Year 2, 3, 4, 5, 6	-NBSAP and implementation plans developed and validated. -Monitoring and evaluation reports highlighting the implementation status of the NBSAP	-NBSAP revised report -Fifth National Report to the CBD -NBSAP implementation monitoring report
Target 17: By 2020, values of traditional knowledge, innovations and practices of local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of	-Conduct research and valuation of traditional knowledge and practices related to biodiversity management -Transfer traditional knowledge within training and research	**REMA** MINISPOC, Institute of National Museums, CoEB, UR, NIRDA, MINEACOM, RDB, research Institutions	Years 1, 2, 3 Years 2, 3, 4, 5, 6	-Number of published papers on traditional knowledge and practices relative to biodiversity conservation; -Curricula that include traditional knowledge related to biodiversity conservation	- Published papers - Training modules

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
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 local communities, at all relevant levels.	institutions and their utilization in teaching programs and joint research projects -Review of national policies and legislations and include respect and use of traditional knowledge, cultural heritage, in biodiversity management and conservation		Years 2, 3	-Number of national policies and legislations revised accordingly	-Revised policies and laws
***Target 18*:** 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, applied and reflected in the implementation of the NBSAP.	-Assessment of the biodiversity status, trends, causes and consequences of biodiversity loss, including ecosystem services and values, during the stocktaking phase of the NBSAP development	**REMA**, MINEDUC, CoEB MINIRENA, RNRA, RDB, UR and stakeholders	Years 1, 3, 6	-Stocktaking report encompassing all this information	-Stocktaking reports
	-Continue fundamental research projects in order to increase knowledge	**REMA** MINEDUC, UR, CoEB, RDB	Years 1, 2, 3, 4, 5, 6	-Published documents on status of biodiversity -Number of research projects elaborated and executed	- Research papers - Research projects

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
	on ecosystems and their biodiversity.				
	-Strengthen and enhance the capacity of National Centre for Excellence in Biodiversity Conservation and Natural Resources Management.	**MINEDUC** UR, UNEP/GEF, CoEB and stakeholders	Years 2, 3, 4	-Number of research programs developed -Volume of scientific production accumulated	-Research programs -Reports
	-Conduct research on genetic resources important for national agriculture especially those whose survival is threatened;	**RAB** MINEDUC, UR, Regional, International agriculture research institutes	Years 2, 3, 4	-Number of published papers on important genetic resources -Number of trials conducted	- Published papers -Trials development reports
	-Enhance the capacity of human resources in biodiversity management and conservation through short, medium and long term training.	**MINEDUC** Higher Learning and Research Institutions (Lead), and other partners.	Years 2, 3, 4, 5, 6	-Number of human resources trained through short, medium and long term trainings.	- Training modules - Training reports
	-NBSAP content mainstreamed and information transferred across the country	**REMA** MINECOFIN and other stakeholders involved in Biodiversity conservation	Years 1, 2, 3, 4, 5, 6	-NBSAP mainstreamed and adopted by central and decentralized entities and all stakeholders	- Biodiversity mainstreaming report -Stakeholders reports

Targets	Actions	Lead institution/stakeholders	Time (up to 2020)	Implementation Indicators	Sources/Means of Verification
Target N° 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 increased substantially from the current levels.	-Strengthening institutional capacity in "resource mobilization "to facilitate effective implementation of NBSAP	**REMA** CoEB, RDB,	Years 1, 2	-Number of people trained and skilled in Resource mobilization	- Training module - Training reports
	-Inventory of all potential internal and external sources of funds for NBSAP implementation and establishment of resources mobilization strategic mechanisms	**REMA** RDB CoEB, MINECOFIN	Year 1, 2	-List of potential source of funds and resources mobilization strategy established through NBSAP implementation plan	List of development partners
	-Development and use of innovative financing mechanisms, including market-based instruments.	**REMA**, RDB, MINECOFIN, NGOs	Years 1, 2, 3, 4	-Types of innovative financing mechanisms proposed, accepted and utilized	-List of innovative financing mechanisms operating

7.2. MAINSTREAMING BIODIVERSITY INTO SECTORS, POVERTY REDUCTION AND CLIMATE CHANGE

- Communication tools will be utilized during biodiversity conservation mainstreaming phase across development sectors, ministries, and different government entities. An effort to enlarge and enhance partnership for biodiversity conservation will continue by engaging with a range of potential new partners, including those from areas outside the environmental sector such as private business and industry.
- During NBSAP implementation phase, the integration of biodiversity across all sectors, through participatory approaches will be considered.

7.2.1 Mainstreaming Biodiversity into other Economic Development Sectors

- The promotion of sustainable exploitation of natural resources constitutes a crucial asset for economic development in many countries. Nowadays, companies developing and marketing biodiversity products are emerging in several African countries and the protection and promotion of ecological assets constitutes a growth factor for eco-tourism development. Therefore, time has come to integrate the economic value of biodiversity and ecosystems into national accounts, local development strategies and planning processes. Mainstreaming biodiversity and ecosystem service values into other development sectors will be facilitated by cross-sectoral approach, meaning that specific NBSAP activities will be incorporated into other strategies and plans as follows:

    - The Government of Rwanda has adopted the Green Growth and Climate Resilience Strategy (GGCRS), which aims to guide the process of mainstreaming climate resilience and low carbon development into key sectors of the economy. Some NBSAP activities will fall under the programmes of action of the GGCRS such as ecotourism, conservation and payment for ecosystem services (PES), sustainable forestry, agroforestry and biomass.
    - Agriculture sector is one of the key pillars of the Rwandan economy and the primary goal of the Strategic Plan for Transformation of Agriculture (PSTA III) is to transform Rwandan agriculture from a subsistence sector to a market-oriented and value creating sector. Specific NBSAP activities should be taken into account while

implementing the PSTA III to help the country achieving biodiversity targets related to conservation of agro-ecosystems and halt agro-biodiversity loss.

- Among other key sectors that are driving Rwandan economy include energy, mining, industry and infrastructure development; the Government of Rwanda has put an emphasis on increasing investment and projects in the above said sectors. Biodiversity conservation must be taken into account during the elaboration of strategic plans of the above sectors. The NBSAP recommends that all development projects in these sectors must undergo an Environmental Impact Assessment (EIA) that is biodiversity inclusive.
- Some environmental issues such as: preservation and restoration of environmental conditions while maintaining the productive capacity of natural ecosystems should be included in the national Strategy for Food Security.
- Natural capital accounting including ecosystem services accounts should be integrated in the National System of Accounts to ensure GDP integrates natural resources depletion factor.

7.2.2. Mainstreaming biodiversity in Education Sector

- Though conservation of biodiversity is key to people's livelihood, this vital concept has not yet found its place in the formal education system, at the primary and secondary levels.
- The integration of biodiversity concerns into education will be done through implementation of the national "Environmental Education for Sustainable Development Strategy (EESD)".

7.2.3. Role of development partners in mainstreaming biodiversity

- Many international agencies and development partners (donors) are supporting biodiversity and natural resource management projects in the country, especially for sustainable socio-economic development, poverty reduction and livelihood security. In implementing the NBSAP, there are opportunities for donors to contribute in many action areas, such as, Capacity Building, Co-management of Protected Areas, Communication and Awareness Raising, Knowledge development on biodiversity, Biodiversity

Management Partnership with NGOs and CBOs, in securing population livelihood through integrating biodiversity in other development sectors.

- For illustrative purpose, to achieve the development goals for poverty alleviation within the country, the donors as development partners should think of:
- Integrating elements of the NBSAP into their strategic and annual plans;
- Providing funds to support NBSAP implementation and;
- Suggesting ways of inter-sectoral cooperation through coordinated action programs.

7.2.4. Including Biodiversity conservation in Economic Decisions

- In many countries, business and economic activities play a major role in biodiversity conservation or destruction, either by the impacts (negative or sometimes positive) of their activities on species and natural ecosystems, or through the benefits which they derive from the goods and services delivered by biodiversity. These costs and benefits are rarely addressed in economic decision-making. It is necessary to integrate biodiversity more fully into the economic sphere in order to reconcile public and private interests, ensure mainstreaming in the long term, raise awareness among businesses on their dependence on biodiversity and encourage economic stakeholders to invest in ecological capital and thus to play a role in developing this common asset. In order to successfully integrate biodiversity into the economic sphere, it is necessary:
- To reduce then withdraw incentives which harm biodiversity;
- To reform the tax system;
- To develop new positive incentives especially around protected areas;
- To extend the “polluter pays” principle and enforce it more rigorously and;
- In particular, public subsidies must be redirected in several areas having positive impacts on biodiversity conservation to avoid contributing to the loss of biodiversity and must be subject to bio-conditionality measures.

7.3. STRATEGIES AND ACTIONS TO IMPROVE PROTECTION OF GENETIC DIVERSITY AND TO AVOID EXTINCTIONS

The following strategies will help to improve the protection of endangered (EN) and critically endangered (CR) species by identifying and safeguarding the places identified as their remaining refuge.

The Alliance for Zero Extinction (AZE) is a global initiative originally launched by biodiversity conservation organizations, and now increasingly adopted by governments, that aims to prevent species' extinctions by identifying and safeguarding key sites (known as AZE Sites), each one of which is the last remaining refuge for one or more Endangered or Critically Endangered species.

The AZE sites are sites which feature species evaluated to be Endangered or Critically Endangered under IUCN-World Conservation Union criteria that are restricted to single remaining sites. Nyungwe National Park is recognized globally as the only AZE site existing in Rwanda. It is in this regards that the present strategy aims at updating data on existing AZE sites in Rwanda, identifying new national AZE sites and improve their protection to halt the extinction of Endangered and Critically Endangered species located within those sites.

The strategy also intends to improve the protection of other sites which are of high biodiversity importance but do not fall under the category of AZE sites recognized on the international level.

7.3.1. Identifying and improving protection of potential national AZE sites

7.3.1.2. Identification of potential national AZE sites

The plan aims at identifying existing and potential protected areas where Endangered and Critically Endangered species are ~95% confined to single sites (AZE sites). After the identification, the plan intends to conduct an analysis to highlight those that could benefit from new or enhanced protection, and develop an action plan to advance their conservation.

Based on the guidance provided on how to include AZE sites into NBSAP, the following criteria will be used to identify national AZE sites:

1. **Endangerment**. An AZE site must contain at least one Endangered (EN) or Critically Endangered (CR) species, as listed on the IUCN Red List or the national Red List.

2. **Irreplaceability**. An AZE site should only be designated if it is the sole area where an EN or CR species occurs, contains the overwhelmingly significant known resident population (>95%) of the EN or CR species, or contains the overwhelmingly significant known population (>95%) for one life history segment (e.g. breeding or wintering) of the EN or CR species.

3. **Discreteness**. The area must have a definable boundary within which the character of habitats, biological communities, and/or management issues have more in common with each other than they do with those in adjacent areas.

The identification process will also take into account the existing AZE sites in Rwanda, Nyungwe National Park; in order to provide updated information on its current status.

7.3.1.2. Improving protection of national AZE Sites

The identification of potential national AZE sites will help in the elaboration and improvement of protection measures to stop biodiversity loss in the sites. Scientific studies will provide for decision makers with adequate measures of protection for each site. The strategy aims to provide specific protection for the sites which meet the AZE sites criteria to preserve and conserve endangered and critically endangered species within them. AZE sites that are not included in protected areas, will be assured an appropriate level of protection to reduce biodiversity loss. AZE sites included in the coverage of protected areas will follow the protected areas' management plans already in place or in course of development. Mapping the national AZE sites and national biodiversity hotspots will assist in the conservation planning of the country.

Different actions will be done in order to achieve the objectives of the strategy and ensure a step forward to attain the Aichi Biodiversity Targets 11 and 12. These include:

- To carry out a study to identify and establish a national list of threatened species and ecosystems that will serve as National Red List and analyse those that meet criteria of AZE sites to be assigned the status of national AZE sites;
- Elaboration and implementation of rehabilitation and protection plans specific for each AZE site;
- Ex-situ conservation of all species identified as endangered (EN) or critically endangered (CR).

VIII. IMPLEMENTATION PLANS

8.1. CAPACITY BUILDING PLAN

8.1.1. Objective of the capacity building plan

- This plan intends to propose a framework for:

a) Institutional capacity strengthening in biodiversity management. This entails institutional arrangements, partnership and collaborative mechanisms for effective management of the biodiversity
b) Human resources capacity building for entities involved in biodiversity conservation, agro-biodiversity, biotechnology and biosafety.
c) Building capacity in supportive areas such as resources mobilization, communication and outreach strategy and gender mainstreaming in biodiversity management.
d) Defining types of indicators for proper monitoring of the capacity building plan.

8.1.2. Institutional arrangements

8.1.2.1. National level coordination

- The Centre of Excellence in Biodiversity and Natural Resources Management (CoEB) is a knowledge-based institution whose responsibility is to address challenges facing biodiversity and natural resources management. The central hub of the CoEB is hosted by the UR and linked to nodes representing specific functional networks (higher learning and research institutions, NGOs private sector, etc.). Each node has specific roles to ensure that the CoEB achieves its mission. The hub is the coordinating organ and provides administrative, financial and managerial services to the CoEB. It will function as a corporate centre, providing potential sources for ensuring all research and information management and the sharing of skills and expertise, through proper landscape level planning and management for sustainable development. It shall be a source of information (databases of biodiversity, economy, social issues, and database of experts, publications and access to existing literature), and play advisory roles for decision making.

- The Centre of Excellence should be on front line, coordinate, oversee and monitor the cross sectoral implementation of the NBSAP, through collaborative and partnership mechanisms. Its capacity should be strengthened technically and legally mandated for this purpose. The CoEB shall have a website with a catalogue for biodiversity where related data and information will be uploaded and updated for the benefit of different users. A link shall be established between the website of the Centre and Rwanda Clearing House Mechanism (CHM) in order to communicate and share updated information on biodiversity and facilitate easy access to all users.

8.1.2.2. Partnerships and collaborative mechanisms

A big number of institutions and organizations are directly or indirectly engaged in biodiversity conservation or use based on their respective legal mandates and responsibilities. A sound broad-based approach that allows the involvement of all stakeholders is the most cost-efficient way for the NBSAP implementation. Hence the principle of shared responsibility should be operationalized in order to minimize harmful impacts on the biodiversity. This is particularly important for sectors such as agriculture, mining, industry, settlement, transport, and others whose development plans should include biodiversity conservation and provide awareness to their personnel.

The following diagram summarizes key institutions partnering in the conservation of biodiversity in Rwanda:

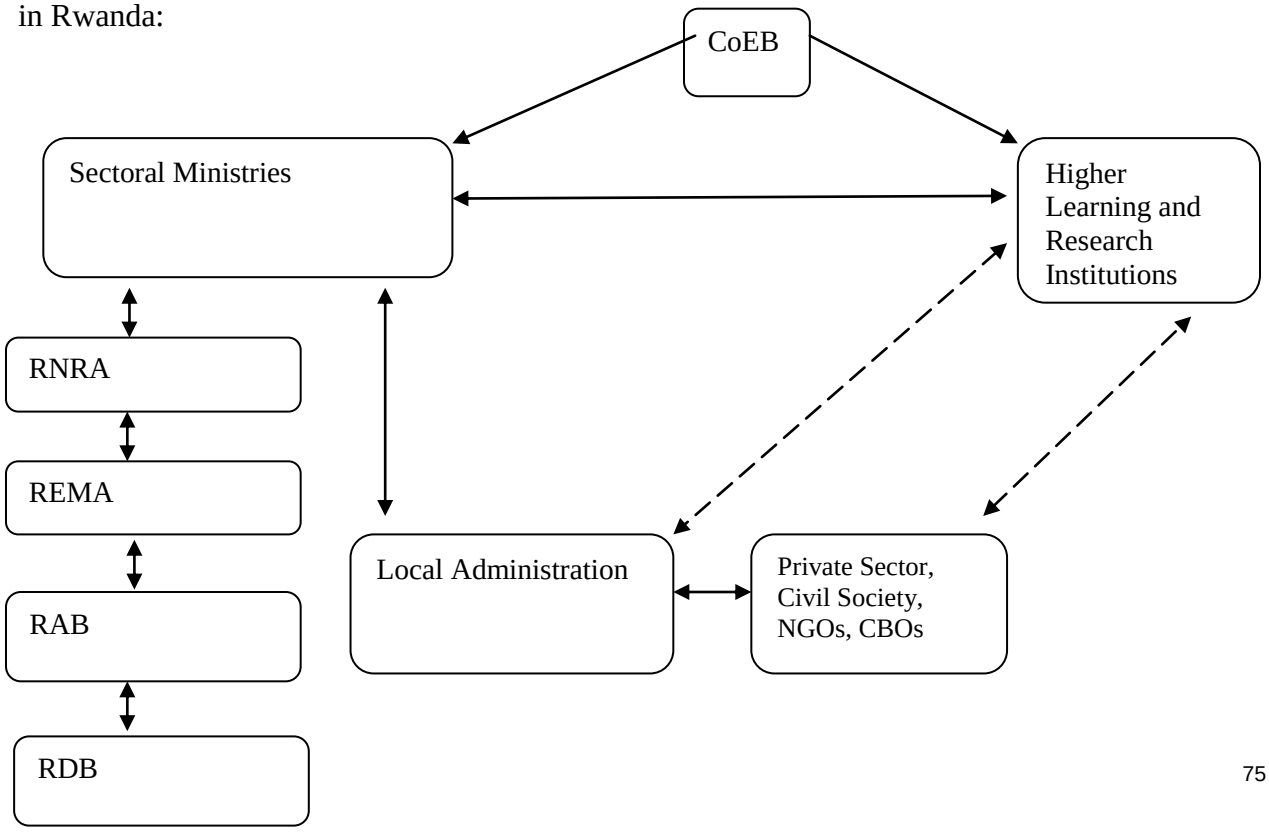

Figure 9: Institutions involved in biodiversity conservation in Rwanda

The overall operational support of the CoEB, in collaboration with higher learning and research institutions, and relevant government ministries and attached institutions can effectively advocate for NBSAP implementation. Their role will be to ensure that biodiversity conservation is integrated into their developmental plans and programs. Private sector and civil society organizations also advocate for biodiversity conservation through their mandates, in addition to their direct technical and financial support to biodiversity initiatives.

8.1.2.3. Development and enhancement of transboundary collaborative management mechanisms

- Enhancing trans-boundary mechanisms in biodiversity management is very important for Rwanda, since much of its biodiversity hotspots are located at the borders with neighbouring countries. This is the case of Volcanoes National Park (VNP) on the border with Democratic Republic of Congo (DRC) and Uganda; Nyungwe National Park (NNP) on the border with Burundi; Akagera National Park (ANP) on the border with Tanzania; Rweru - Mugesera complex wetland bordering with Burundi and Akagera complex wetland bordering with Tanzania. Therefore, effective management of these ecosystems is ultimately depending on the collaborative and enhancement of trans-boundary management mechanisms in order to control poaching and other types of encroachment from neighbouring countries.
- The Treaty of the Greater Virunga Transboundary Collaboration (GVTC) has been signed by all riparian countries, the Democratic Republic of Congo (DRC), Rwanda and Uganda. GVTC has been established for transboundary management of Mountain Gorilla population hosted by the three national parks (Volcanoes National Park in Rwanda, Virunga National Park in DRC and Mgahinga National Park in Uganda) of Virunga Massif. Such Transboundary collaborative mechanisms should be strengthened between Rwanda and Burundi for effective management of two connected and transboundary National Parks which are Nyungwe National Park in Rwanda and Kibira National Park in

Burundi. And also between Rwanda and Tanzania for the management of Akagera National Park.

8.1.3. Human resources capacity building

- Human resources capacity shall be strengthened through the development and implementation of short courses, medium and long term training programs for the benefit of early to mid-career professionals as well as the upgrading of the experienced staff from various institutions involved in biodiversity, agro-biodiversity and biotechnology management in Rwanda. Short courses are just for updating and/or upgrading knowledge and skills in short term trainings. Post-Graduate Diploma programs will be organized for biodiversity conservation practitioners in medium term training whilst long term trainings will include MSc and PhD programs.
- The trainings will be offered by different institutions specialized in biodiversity, agro-biodiversity, bio-technology and related fields. These range from public and private high learning institutions to non-government organizations. The main one is the University of Rwanda (UR) which is a multidisciplinary academic institution and which provides a complex set of teaching and research programs including those related to the aforementioned fields at undergraduate and graduate levels. In addition, UR is well equipped with modern research and teaching infrastructures that enable the university to effectively run its programs. The University has also developed a strong and wide international partnership with universities and research institutions around the world. There are other public research institutions, private higher learning institutions, government agencies and international NGOs that are also involved in delivering various trainings, teaching and research programs including those related to biodiversity and environmental conservation. The list of some of these institutions is presented in the below table.

Table 7: List of the main training and research institutions operating at country level

Institutions	**Teaching & Research areas**	**Degree/Certificate delivered**
Universities and Higher Learning Institutions		
University of Rwanda (UR)	• Biology Conservation • Environmental Chemistry • Natural Resources Management • Crop production and Animal Husbandry	Bachelor, Diploma, Masters and PhD

	• GIS and Remote Sensing •Environmental Management and Sustainable Development • Rural Development • Biotechnology • Urban Planning • Water resources management • Life Sciences, Humanities • Applied Microbiology • Education • Environmental Science • Environmental Health • Agriculture • Veterinary Science, etc.	
Institut National d'Enseignement Supérieur de Musanze (INES)	• Training and research • Land survey • Biotechnology • Social sciences	Bachelor degree
Institute of Agriculture, Technology and Education of Kibungo (INATEK)	• Education • Rural development • Agriculture • Technology	Bachelor degree
Kitabi College for Conservation and Environmental Management (KCCEM)	• Training in Conservation and Environmental Management Education	Diploma and Certificates
Research Institutions		
National Industrial Research and Development Agency (NIRDA)	• Industrial Research (Phytomedicine, Energy, Forestry and Biotechnology)	
Government Agencies		
Rwanda Environment Management Authority (REMA)	• Mainstreaming environmental issues into schools curricula; • Mainstreaming environment into informal education; • Conducting research to facilitate integration of environmental considerations into development policies, plans, programs and projects; • Facilitating research to address environmental degradation (air, water, land, ….) for the purpose of rehabilitation; • Undertaking and coordinating environmental research and cooperating with national and	

	international organizations involved in research.	
Rwanda Agriculture Board (RAB)	• Crop variety • Livestock improvement • Agroforestry • Biotechnology • soil science • Veterinary • Microbiology • Germplasm Conservation • Delivery of technology package targeting farmers aiming at the increase of production, adapt to climate extremes, etc.	
International NGOs		
International Gorilla Conservation Program (IGCP)	• Building capacity for staff involved in the Volcanoes National Park; • Gorilla monitoring/Ranger-Based Monitoring (RBM); • Tourism development; • Community initiatives and management planning; • Socio-economic monitoring.	Certificates
Dian Fossey Gorilla Fund International (DFGFI)/Karisoke Research Center (KRC)	• Research on Gorilla: behavior, monitoring; • Gorilla Protection; • Awareness raising for environmental protection; • Long-term surveillance of some plants and animal species in the VNP; • Scientific capacity building; • Improvement of population living conditions.	
Wildlife Conservation Society (WCS)	• Inventory of mammals, amphibians, birds and plants; • Forest regeneration and tree phenology; • Environmental Education.	
Mountain Gorillas Veterinary Program (MGVP)	• Tissues fixing for feature histopathology examination in California, US; • Mountain Gorillas health care monitoring; • "Biobank" samples prepared and sent to scientists worldwide; • Health care provision to gorilla in the Volcanoes; • Assessment of the health of other species.	

The following table summarizes the capacity building implementation framework in line with the four main fields:

- Biodiversity conservation in natural ecosystems;

- Agro-biodiversity;
- Biotechnology management and Bio-safety;
- Cross-cutting and supportive skills.

The framework provides the information about capacity needs, time-frame for each training, targeted people, expected outputs and outcomes, training institution and indicative budget.

Table 8: Human resources capacity building framework

Training areas/topics	Training timeframe (Short, Medium and Long Terms)			Target people/ Institutions/ Departments	Indicators		Training Institution	Indicative Budget (in FRW)
	S	*M*	*L*		Outputs	Outcomes/Impacts		
Biodiversity conservation in natural ecosystems								
Methods/techniques for taxonomic studies	**x**			RDB, REMA, RNRA, Local NGOs involved in biodiversity conservation	-Training module developed -Number of people trained -Training reports	-Species classification known -Rare species known -Sustainable management of natural ecosystems	-UR -Centre of Excellence in Biodiversity Conservation and Natural Resources Management -KCCEM, -DFGF-I,	**30,000,000**
Ecological studies			**x**	RDB, REMA, RNRA, Local NGOs involved in biodiversity conservation	Idem	-Study reports, research papers -Ecological processes and dynamics known -Balanced and sustainable management of ecosystems	UR, DFGF-I other research and high learning institutions	**100,000,000**
Animal species behavior (eco-ethology)		**x**	**x**	RDB, Local NGOs involved in biodiversity conservation	Idem	Research papers -Species behavior known -Proper management system of animal species established	UR, DFGF-I other research and high learning institutions	**100,000,000**

						- Species safety		
Environment economics	**x**	**x**	**x**	MINIRENA, MINEACOM, MINECOFIN, NISR, RDB, REMA, RNRA, Local NGOs involved in biodiversity conservation, and local administration technicians	Idem	-Ecosystem services valuation reports -Biodiversity and ecosystem values integrated into national accounting system -Biodiversity-based decision making	-WCS -UR -Other research and high learning institutions	**120,000,000**
Bioinformatics	**x**	**x**	**x**	RDB, REMA, RNRA, MINIRENA, Local NGOs involved in biodiversity conservation, and local administration technicians	Idem	-Biological data are statistically analyzed -Conservation scenarios are developed	-UR -Other research and high learning institutions	**100,000,000**
Biodiversity modeling		**x**	**x**	RDB, REMA, RNRA, MINIRENA, Local NGOs involved in biodiversity conservation, and local administration technicians	-Training module developed -Number of people trained -Training reports	-Biodiversity trends are well demonstrated -Decision making in biodiversity management are scientifically guided -Proper measures are taken and biodiversity loss is prevented -Biodiversity models are developed	Idem	**70,000,000**

GIS and RS applied to conservation	**x**	**x**	**x**	Idem	Idem	-All critical ecosystems mapped and characterized -Efficient ecosystem management and monitoring system developed -Sustainable management of critical ecosystems	-UR/Centre for GIS Other research and high learning institutions	**60,000,000**
Traditional knowledge documentation and valorization	**x**			RDB, REMA, RNRA, CBOs, Local NGOs involved in biodiversity conservation	Idem	-Traditional knowledge documented -Use of traditional knowledge in biodiversity conservation -Local communities involvement in biodiversity conservation	-NIRDA (IRST) -MINISANTE -MINISPOC	**20,000,000**
Biodiversity assessment	**x**	**x**		RDB, REMA, RNRA, MINIRENA, Local NGOs, and local administration technicians	-Training module developed -Number of people trained -Training reports	-Evaluation reports produced -Conservation plans revised and adjusted -Sustainable management of Biodiversity	-UR, -Private companies	**35,000,000**
Adaptive management of Natural Resources	**x**			RDB, RNRA, Local NGOs, CBOs and Local administration technicians	Idem	-Integrated/inclusive buffer zone management plans developed -Effective and sustainable community based biodiversity conservation	WCS, IGCP, UR (MSc biodiversity Conservation Program)	**35,000,000**

						-CBNRM plans developed -Biodiversity conservation and community livelihoods ensured -Sustainable biodiversity conservation.		
Climate change impact on the biodiversity		**x**	**x**	RDB, RNRA, REMA, Local NGOs	-Training module developed -Number of people trained -Training reports	-Mitigation and adaptation measures developed -Ecosystems resistance and resilience capacity improved	UR, WCS, UNEP, CBD Secretariat, UNFCCC Secretariat	**100,000,000**
Regeneration and propagation of indigenous plant species	**x**	**x**		RNRA, RDB, REMA, local NGOs, local communities	Idem	-Indigenous plant species conserved -Natural habitat restored -Biodiversity conserved	-UR, WCS, RNRA	**100,000,000**
Sub-total 1								**87,000,000**
Agro-biodiversity								
Land use management	**x**			REMA, RDB, Local NGOs, CBOs, Local administration, RAB, RNRA, MINAGRI	-Training module developed -Number of people trained -Training reports	-Sustainable land use management plans developed -Biodiversity sustainably managed	-UR -Other research and high learning institutions	**35,000,000**
Apiculture/Beekeeping	**x**	**x**		Local NGOs, CBOs, Local administration technicians	Idem	-Beekeeping value chains developed -Apiculture products(such as honey) meeting international	-UR, WCS, NAEB,	**35,000,000**

						standards -Local communities (honey producers) livelihoods improved -Encroachment on PAs resources reduced and sustainable biodiversity conservation.		
Urban agro-forestry systems	**x**	**x**		Local NGOs, CBOs, Cities administration technicians	-Training module developed -Number of people trained -Training reports	-Urban agro-forestry plans developed -Soil fertility restored -Urban agriculture production increased -Encroachment on urban natural resources (i.e. wetlands) reduced and sustainable biodiversity conservation	RAB, RNRA, ICRAF,	**35,000,000**
Sub-total 2								**105,000,000**
Biotechnology management and Bio-safety								
Agro-processed food quality control	**x**	**x**		-Private food processing companies -Cooperatives -CBOs	-Training module developed -Number of people trained -Training reports	-Modern and safe equipment in use -Quality control protocol developed -Safely processed food produced -Consumers safety ensured -Population health protected	RSB other institutions	**35,000,000**
Traditional Medicine	**x**	**x**		-Traditional	Idem	-Modern equipment and	NIRDA,	**35,000,000**

quality control				healers		material use -Medical control protocol developed -Quality and approved drugs and medicines in use -Environment pollution prevented -Population health protected	UR,RBC, RSB	
Genomics and GMOs detection/analysis	**x**	**x**		-RSB -RAB	Idem	-Quality control protocol developed -Risk assessment and control improved -Population health protected	UR Other institutions	**35,000,000**
Sub-total 3								**105,000,000**
Crosscutting and supportive skills								
Financial resources mobilization strategy	**x**			RDB, RNRA, REMA, RAB, Local NGOs, CBOs and Local administration technicians	-Training module developed -Number of people trained -Training reports	-Resources mobilization plans developed -Sufficient resources for cross-sectoral biodiversity management -Sustainable Biodiversity management	MINECOFIN External Finance Unit, FONERWA, WB, UR, LODA	**35,000,000**
Biodiversity Communication and outreach techniques	**x**			RDB, RNRA, REMA, RAB, Media groups Local NGOs,	Idem	-Communication tools developed -Stakeholders awareness raised	UR, WCS, IGCP, RBA	**20,000,000**

				CBOs and Local administration technicians		-Stakeholders engagement improved -Biodiversity managed sustainably		
Gender mainstreaming into biodiversity planning	**x**			MIGEPROF, RDB, RNRA, REMA, RAB, Local NGOs, CBOs and Local administration technicians	Idem	-Gender issues considered into conservation planning -Equitable sharing of biodiversity resources -Sustainable management of biodiversity	-Gender Monitoring Office -Ministry of Gender and Family Promotion	**20,000,000**
Sub-total 4								**75,000,000**
TOTAL GENERAL								**1,155,000,000**

8.1.4. Policy strengthening and law enforcement

Biodiversity considerations shall be integrated into new and revised sectoral policies and laws as explained in chapter 4, in order to promote and support biodiversity and environment sustainable development.

Permits for land use or natural resources exploitation should be given under strict agreement between concessionaires and the relevant authority to set mechanisms that guaranty the conservation of the biodiversity including protection of critical ecosystems as well as the restoration of degraded ones after completion of exploitation. Mining sector is one of the most concerned sector, since mining activities have particularly intensified in Western Province of Rwanda where natural forest reserve such as Mukura are seriously threatened by mining exploitation.

Traditional knowledge that ensure sustainable use of natural resources and land use management shall be promoted along with the fair and equitable sharing of benefits arising from the utilization of biodiversity resources as required by Nagoya Protocol.

8.2. COMMUNICATION AND OUTREACH STRATEGY

8.2.1. Importance of NBSAP Communication Strategy

- NBSAP communication strategy shall be part of overall strategy for implementing biodiversity policy and achieving long-term objectives dedicated to conservation and sustainable use of biodiversity.
- A well prepared and solid communication strategy shall be of great importance in informing and getting all stakeholders, including local communities, to collaborate and support NBSAP's activities.

8.2.2. Objectives

- To improve the knowledge and information sources for Rwandan communities on the role and relevance of biodiversity conservation in their livelihoods;

- To strengthen national communication tools and promote new and innovative communication mechanisms in order to provide users an enhanced communication hub necessary for the implementation of NBSAP's activities;
- To develop methods of responding to local population needs using the communication strategy efficiently;
- To flow significant information necessary for national capacity-strengthening in the development and use of biodiversity and ecosystem services.

8.2.3. NBSAP communication and outreach implementation framework

The priority issues outlined in national biodiversity strategy will be widely communicated to the decision-makers, managers, potential donors, private sector, civil society organizations and the general public (Table 9).

Table 9: Framework for communication and outreach strategy implementation

In charge	Appropriate Action	Process Framework	Communication tools	Target Audiences
NBSAP coordination and monitoring unit	Provide guidance and advice about NBSAP activities and implementation processes	Technical documents	Email, telephone, website, newsletters	Policy and decision-makers
	Communicate NBSAP activities to potential donors	NBSAP Reports Newsletters	Email, telephone, teleconference, website NBSAP national meetings	Donors and bilateral partners
	Communicate NBSAP activities at national level	Workshops reports	Email, telephone, Skype, teleconference, National website	Public and private agencies involved in biodiversity conservation
	Communicate country's engagement in bio-diversity conservation	Consultancies' publications	NBSAP regional and national workshops Newsletters	Donors and bilateral partners
	Develop closer working relationship between the NBSAP Project and CBD Secretariat	National NBSAP and Reports sent to CBD Secretariat, Newsletters	Email, tele-conference, CBD website, NBSAP Forum and/or meetings	CBD Secretariat
	Communicating NBSAP activities and its implementation	Scientific conferences, scientific papers	Dissemination program Participation in international events Press releases, conference proceedings papers	Civil Society (NGOs and CBOs) Educational and research scientists

8.2.4. Strategic Communication Approach

- Strengthening partnership between all stakeholders directly or indirectly involved in biodiversity management and conservation as well as enhancing communication mechanisms dedicated to share all available information will constitute the key directional approach to sustain the present NBSAP communication and outreach strategy.
- The elaborated communication strategy will be a principal vehicle for coordinating the development of all NBSAP actions and the primary mechanism for monitoring progress towards achieving the National Targets for biodiversity management and conservation.
- The basic approach of the strategy will consist of facilitating communication activities of partners, seeking to minimize competition for attention of the same audiences, making the flow of information necessary for national capacity-strengthening in the use and management of biodiversity and ecosystem services.
- The strategic approach of the communication and outreach steps shall permit the expansion of partnership sphere of influence by engaging with development sectors previously not involved in biodiversity conservation (i.e. private business, industries emerging). The communication strategy will include specific tailored activities for this purpose.

Table 10: Proposed communication channels

Communication media	Role and relevance	Constraints
• Print media	• Convey the message dealing with biodiversity management and conservation in Rwanda through printed newspapers.	Newspapers provide very few and superficial information on biodiversity conservation
• Websites	• Easy dissemination of key initiatives and NBSAP activities and possibility to reach a wide range of audiences at the national, regional and international levels. • Easy access to available	-Local websites less updated, -Limited access to internet facilities by general public.

	biodiversity information and related data.	
• Social media	• Easy access, and user friendly and fast (e.g. facebook, twitter...). • Great potential to reach large audiences. • Easy wide spreading of events, news and biodiversity conservation campaigns and related fields.	-Information needs to be constantly posted and updated, which requires significant time resources. -Access to internet (limited for general public)
• Newsletter	• Regular newsletters circulate biodiversity information and updates among all partners and governance bodies' members. • The newsletter can be used to inform about on-going activities, upcoming meetings, publications and general outcomes from miscellaneous research works. • Thematic storylines are developed, aiming to highlight partnership with other development sectors and understanding of different sectoral issues affecting biodiversity conservation and ecosystem services.	More locally accessible to a given institution than to large public audience.

• Radio and Television	• With majority of the rural population having no other accessible means of communication, the radio is the most effective means of information sharing within the country on biodiversity conservation in particular.	Access to television is still limited to most of people.
• Clearing House Mechanism (CHM)	• The establishment of the Clearing House Mechanism (CHM) will facilitate sharing of scientific information on biodiversity	A clear coordination mechanism of information gathered by Rwanda's CHM and the CoEB should be established.
• School curricula	• Early awareness increase among young generations about biodiversity issues through school programs.	What is most needed at the moment is a government backed strong initiative to introduce biodiversity management and conservation as a regular subject, in the teaching curricula at the primary, secondary and tertiary levels of education, as appropriate. Some specific short comedies dedicated to publicity or illustration of traditional knowledge in biodiversity conservation should be envisaged as well as theatre scenes played by students at school.

• Promotional materials	• Promotional materials (leaflets, postcards, posters, banners, brochures, etc.) developed and disseminated during biodiversity related events contribute to awareness increase among general public.	
• Scientific reports and publications	• Reliable information among scientific community.	Financial means for thorough scientific research with appropriate tools and equipment constitute a big challenge.

8.2.6. Available Resources

- Implementation of NBSAP will require substantial and sustainable financing from traditional and innovative financing streams. Government subsidies will not be enough and new financial mechanisms will have to be explored. The communication strategy should help to mobilize more resources.

8.2.7. Communication Strategy Action Plan

The communication strategy action plan (Table 11) constitutes a concrete set of strategic and feasible actions necessary to gather and diffuse appropriate information at different levels in order to facilitate the smooth implementation of updated NBSAP and therefore to achieve the proposed National Targets.

Table 11: Communication Strategy Action Plan

Strategic action	Responsible for implementing Action	Estimated budget (in FRW)	Timeframe	Monitoring Indicators
• Strengthen National Biodiversity database and make it accessible to all interested people (users)	Management, Training and Research institution as well as other Stakeholders	100,000,000	Medium term (5-7 years)	-Volume of biodiversity information gathered -Number of subscribers to database
• Strengthen effective Clearing House Mechanism, using different communication Channels.	CBD, REMA, UR and link to other biodiversity related conventions (CITES, CMS, ITPGRF, RAMSAR, World Heritage Convention-WHC), other key international instruments and Development Partners	50,000,000	Short term 2 years	-Number of links established -Number of subscribers
• Formulate key communication guidelines relevant to all people	REMA and UR, and all stakeholders.	30,000,000	Medium term 2 years	-Document of communication guidelines -Monitoring and evaluation reports
• Develop specific curricula on biodiversity conservation (Ecosystem services) for school and university students	Training institutions, Higher Learning Institutions, REB, & RDB, REMA	50,000,0000	Short term 2 years	-Number of curricula developed -Number of schools adopting curricula

• Prepare a short, easy-to-read version of the NBSAP in the 3 official languages targeting a broader range of stakeholders.	REMA, Development partners	300,000,000	Short term 1 year	-Number of documents prepared in 3 national languages -Number of copies distributed
• Support development of raising awareness materials in Kinyarwanda	REMA, Development partners, Training institutions &NGOs	50,000,000	Short term (2 years)	-Number of materials produced -Number of people receiving materials translated in Kinyarwanda
• Develop television shows and other public media (Radio, Social media, Newspapers, etc.) to communicate biodiversity conservation messages	REMA, RBA, Private Sector, Media High Council,	350,000,000	Medium term 7 years	-Number of TV emissions broadcasted -Number of channels broadcasting biodiversity conservation emission -Number of copies of distributed newspapers
• Promote Environmental Education activities in schools to reach more people with biodiversity conservation messages	REMA, Schools Directorates, Civil society organizations	60,000,000	Short term (1to 2 years)	-Number of biodiversity related events -Number of people attending the events -Number of participating schools

• Organize training sessions on communication techniques for different stakeholders including communication personnel	REMA, Development partners, Training Institutions	30,000,000	Short term (2 years)	-Number of sessions organized -Number of participants trained
• Assess impacts of the communication strategy on conservation.	REMA, Development partners, Research institutions or Consultancy firms	30,000,000	Medium term (7 years)	-Monitoring Reports
• Empower the communication network on the ongoing biodiversity conservation activities and information exchange.	REMA, RDB, Centre of Excellence on Biodiversity Conservation and Natural Resources Management	30,000,000	Short term (2 to 3 years)	-Number of network members -Number of topics discussed
TOTAL		**1,430,000,000**		

8.2.8. Monitoring system of the communication

- It will be important to initiate a monitoring system in the initial stages of communication strategy implementation that gives feedback to the REMA communication office in order to assess the effectiveness of communication activities and modify course accordingly. REMA's communication office will regularly monitor both the internal and external flow of information delivered. First of all, the office has to be ensured that partners in biodiversity management and conservation are well informed, engaged and able to perform the communication activities agreed upon. Second, the office has to be ensured that information delivered has been well received by the different range of audiences (i.e. users, new sectors, etc.). Below is an example of a tool to assess progress towards achieving communication objectives and results during an external communication monitoring phase. Proposed indicators and means of verification for monitoring are presented and clustered by area or action (Table 12).

Table 12: Tools to monitor and evaluate the communication strategy

Area of action	**Indicators**	**Means of verification**
Effectiveness of websites establishment	-Number of search/consultations from website	-Consultations and number of subscribers records
Biodiversity mainstreaming effectiveness and impact of NBSAP activities	-Part of biodiversity writing in sectoral reports,	-Reports clippings on biodiversity
Engagement of new partners to finance biodiversity conservation	-Number of new partners engaged in financing	-Funding letters/agreements
Integration of NBSAP activities within CBD processes	-Number of information documents shared or submitted to CBD	-Information documents shared
Engagement with new development sectors in biodiversity conservation	-Number of request for joint projects -Number of collaborative meetings held with representatives of different sectors.	-Official information on requests -Meetings' agenda and reports

8.3. RESOURCE MOBILIZATION PLAN

8.3.1. Introduction

8.3.1.1. Setting Context

- To achieve the assigned objectives of NBSAP and ensure that our nation will fulfil its biodiversity conservation commitments will mostly depend on the availability and efficient use of financial resources.
- The present resource mobilization strategy constitutes a tool, an insight way dedicated to increase substantially financial resources from all potential sources for an effective implementation of the NBSAP. It will not only indicate ways of raising funding, but also deal with the implementation responsibilities of different sectors involved in biodiversity conservation, so that our country becomes self-reliant on raising resources needed for the purpose. The strategy will also provide a framework for highlighting donors on priorities to support biodiversity conservation. Thus, appropriate financial mechanisms as well as consolidated sources of funds shall be considered first. Besides financial resources from cooperation, it shall be necessary to raise national financial means through public and private sectors as well as civil society partnership in biodiversity financing and actions implementation. Among others, at countrywide level, it shall be necessary to map and assess the state of ecosystems, the economic value of their services and promote the integration of these values into national accounting and reporting systems.
- Furthermore, Payment for Ecosystem Services (PES) schemes should reward public and private goods from agriculture, forest and water bodies' ecosystems. Incentives shall be provided to attract private sector investment in green infrastructures.
- Finally, it will be necessary to identify the full cost of implementing each of the NBSAP strategic actions and elaborate a detailed resource mobilization plan that identifies a wide range of finance actors, mechanisms and opportunities for mobilizing biodiversity resources.

8.3.1.2. Definitions of key concepts

- **Resource mobilization strategy in Biodiversity Conservation**: Resource mobilization strategy in biodiversity conservation comprises the mix of mechanisms the government

will employ in order to directly finance all programs of NBSAP implementation in a manner that is efficient, equitable, sustainable, transparent and improve biodiversity conservation at country level.

- **Financial actors:** A financial actor, agent, investor or institution is any individual, group or entity that could potentially provide funding for biodiversity objectives through a financial mechanism.
- **Biodiversity finance mechanism:** A biodiversity finance mechanism is any instrument or tool that enables potential revenue to be captured (i.e. fees, taxes, incentives and payments etc.).
- **Total amount of potential revenue:** The amount of potential revenue of a finance mechanism is a factor of the general amount the mechanism can generate per unit, and the total units likely to occur within a given year (i.e. value of land acquisition on a per hectare basis x number of hectares included in biodiversity offsets each year).
- **Feasibility of the finance mechanism:** Feasibility of the finance mechanism is defined by numerous factors, including how easy it will be to establish, implement and maintain the mechanism, the extent of changes required, the alignment with other related policies, and the fit with the overall policy environment, among other factors.

8.3.2. Objectives

8.3.2.1. Global objective

- Design a national specific resource mobilization strategy in the framework of updating and implementing NBSAP.

8.3.2.2. Specific objectives

- Gather information base on biodiversity conservation funding needs, set financial priorities and propose appropriate mechanisms for national and international resources mobilization;
- Identify potential sources of funding and elaborate resource mobilization plan.

8.3.3. Resource needs for NBSAP implementation

- One of the critical elements in formulating a resource mobilization strategy is estimating the resource needs for biodiversity conservation. The present chapter constitutes a resource mobilization strategy which presents activities to implement NBSAP and source of funding.

8.3.3.1. Actions for NBSAP implementation and sources of funding

- A seven-year program of actions will be developed, involving 8 focal areas and 64 prioritized activities (Table 13).

Table 13: Activities and source of funding

• **Planned Actions**	• **Source of funding**
• **Focal area 1: Mainstreaming biodiversity conservation into development sectors**	
Develop appropriate and efficient communication and outreach tools (website, newspapers…)	Government funds (REMA) Private sector, NGOs
Raise awareness among stakeholders on the value of biodiversity and ecosystem services	Government funds (REMA, MINIRENA, RDB) and NGOs funds
Increase knowledge in biodiversity and ecosystem services valuation and their account in economic planning at national and decentralized levels	Government and Partners (UNEP/GEF), Bilateral donors
Environment safeguards for public and private sectors and civil society development plans through Strategic Environmental Studies (SES).	Government funds (REMA, RDB, RNRA)
Promote positive incentives for conservation and sustainable use of biodiversity	Government & Bilateral donors (Projects)
Develop sustainable investment to address poverty among communities living around PAs	Government & Bilateral donors (Projects)
• **Focal area 2: Biodiversity conservation and its sustainable utilization**	
Develop, update and implement integrated conservation plans for critical (terrestrial and aquatic) ecosystems	Government and Partners (UNEP/GEF), Bilateral donors
Conduct survey to identify "Alliance for Zero Extinction (AZE)" sites and evaluate their degradation status	Government and Partners (UNEP/GEF), Bilateral donors

Elaborate rehabilitation plans for degraded ecosystems areas	Government and Partners (UNEP/GEF), Bilateral donors
Conduct research on alien invasive species and develop related control action plans	Government and Partners (UNEP/GEF), Bilateral donors
Enforce law in control of the introduction of exotic species	Government and Partners (UNEP/GEF), Bilateral donors
Promote integrated watersheds management plans around water bodies with biodiversity components	Government and Partners (UNEP/GEF), Bilateral donors
Support domestic energy alternatives to mitigate increased bio-energy use on biodiversity	Government (MININFRA) Private sector, NGOs
Improve management of wastes and pollutants and sensitize polluters (industrial and agriculture developers)	Government (Economic Cluster)
Regularly monitor water quality in sources, small streams, rivers lakes and swamps.	Government & Bilateral donors (Projects)
Conduct surveys to determine distribution patterns of harmful invasive species and evaluate their impact on biodiversity.	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Restore fish stocks and intense selective fishing targeting harmful invasive species to establish a balanced predator/prey relationship	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Evaluate fish stock for each lake and estimate its thresholds fishing yield	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Localize, collect and promote the use of underutilized native species (landraces/breeds races)	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Develop and implement plans aimed at conservation of neglected and underutilized landraces and local breeds	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Evaluate restoration needs for particular ecosystems, develop and implement related rehabilitation plans	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Establish appropriate and durable buffer zones around protected areas	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Finalize and enforce national protected areas Law and updating existing sectoral ones	Government and Partners (UNEP/GEF), Bilateral donors (projects)

Update an inventory of biodiversity hotspots and threatened species, especially those in danger of extinction and propose specific measures for their conservation	Government and Partners (UNEP/GEF), Bilateral donors (projects)
Reintroduce some eliminated species in protected areas to reestablish biological communities equilibrium	Government and Partners (UNEP/GEF), Bilateral donors (projects)
• **Focal area 3: Agricultural biodiversity and biotechnology**	
Develop plans for conservation of unique genetic resources whose survival is being threatened or endangered.	Government (MINAGRI /RAB, Partners and Bilateral projects
Promote socio-economic activities, i.e. tea plantation in some areas, with more involvement of local vulnerable groups.	Government (MINAGRI /RAB, Partners and Bilateral projects
Project for conservation of selected genetic diversity of crop varieties, livestock breeds and races.	Government (MINAGRI /RAB, Partners and Bilateral projects
Project to evaluate effective use of GMOs and their impact on human health and environment in general.	Government (MINAGRI /RAB, Partners and Bilateral projects
Develop technical capacity in biotechnology risk assessment including GMOs risks	Government (MINAGRI /RAB, Partners and Bilateral projects
Elaborate biosafety policy and legal framework, particularly in relation with GMOs	Government (MINAGRI /RAB, Partners and Bilateral projects
Construct indoor experiments to monitor GMOs restricted application.	Government (MINAGRI /RAB, Partners and Bilateral projects
Elaborate incentive policy to encourage reuse of agronomic resources and development of an alternative technology.	Government (MINAGRI /RAB, Partners and Bilateral projects
• **Focal area 4: Biodiversity use and ecosystem services delivery into national economic system9**	
Develop methods of cost estimate of biodiversity use and ecosystem services delivery.	Government and Partners (UNEP/GEF), Bilateral donors and NGOs
Assess the state of ecosystems and economic value of their services	Government and Partners (UNEP/GEF), Bilateral donors and NGOs
Develop emerging markets for biodiversity and other ecosystem services	Government and Partners (UNEP/GEF), Bilateral donors and NGOs

Develop and use innovative financing mechanisms, including market based tool.	Government and Partners (UNEP/GEF), Bilateral donors and NGOs
Develop a strategic framework to set priorities for all ecosystems restoration that provide essential services to human wellbeing and health.	Government and Partners (UNEP/GEF), Bilateral donors and NGOs
Promote afforestation and reforestation programs to increase forest areas up to 3,000 hectares for carbon stock production and mitigating climate change	Government (MINIRENA /RNRA), Partners (ICRAF) & Bilateral projects
Strengthen institutional capacity for forest technology transfer and enforcement of forest policy and law.	Government (MINIRENA /RNRA), Partners (ICRAF) & Bilateral projects
Install 30 tree nurseries in all Districts.	Government (MINIRENA /RNRA), Partners (ICRAF) & Bilateral projects
Develop guidelines for access and benefits sharing of forest genetic resources	Government (MINIRENA /RNRA), Partners (ICRAF) & Bilateral projects
• **Focal area 5: Improving population welfare through fair and equitable sharing of benefits**	
Construct needed socio infrastructures to improve welfare of population using revenue sharing funds.	Government (RDB, Districts & Sectors), Private sector and NGOs
Participate to financing local socio-economic initiatives generating incomes to alleviate poverty among less endowed families.	Government of Rwanda (RDB, Districts & Sectors), Private sector and NGOs
Access to natural resources that can be sustainably harvested by neighboring communities (i.e. medicinal plants)	Government (RDB, Districts & Sectors), Private sector and NGOs
Enhance share of National Parks' financial revenue earned through tourism or other activities with local communities	Government (RDB, Districts & Sectors), Private sector and NGOs
Compensate local communities for crop raiding and attacks by animals	Government (RDB, Districts & Sectors), Private sector and NGOs
• **Focal area 6: Traditional knowledge and cultural heritage preservation**	
Conduct research and valuation of traditional knowledge, cultural heritage of biodiversity conservation	Government, Training and Research institutions
Transfer indigenous traditional knowledge and cultural values on biodiversity into curricula development	Government, Training and Research institutions

Review the national policy and legal framework to include respect and use of traditional knowledge in biodiversity management and conservation.	Government, Training and Research institutions
• **Focal area 7: Scientific knowledge management and capacity building**	
Promote fundamental research projects in order to increase knowledge on ecosystems and their biodiversity.	Government (MINIRENA, MINEDUC, Research institutes), NGOs
Strengthen and enhance the capacity of the national Centre for Excellence on Biodiversity Conservation and Natural Resources Management.	Government (MINIRENA, MINEDUC, Research institutes), NGOs
Conduct research on genetic resources important for national agriculture especially those whose survival is threatened;	Government (MINIRENA, MINEDUC, Research institutes), NGOs
Enhance the capacity of human resources in biodiversity management and conservation through short, medium and long term training.	Government (MINIRENA, MINEDUC, Research institutes), NGOs
• **Focal area 8: Resource mobilization for NBSAP implementation**	
Appoint a "resource mobilization focal point" to facilitate its strategy implementation.	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Strengthen capacity of NBSAP staff in “resource mobilization " strategy to facilitate effective implementation of the strategy	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Conduct an inventory of all potential sources of fund internally and externally for NBSAP implementation and establish resources mobilization strategic mechanisms	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Assess the current resources available and their distribution across sectoral planned budgets	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Assess resource requirements based on actual needs and action plan for NBSAP implementation.	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Develop emerging markets for biodiversity and other ecosystem services	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Develop and use innovative financing mechanisms, including market based tool.	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors
Set out financial needs for biodiversity conservation and match it with financial flows	Government (MINECOFIN, MINEACOM REMA, RDB) Partners donors

8.3.4. Biodiversity Finance: current situation, sources, actors and mechanisms

8.3.4.1. Current situation in biodiversity financing and constraints encountered

- The biodiversity financing in Rwanda is mainly provided through government budget and development partners' financial support. Some financing comes also from national and international NGOs. At present, it seems not easy to evaluate the Government contributions to biodiversity conservation because, in budget allocations to different national institutions/departments, biodiversity conservation benefits are not always clearly indicated. For example, the budget allocated to the gene bank in the Ministry of Agriculture and Animal Resources is not explicitly labelled as for biodiversity conservation.
- Through community work (umuganda) local population contributes significant amounts of time and material resources for conservation, which have never been quantified. Despite financial support available from government sources and international agencies, there exist several constraints such as:
- The amount of budgets allocated to environment conservation are too small to address all the programmed actions;
- Lack of long-term commitments in investment for biodiversity conservation;
- Very few considerations on the services biodiversity can provide in relation to poverty reduction, economic development, health, sanitation infrastructural development, disaster management etc.;
- In most of cases, funds are allocated in relation to either a disaster or a commitment to an international obligation. Thus, the category and amount of support seems to be inadequate.

8.3.4.2. Sources of funds

- Currently, the objective is to identify, diversify and scale up various sources of funds. It shall be important to broaden the channels of inputs, increase national and local funding, and guide private and international capital to participate in the protection of biodiversity, and foster a diversified investment mechanism. Further, it shall be necessary to rationalize available resource funds, integrate existing dispersed funds in biodiversity

conservation to improve the efficient use and maximize co-benefits of various funding sources:

- **- Public funds**
- The origin of public funds is diverse: Government allocation funds, user fees, environmental taxes, etc... In line with the 2020 Strategy and the global CBD target, the reform of harmful subsidies should also benefit biodiversity management and conservation.
- It is time to engage more governmental and non-governmental institutions as well as private sector to consider in their budgets financing the activities mentioned in the NBSAP that are relevant to their field of operations
- **- International funds**
- In Rwanda, one of the most important resources to support biodiversity management and conservation is international cooperation.
- **- Biodiversity users**
- To meet the financial needs for NBSAP implementation, ensuring synergies with other relevant innovative funding sources such as: user charge in public facilities, payment for ecosystem goods and services, climate change finance, funds generated by the Nagoya Protocol on ABS, etc. should be considered.

8.3.4.3. Principal actors and their involvement

- The principal actors mentioned are individuals, groups or entities that could potentially provide funding for biodiversity objectives through a financial mechanism (Table 14). As REMA is receiving technical support and assistance from multilateral and bilateral partners, particularly from UN agencies, it will be important to reinforce the cooperation and search new potential donors for biodiversity management and conservation. REMA shall continue to promote partnership with UN agencies and bilateral partners, both at the national and regional levels, in order to raise more funds.
- MINIRENA and REMA shall also capitalize on their existing partnership with various regional programs through enhancing partnerships and linkages with regional organizations such as East African Conservation Society, among others.

Table 14: Interventions of different potential actors

Potential Finance Actors	*Areas of interventions*
• Development partners: - UNDP - UNEP - FAO - GEF	-Developing joint programs and projects proposals for funding of the priority strategic areas. -Developing strategic frameworks related to financial and technical support to communities and civil society organizations.
• Public institutions: - MINAGRI - MINECOFIN - MINEACOM - MININFRA - MINIRENA - FONERWA - REMA - RDB - RTDA - RNRA - WASAC - NATIONAL MEDIA COUNCIL • Private Sector • Regional Organisations	-Developing policy and legal frameworks and strategies for biodiversity conservation. -Developing and implementing programs and projects relevant to biodiversity conservation -Conduct economic assessment of the consequences of the loss of biodiversity -Payment for Ecosystem Services, Ecological Services beneficiaries -Ecotourism -Identifying and estimating the benefits to major sectors provided by products and services derived from biodiversity. -Developing sustainable financing mechanism to generate revenues for biodiversity programs. -Developing strategies and tools for communicating national biodiversity issues.

8.3.4.4. Financial mechanisms

- The analysis of existing mechanisms and proposal of innovative ones constitute instruments or tools for the generation and delivery of potential funds at the national

level. Thus, it will be necessary to promote the development and use of innovative financing mechanisms, including market-based instruments. The following are the financial mechanisms proposed:

- Official Development Assistance to Rwanda;
- Public Sector Funds;
- Payment for Ecosystem Services;
- Carbon credit payment;
- Biodiversity utilization payment;
- Fines and levies;
- Fundraising through public revenue-raising effort;
- Voluntary (i.e. hotel fees) and mandatory (i.e. airport departure fees that fund protected areas) fees;
- Biodiversity offsets;
- Environmental economic accounts;
- Reduction of subsidies;
- Set limits on trade of natural resources;
- Legal mechanism for economic incentives to sustain use of biodiversity.

8.3.4.5. Analysis on feasibility of proposed financial mechanisms

- From an analysis on feasibility of proposed financial mechanisms, the following considerations have been pointed out:
- Although the proposed new mechanisms are not conflicting with the national financial policies and laws, most of them will require the establishment of legal and regulatory framework accordingly. Nevertheless, they present affordable feasibility and are politically acceptable and reflect legally correct ways of raising resources;
- Awareness rising to finance biodiversity conservation, transparent accountability for mobilized resources as well as securing sufficient resources in the long-term will constitute principal prerequisites for the smooth administration of proposed financing mechanisms;
- Spreading responsibilities among different sectors will improve cost-effectiveness and facilitate identification of diverse sources of funding;

- Improving access to genetic resources and equitable sharing of boons from biodiversity use as well as ecosystem services' benefits will raise a better perception, ownership and legitimacy in natural resources utilization and preservation by different users and beneficiaries.
- Based on truthful scientific information, generated through research projects, a balance between increased revenues from biodiversity use/services and sustainable conservation should be established so that the implementation of new financing mechanisms will not compromise the objectives of natural resources conservation.

8.3.5. Develop partnership strategy

- In order to increase effective engagement in biodiversity conservation, the Government of Rwanda needs to partner with private sector, especially the primary industries sector and attract more private expenditure on biodiversity conservation through effective partnership. Such a partnership to be successful, the following strategies shall be put in place:
- To ensure that there are financial incentives for actions that protect or enhance biodiversity conservation;
- The cost of damage to biodiversity is accounted for in economic planning;
- The benefits from biodiversity use and ecosystem services are fully reflected in national economic system;
- Develop and align emerging markets for biodiversity and other ecosystem services.
- Well-designed markets for biodiversity use and ecosystem services will provide a way to value biodiversity, so that it can be considered alongside economic and social factors, and can be very effective in encouraging investment in biodiversity conservation.

8.3.6. Resource mobilization plan

- The resource mobilization plan is a concrete set of strategic actions to mobilize the financial resources required to implement the full NBSAP and therefore to achieve the proposed National Targets (Table 15).

Table 15: Resource mobilization plan

Financial mechanism	***Strategic action to implement mechanism***	***Responsible for implementing Action***	***Estimated budget to implement action (FRW)***	***Timeframe***	***Monitoring Indicators***
(Official Development Assistance to Rwanda) External financing mechanism	Coordinate with development partners, the United Nations and regional organizations and explore ways to substantially increase levels of funding and develop joint programs	MINECOFIN MINIRENA	1,000,000,000	Once per year during 7 years program	-Number of agreement signed -Amount of fund mobilized
Public Sector Funds	Development and submission of well elaborated specific project proposals for the priority strategic areas	MINECOFIN (FONERWA), REMA, RDB, RNRA & Concerned Sectors,	1,500,000,000	Each year during 7 years	-Number of elaborated specific project proposals submitted and funded
Payment for Ecosystem services	Development of schemes that allow users to pay for the costs of maintaining ecosystem services (i.e. water, electricity, road services)	RNRA, REMA RDB	100,000,000	First year 2014	-The value of payment to ecosystem services -Number of beneficiaries of paid ecosystem services -Financial reports of total amount of paid services
	Identify and estimate the benefits for major sectors generated by products and services derived from biodiversity (environment)	RNRA, REMA RDB & Service users	100,000,000	Once each year	-Benefit derived from biodiversity conservation calculated
	Evaluation of forested areas and development of tax credits and tax deductions for behaviors.	MINECOFIN, MINAFET, RRA	2,000,000,000	Short term (2 years)	-Financial reports on carbon credit paid -Superficies of planted forest areas
Biodiversity utilization payment (Bio-prospective)	Increasing percentage of revenue from biodiversity use for financing of local development initiatives	RNRA, RDB MINECOFIN, NIRDA	700,000,000	Each year during 7 years	-Amount of revenue from biodiversity use -Number of certificates/permits delivered for biodiversity

					use
Fines and levies	Comply with existing punitive fees and fines to discourage environmentally harmful behaviors.	REMA, RDB MINIJUST, RNP, Local Authorities	50,000,000	Short term 2 years	-Number of punitive cases and collected amount/fees
Fundraising through public revenue-raising effort	Raising funds for biodiversity conservation during: national tree day, world environment day, KWITA IZINA (babies Gorilla naming ceremony)	MINIRENA, RDB MINECOFIN, MINALOC, RNP	700,000,000	Each year during ceremonies	-Amount of funds gathered -Number of fundraising events organized
Voluntary (i.e. hotel fees) and mandatory (airport departure fees) fees	Directing towards biodiversity management voluntary fees (i.e. hotel fees) and mandatory fees (airport departure fees that fund protected areas)	MINECOFIN DISTRICTS RRA	50,000,000	Each year	-Amount of funds gathered -List of contributors recorded
Biodiversity offsets	Promotion of a framework for reducing biodiversity loss by allowing companies (i.e. mining) to protect equivalent areas of land and biodiversity using agreed upon standards.	DISTRICTS & MINIRENA	500,000,000	Once opportunity arise	-Number of biodiversity offsets recorded
Reduction of subsidies	Reduction of subsidies on harmful pesticides (i.e. fertilizers) and increasing those having beneficial impacts on ecosystems.	RSB, MINAGRI	500,000,000	Each year during 7 years	-Volume of harmful pesticides reduced -Volume of good fertilizers utilized
Set limits on trade of natural resources	Setting limits on amount of ecosystem's goods to be exploited and commercialized.	MINIRENA, RNRA, RDB, MINEACOM, RNP	700,000,000	Each year during 7 years	-Amount of annual maximal capacity of ecosystem to be exploited
Legal mechanism for economic incentives to sustain use of biodiversity	Develop normative act of the National Biodiversity Fund (NBF)	REMA, RDB MINIJUST	10,000,000	Short term 1 year	-Document of proposed Act and published in official gazette
TOTAL			**7,910,000,000**		

Recommendations

- The Government of Rwanda needs to consider how to develop new and innovative financing mechanisms and facilitate voluntary schemes dedicated to harness their potential for protecting and enhancing ecosystem's services and contribute to pilot 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;
- Establish a strong partnership with all stakeholders in order to help the biodiversity sector make the most of existing sources of funding, which will continue to be highly important to support the NBSAP's priorities.

8.4. TECHNOLOGY NEEDS ASSESSMENT

- Biodiversity management and conservation constitutes a cross-cutting issue in different development sectors. Thus, the technology needs assessment has been conducted to identify environmentally sound technologies developed in different sectors that will positively or negatively contribute to the reduction of biodiversity loss and contribute to the national biodiversity management and conservation.

8.4.1. Identification of sectoral technology needs

8.4.1.1. Technology needs in Agriculture Sector

a. GMOs detection in food or feeds

- The detection of genetically modified organisms in food or feeds is possible by biochemical means. It can either be qualitative, showing which Genetically Modified Organism (GMO) is present, or quantitative, measuring in which amount a certain GMO is present.
- The common method used is called Polymerase Chain Reaction (PCR). The polymerase chain reaction is a biochemistry and molecular biology technique for isolating and exponentially amplifying a fragment of DNA, via enzymatic replication, without using a

living organism. It enables the detection of specific strands of DNA by making millions of copies of a target genetic sequence.

- The quantitative PCR is used to measure the quantity of a PCR product. It is the method of choice to measure amounts of transgenic DNA in a food or feed sample. Quantitative method is commonly used to determine whether a DNA sequence is present in a sample and the number of its copies in the sample.
- The qualitative PCR shows whether or not a GMO present in a sample can be tested by Q-PCR, but also by multiplex PCR. Multiplex PCR uses multiple, unique primer sets within a single PCR reaction to produce amplicons of varying sizes specific to different DNA sequences, i.e. different transgenes. By targeting multiple genes at once, additional information may be gained from a single test run that otherwise would require several times the reagents and more time to perform.

b. In vitro Gene bank

The standard operation procedures in vitro gene bank conditions where germplasm is maintained into in vitro slow growth conditions (medium-term storage). According to Badara *et al.* (2012), the procedures include:

- Plant tissue culture and in vitro conservation working in a sterile environment (under the sterile laminar flow);
- Media preparation for in vitro plant tissue culture. In vitro culture implies maintaining plant tissues in artificial conditions for conservation or multiplication purposes;
- The establishment of the plant material in the in vitro culture system which is called in vitro culture;
- Germplasm in vitro conservation (medium-term storage);
- In vitro gene bank inventory system. Any operation applied to the germplasm (acquisition, subculture, elimination, distribution, acclimatization, indexing, and duplication) creates new information/data;
- In vitro sample preparation for indexing. Indexing involves collecting leaf samples from the in vitro seedling at an adequate time for further analysis by the Germplasm Health Unit (GHU);
- Storage of biological materials at ultra-low temperatures (generally in liquid nitrogen at –196 ºC) is the third option for the ex situ conservation of clonally propagated crops;

- In vitro germplasm distribution/reception. In vitro collections of the clonally propagated crops conserved should normally be distributed worldwide under the Standard Material Transfer Agreement (SMTA) for food and agriculture.

c. Micro-irrigation efficiency

- Developing micro-irrigation efficiency would be instrumental in addressing water scarcity, raising crop production and food security, and by the way increasing agro-biodiversity within a larger area irrigated with the same volume of water. In terms of environmental sustainability, improved micro-irrigation efficiency may release more water for the environmental flow, thus alleviating constraints leading to biodiversity loss. Micro-irrigation application can result in higher yields and generally offers higher water use efficiency than for instant surface irrigation.

d. Crop rotation

- Crop rotation leads to a better control over weeds, pests and insects and the soil extracts or regains more nutrients, especially when legumes are included in the rotation cycle. Crop rotation also means constant vegetative soil cover, either with live crops or dead plant residues and has to be combined with minimal tilling in order to produce the biggest benefits.

e. Composting and raising nutrient management

- An adequate management of nutrients plays an important role in soil fertility and increasing crop production. Furthermore, integrated nutrient management aims at ensuring soil health, enhances biological processes in soil as well as biomass production and biological nitrogen fixation.

8.4.1.2. Technology needs in Water Sector

a) Water reservoirs and/or large dams

- The agriculture sector, especially in eastern part of the country, is subjected to high fluctuations in rainfalls or river runoffs, and it is expected that climate change will likely bring some higher annual variability in rain water. Faced with this issue, the national

authorities have proposed to build multipurpose dams and expand rainwater harvesting. Water reservoirs/or dams allow for storing of large volumes of water, which can be used for multiple purposes (i.e. a multipurpose dam will be built at Muvumba River in Nyagatare District to secure stable water resources, to supply domestic/ irrigation water and to generate electricity through hydropower).

b) Modernization of hydrological and hydro-meteorological stations

Climate fluctuations conditions usually increase annual variability in rainfalls. Therefore, more robust forecasting is needed to raise preparation of agriculture production facing possible damage through droughts and floods, affecting crops and destroying biodiversity in lowlands. Climate change poses a range of threats to biodiversity and ecosystem services, greatly increasing the risk of species extinctions and affecting vital ecosystem services, such as air and water purification, pollination, food production and carbon cycles.

- Relevant measures to propose will include technological modernization of hydrological and hydro-meteorological stations and foresee improvements in weather and climate forecast models.

In general, the reasons behind deterioration of hydrological monitoring as well as meteorological observations are:

- Lack of sufficient funding;
- Insufficient national capacity of the hydrological and hydro-meteorological services;
- Weak regional cooperation in information exchange and harmonization of measurement methods.

8.4.1.3. Technology needs in Forestry Sector

Forestation and preservation of existing forests

- Deforestation is one of the most critical environmental problems facing developing countries today in terms of its long-term catastrophic impact on biodiversity, lost economic opportunities, social problems created and contribution to global climate change.

- Three broad categories of forest related interventions in order to conserve biodiversity can be considered:
- Better management of existing forests through extending harvesting age, reducing or avoiding deforestation and forest preservation,
- Forest cover expansion through afforestation on previous cropland or pasture and reforestation by establishing forest on clear felled areas,
- Biomass increasing through planting short rotation woody crops.
-

8.4.1.4. Technology needs in Bio-ecology Sector

- The following are some needs in bio-ecology sector:
- Attaching tags on birds for tracing their migratory routes and location of their breeding sites;
- Installation of electronic devices on wild animals for tracing their distribution patterns within a protected area or fishes' migration in water bodies;
- Taxonomy equipment (both for plant and animal species);
- DNA species identification techniques and equipment;
- Specimen conservation techniques, equipment and infrastructures, etc.

Table 16: Technologies developed in different sectors impacting on biodiversity conservation

Key Sectors	***Technologies***	***Elements impacting on biodiversity conservation***	***Needed infrastructures, equipment /or materials***	***Major barriers for their adoption***
Agriculture				
	Micro-irrigation efficiency	-Raising crop production	Line drippers, sprayers and sprinklers. Valves, pumps and tubes	-Lack of an incentive system to push farmers to adopt these technologies. -Application geographically limited -Lack of market for the technology
		-Maintain soil moisture and its fauna	-Piezometer	Request high technical skills
	-Gene bank to keep genetic materials -In situ or Ex-situ conservation techniques	-Intense production of crop varieties and/or local landraces resistant to drought, pests and pathogens	-Autoclave, -pH-meter calibrator, -Precision balance, -Water distiller /deionizer, -Refrigerator, -Laminar flow Cabinet, -Label printer, -Hand scanner, - Erlenmeyer Flask, -Chemicals etc…	Request high skills development and experience;
	-Genetically Modified Organisms (GMOs) detection	-Negative impact on human health and other biodiversity elements in general	-PCR Automated workstation -Real time PCR systems have the capability for gene expression analysis	-Request special skills and experience -Request high financial investments; -Request institutional/policy efficiency
	-Crop rotation	-Control over weeds, pests and insects -Constant vegetative soil cover; -Soil regains more nutrients	-Rotto tiller, -Spading fork or shovel	-Request more skills and experience -Institutional/policy deficiency;
	-Crop diversification	-Increase crop varieties and production	-Crawler tractor, -Harvester, -Farm trailer,	-Request skills and experience; -Technology

		-Inhibit local landraces development and conservation	-Grain thrower, -Meadow aerator, -Combine seed drill etc…	application is limited in country
	-Composting for green manure and raising nutrient management	-Increase soil fauna; -Increase vegetation biomass production	-Straddle turner, -Screeners, -Grinding buckets	-Request special skills and experience -Request moderate financial investment
Water				
	-Water reservoirs or large dams	-Increasing aquatic biodiversity; -Limiting drought and increasing bio-cover with associated fauna	-Pumps, Dam outlets -Off-take towers	-Insufficient coordination between stakeholders and beneficiaries -Request high financial investment
	-Modernization of hydrological and hydro-meteorological stations	Development of early warning systems to avoid biodiversity loss through droughts and floods	Set up modern hydrological and hydro-meteorological stations; -Use automated hydrological and hydro-meteorological equipment; -Utilize GIS and remote sensing (RS) tools	-Request high capital costs -Demand special skills and experience
Forestry				
	-Forestation (afforestation & reforestation) Trees nurseries development	Increasing forest biodiversity , maintain microclimate cool, slow decomposition and release of CO_2	-Kilns, tumblers, separators, dewingers, etc. Scalpers, grinders. -Seedbeds are prepared with plows, harrows, rock rakes, packers, bed formers, and levelers; -Seed is then sown with drills or broadcast seeders	-Enhancement of coordination between technicians and local communities (farmers, forest technicians); -Request moderate technical skills in forestry and agro-forestry
	-Forest biomass preservation	-Storage carbon in plants and soil; -Slowing of decomposition and release of carbon to the air	Just conservation measures, no equipment needed	

	-Rotation of high woody crops	-Maintenance of forest biomass and climate change mitigation	-Refer to equipment for tree nursery development	-Request moderate technical skills in forestry
Bio-ecology				
	-Electronic devices (tags) for assessing wildlife fauna and tracing their distribution patterns -Taxonomy equipment (both for plant and animal species) -DNA species identification techniques and equipment -Specimens conservation techniques, equipment and infrastructures,	-Biological resources conservation and management monitoring -Biodiversity census -Specimen sample conservation	-Electronic tags -Systematic inventory -Conservation materials and infrastructures	-Request special skills and experience; -High capital costs -Fund availability -Required expertise, especially for DNA use in species identification

Recommendations

- Set up key hydrological and meteorological stations responsible for providing the end-users with climate observation data and water flow forecasts;
- Provide automated hydrological, hydro-meteorological and communication equipment;
- Promotion of water reservoirs or large dams in order to support agricultural expansion and maintain water supply for livestock development in the Eastern region of the country;
- Increasing water use efficiency through better water management at national and sub-regional levels;
- Testing specific drought, pest and pathogens resistant varieties, suitable for the Eastern Province and transfer gained results to farmers on a larger scale;
- There is a need to conciliate crop intensification and diversification program with crop rotation at country level for a better development of agriculture sector.

XIX. INSTITUTIONAL, MONITORING AND REPORTING

9.1. NATIONAL COORDINATION STRUCTURES

- A key to the achievement of NBSAP objectives and its effective implementation is the establishment and continuation of a coordination structure that will ensure its implementation and subsequent monitoring and reviewing.
- The Ministry of Natural Resources through the Rwanda Environment Management Authority and the focal point of the CBD are responsible for the conservation and management of biodiversity in the country. At sectoral level, the responsibility of conserving and managing the nation's natural resources is shared between a number of different government bodies, including the Ministries of Agriculture and Animal Resources, of Natural Resources, of Infrastructures, etc.
- The Rwanda Development Board (RDB) is a specialized body dealing with the management of natural reserves, wildlife and protected areas in general. Within the Rwanda Natural Resources Authority (RNRA), the Department of Forestry and Nature Conservation is another specialized body dealing primarily with planted and natural forests.
- Research institutions like the National Industrial Research and Development Agency (NIRDA), Rwanda Agriculture Board (RAB) with its forestry and agro-forestry program and many University departments are conducting research and action programs on biodiversity documentation and management. Some international, regional and national NGOs are also involved in carrying out action programs related to biodiversity conservation and policy issues.
- Unfortunately, responsibilities, coordination mechanisms and communication channels among these many different ministries, government and private agencies, training and research departments remain poorly defined and unclear. Hence, there is need for effective coordination of various biodiversity conservation activities, executed by different organizations to ensure the successful implementation of the NBSAP. Therefore, strengthening the Centre of Excellence in Biodiversity Conservation and Natural Resource Management (CoEB) in order to coordinate efforts of biodiversity conservation, sustainable management and equitable benefit sharing is an urgent need.
- The proposed institution will act as the national forum for coordinating the biodiversity conservation efforts and integrate biodiversity conservation activities in a holistic manner.
- The CoEB would require a formal institutional mechanism to operate efficiently and effectively and be responsible for the following functions:

- Overall enforcement of biodiversity policy and legal framework;
- Integration of planning, programs and actions on biodiversity conservation by different agencies;
- Management of Clearing House Mechanism in order to share databases information among all stakeholders involved in biodiversity conservation;
- Monitoring and evaluation of programs and actions on biodiversity conservation;
- Produce and disseminate annual reports on the current status of biodiversity conservation;
- Providing support to the Ministry of Natural Resources, REMA, RNRA, RDB on the multinational environmental interventions, including the CBD activities and events;
- Any other issues related to biodiversity conservation.
- The institution will act as clearing/screening house for all biodiversity related projects to be adopted by the public as well as private sectors. It will have power to restrict and control biodiversity related research or any other works to be conducted in the country by foreign organizations.
- Concerning the implementation mechanism proposed for the NBSAP, the most important aspects to consider are that:
- The implementation process should be participatory, cross-sectoral and involve all relevant government agencies, private sector and civil society members;
- It should mainly aim at (i) registering all work undertaken/accomplished which address biodiversity issues across the country, (ii) facilitating coordination between different organizations and sectors, (iii) exchanging experiences and lessons learned, and (iv) assessing general progress towards biodiversity conservation;
- An inter-ministerial committee should be established to review and monitor CoEB's activities. It will be composed of relevant technical staff from MINEDUC, MINECOFIN, MINEACOM, MINAGRI, MININFRA, MINALOC and MINIRENA.
- The basic mandate of CoEB will include providing conceptual guidance and promoting exchanges and inter-sectoral agreements related to biodiversity conservation.

9.2. CLEARING HOUSE MECHANISM

- During the Conference of parties (COP) of December 1994, it has been decided that each country should establish a Clearing House Mechanism (CHM), in conformity with Article 18.3 of the Convention, in order to promote and facilitate technical and scientific cooperation.
- In substance, the CHM has a mission to contribute significantly to the implementation of the Convention's Strategic Plan for Biodiversity 2011-2020, through effective information services

and other appropriate means dedicated to promote and facilitate scientific and technical cooperation; knowledge sharing and information exchange, and to establish a fully operational network of Parties and partners.

- At country level, the national clearing-house mechanism provides effective information services to facilitate the implementation of the national biodiversity strategy and actions plan. The CHM consists of a portal (website) where information on country's biodiversity needs to be posted.
- For Rwanda, the CHM has been developed and is currently operational and embedded in REMA. Rwanda CHM website is hosted by the Royal Belgian Institute of Natural Sciences (RBINS), and REMA signed a Memorandum of Understanding (MoU) with RBINS in order to build the capacity of national web managers and collaborators who are involved in biodiversity management/conservation and these people would regularly post biodiversity information, events and documents. Once the national capacity will be built, all institutions involved in biodiversity management and conservation will contribute to the enhancement of the portal and accuracy of information provided. In order to have an effective technical cooperation, knowledge sharing and information exchange, CHM network has been developed at the level of CBD and the capacity of Focal Points is regularly built by the CBD Secretariat. At national level, parties are only requested to customize the portal according to the situation of the country and start uploading information onto the CHM website.

9.3. MONITORING AND EVALUATION

9.3.1. Monitoring and Reporting System

- Reference to Article 26 of the CBD, each Contracting Party is obliged to report regularly on the Convention, the implementation progress of its NBSAP, as determined by the Conference of Parties. Thus, for the successful implementation of NBSAP and its reporting to CBD, an effective and efficient monitoring and reporting system has to be put in place in Rwanda.
- The proposed monitoring and reporting system will involve:
- Collection of information about the current status of biodiversity and implementation of NBSAP activities by different involved stakeholders and;
- Periodically reporting on the Convention issues to implementing government bodies and the public in general.

The proposed monitoring and reporting system will be undertaken to review the performance on implementation and the impacts of NBSAP implementation on the status of biodiversity. Monitoring and

reporting system component will be directly handled by Departmental office of the Centre of Excellence on Biodiversity and Natural Resources Management.

a. Monitoring system

- With regard to implementation performance, the monitoring system will start by looking at the activities and projects implemented by the different organizations and institutions on the basis of their reports deposited at the relevant authorities.
- Concerning information on biodiversity status and trends, the monitoring system will:
- Begin by preparing a biodiversity status baseline report, including performance indicators, to be taken as the reference point for future comparisons;
- Collect secondary information and commission scientific studies on a regular basis to assess the status and trends of key specific issues relevant to the NBSAP;
- Conduct a new biodiversity status report every four years, the results of which are going to be compared with the baseline ones in order to find the different trends affecting biodiversity in different areas, and other issues relevant to biodiversity situation.

b. Reporting system

- The NBSAP coordination institution will organize regular meetings to report about its findings in different areas. Additionally, NBSAP coordination institution will report regularly to the public through the different communications media utilized by relevant institutions (newspapers, newsletters, website, radio, TV and others).

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ANNEX 1: PROPOSED NATIONAL PROTECTED AREAS PRIORITIES

(Ranking each ecosystem based on criteria for Priority Conservation)

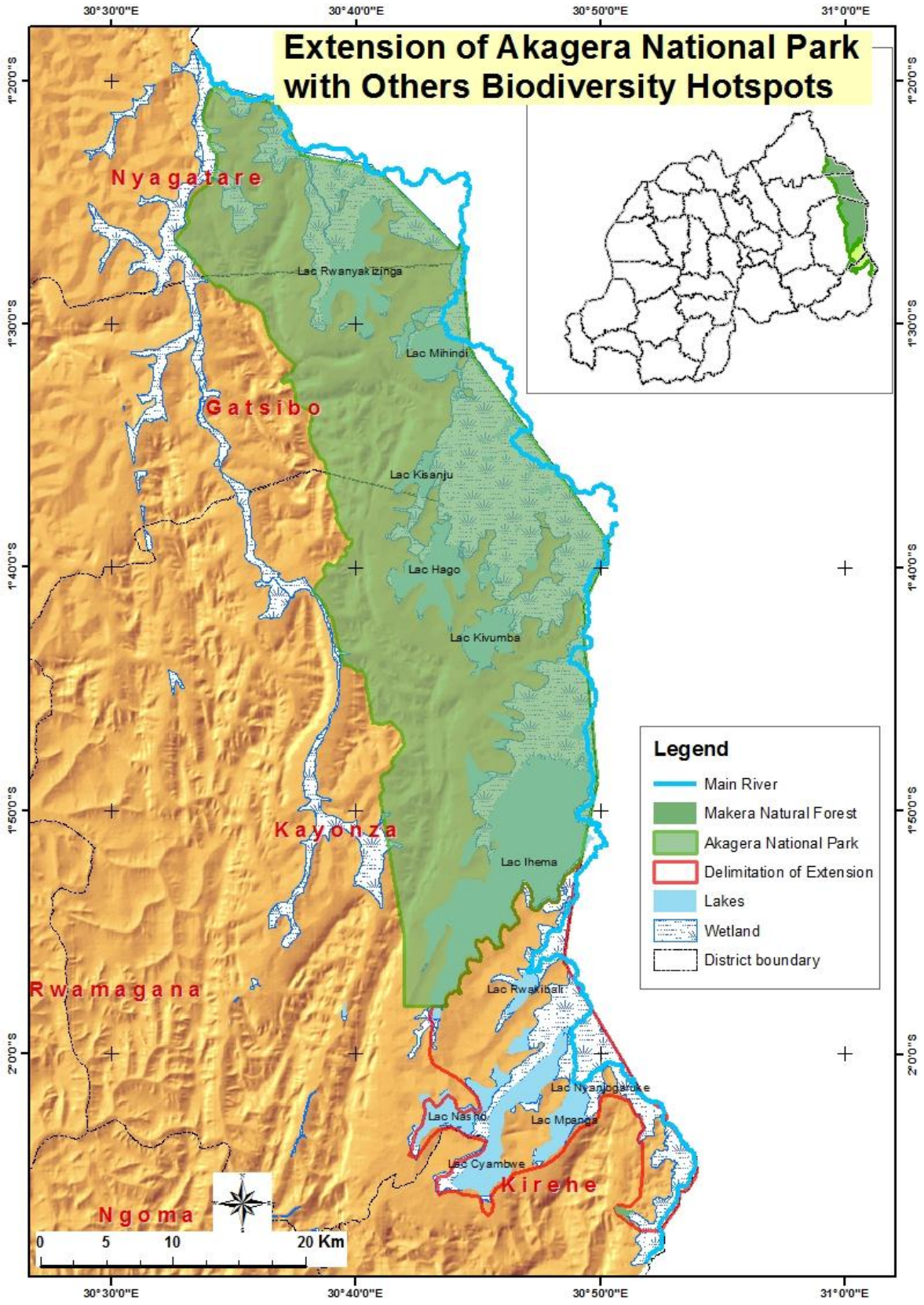
1. Complex Akagera NP-Akagera Wetland-Ibanda-Makera Forest

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Akagera National Park (ANP)	**Scientific and ecological criteria** • Very rich biological diversity including 6 forest fringed lakes, the largest protected wetland in Central Africa, savannah plains, the Akagera River and the Mutumba hills reaching an altitude of nearly 2,000 meters. • Very rich fauna including 7,892 of large mammals, 530 bird species with ***7 bird species*** protected by international conventions and 1 endemic to area (AMC, 2011) **Scientific and hydrological criterion** • ANP includes an important wetland area of the Akagera River, and its depression dotted with lakes and floating swamps. The area is important for the hydrology of the Akagera/Nile system and contributes to water cycle and the reduction of water loss by evaporation. **Socio-economic criterion** • Prosperous tourism industry which generated up to US$400,000 in 2011 from more than 15,000 visitors per annum (AMC, 2011).	**High**
Akagera Wetland Complex (AWC)	**Scientific and ecological criteria** • AWC harbors an 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 within all wetlands (Fischer, E., 2011) • 3 species of amphibians and reptile area endemic to Great lakes and 1 endemic to the area. AWC is inhabited by **3** species of frogs *Phrynomantis*	**High**

	bifasciatus, Hylarana albolabris and new *Phrynobatrachus* which in Rwanda do not occur elsewhere (Fischer, E., 2011). **Scientific and hydrological criterion** • The area is important for the hydrology of the Akagera/Nile system and encompasses a large wetland which contributes to water cycle and the reduction of water loss by evaporation. **Socio-economic criteria** • Very important fishing area in lakes Nasho, Cyambwe, Mpanga etc…plus other marshland products.	
Ibanda-Makera Remnant Forest	**Scientific and ecological criteria** • The importance of Ibanda-Makera forest is that it contains many endemic and rare plants species; • The forest harbors around 90 tree species, 150 herb species, 78 bird species and the most significance record, a *rare Purple-banded Sunbird* **(*Cinnyris bifasciatus)*** and different migratory bird species including ***Merops apiaster.*** • Furthermore, the forest contains an isolated population of baboons ***(Papio anubis)*** and several species of reptiles, including a python (Python sebae). **Scientific and hydrological criterion** • Ibanda-Makera gallery forest is crossed by a stream (Nyamporogoma) which makes this forest a water catchment for local people. Its papyrus swamp in the South extends to the Akagera River and contributes to the reduction of water loss by evaporation. **Socio-economic criteria** • Many of plant species are used in traditional medicine essentially *Blighia unijugata, Grewiaforbesii, Rhus vulgaris*, *Ficus acuta* and *Ficus thoningii*; • Ibanda- Makera remnant forest is located in the drier	**High**

	region of Rwanda, therefore it contributes to climate regulation, refreshment and certainly to climate change mitigation. It offers several forest products to people.	

The current Akagera National Park, the large swamps all along Akagera River, plus remnant gallery dry forest of Ibanda-Makera and its savannah harbor almost a precious high biological diversity. Therefore, proposal is about an expansion of Akagera National Park, which shall encompass the present ANP plus newly delimited Akagera wetland complex and Ibanda-Makera (Annex-figure 1 below).



Annex-Figure 1. Akagera National Park with proposed extension

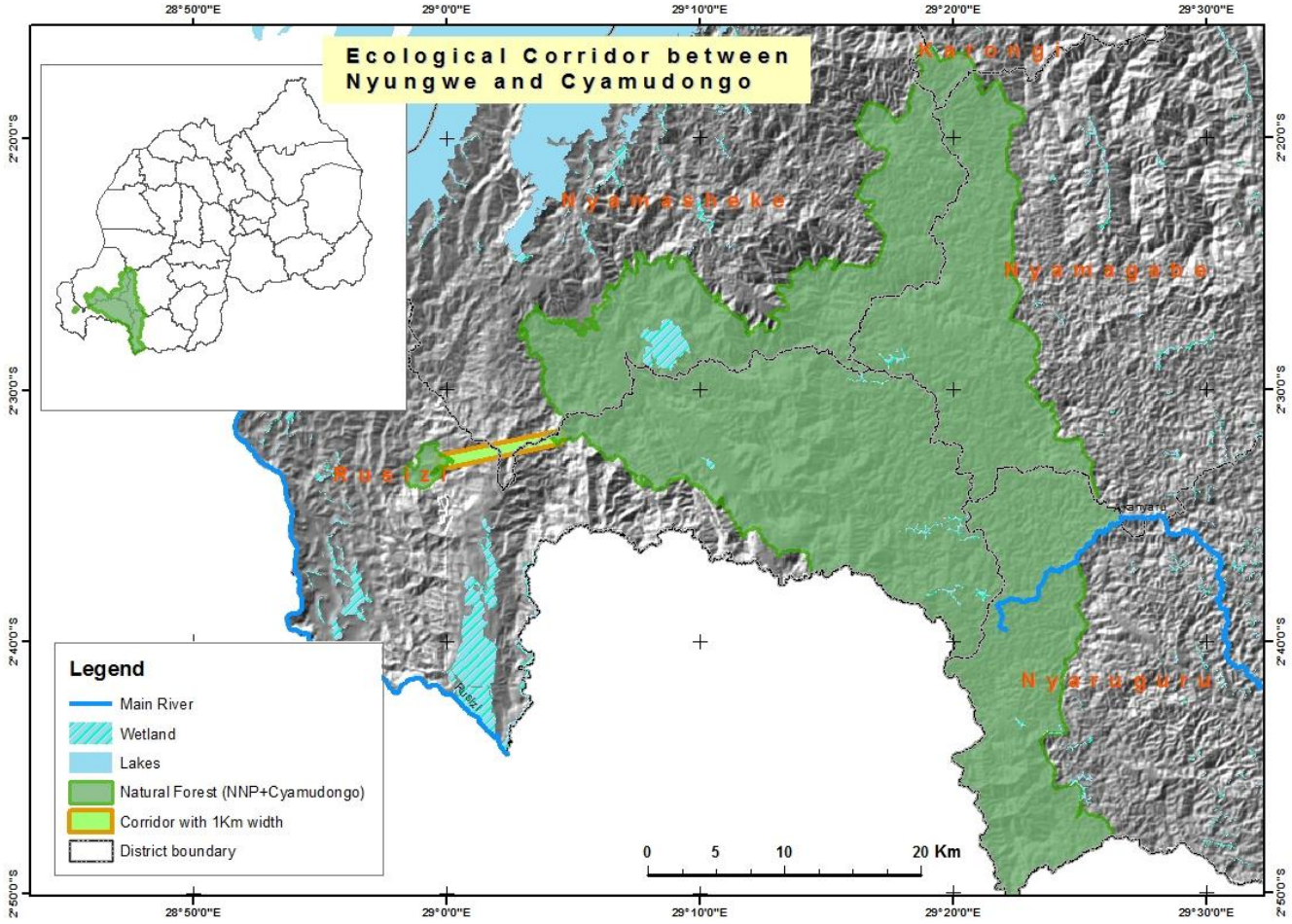
2. Nyungwe National Park

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Nyungwe National Park (NNP)	**Scientific and ecological criteria** • NNP harbors many rare and endemic species, including the endangered Chimpanzee (*Pan troglodytes*) and the vulnerable Owl-faced monkey (*Cercopithecus hamlyni*). • NNP is inhabited by ***129*** Endemic species to Albertine Rift including ***57*** vascular plants distributed in Kamiranzovu only**,** and ***72*** faunal species in the whole park. Three (***3)*** bird species listed as threatened by IUCN (***see NNP Management Plan 2012-2021***), namely Kungwe apalis (*Apalis argentea*), Grauer's swamp warbler (*Bradypterus graueri*) and Shelley's crimson wing (*Cryptospiza shelleyi*). **Scientific and hydrological criterion** • 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 water cycle and the reduction of water loss by evaporation. **Socio-economic criterion** • Prosperous tourism industry which attracted almost 8,000 visitors per annum. NNP offered opportunity for income-generating activities, i.e. beekeeping cooperatives generated 18,000,000 frw in 2012.	**High**

Reference to the common features of biodiversity between main Nyungwe National park and Cyamudongo remnant forest, an ecological corridor is proposed linking the two ecosystems, principally in order to preserve isolated 40 chimpanzees *(Pan troglodytes)* and a population of *Cercopithecus mona* living *in* Cyamudongo, previously dwelling in a large area with several groups of the same species within the western part of NNP (Gisakura, Gasumo and Uwinka sites).

Furthermore, the following plant species distributed in both ecosystems: *Entandrophragma excelsum* (Umuyove), *Musangaleo-errerae* (Icyanyana) which is endemic species to NNP and a famous bird

species, *Tockus alboterminatus* (*Crowen Hornbill*) inhabits both ecosystems should be conserved (Annex-figure 2 below).



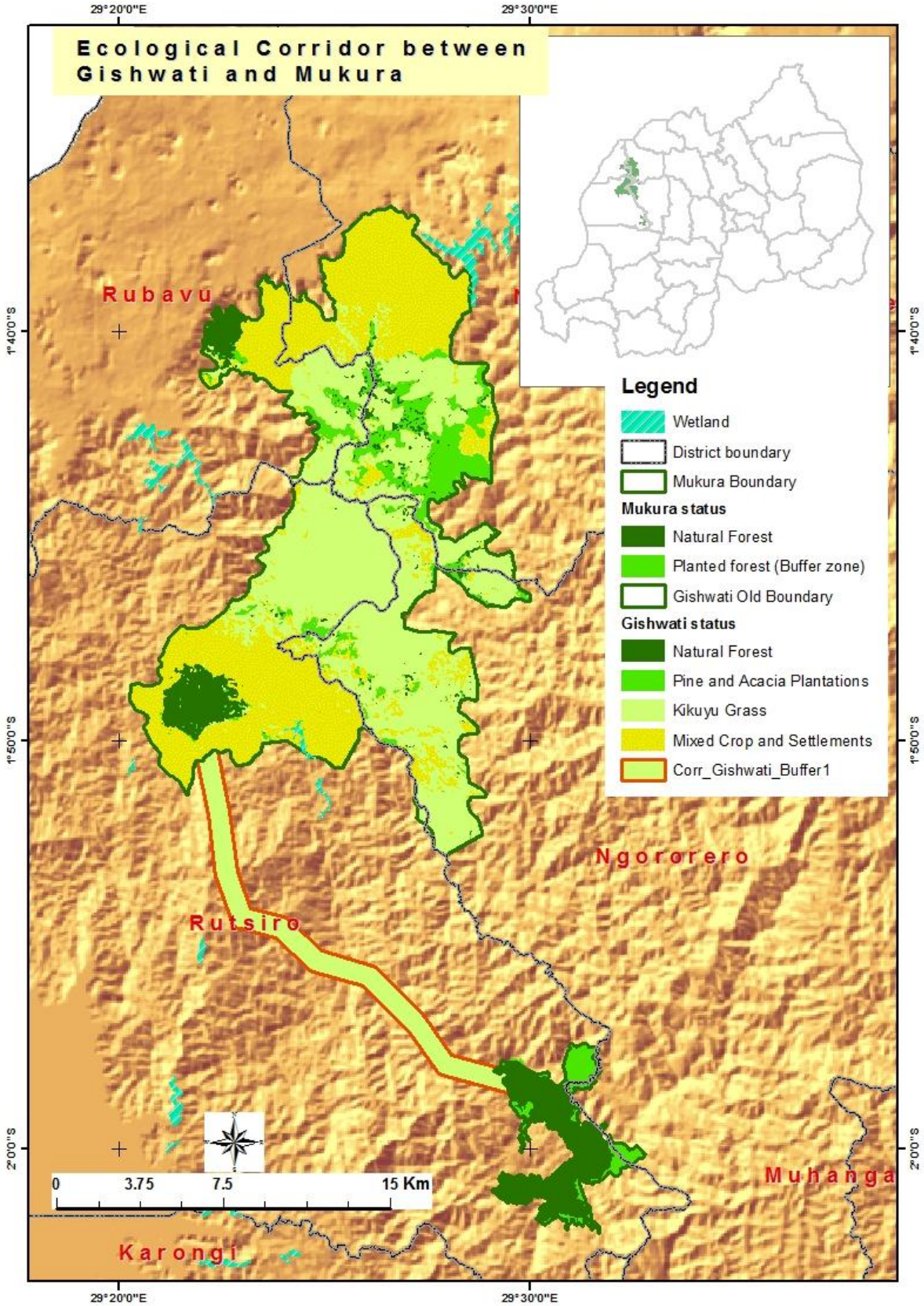
Annex-figure 2. Ecological corridor between main Nyungwe and Cyamudongo

3. Gishwati and Mukura National Park

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Gishwati National Forest Reserve	**Scientific and ecological criteria** • Gishwati Forest Reserve harbors ***13*** plants species and ***14*** bird species which are endemic to the Albertine Rift as well as two vulnerable species Martial Eagle and Grey Crowned Crane. Three Turacos species are in small number (24 in total) and should be preserved. • Gishwati has also 2 threatened monkey species which are on online IUCN index red list of endangered namely *Pan troglodytes schwenfurthii, and Cercopithecus mitis kandti.* **Scientific and hydrological criterion** • Gishwati provides vital watershed protection for Rwanda and important hydrological network for the Akagera/Nile and Congo River systems. It contributes to water cycle and climate maintenance in the region. **Socio-economic criterion** • Potential economic resource for the Ecotourism project planned by Gishwati Area Conservation Program (GACP). The reserve offers several forest products to local communities.	**High**

Mukura National Forest Reserve	**Scientific and ecological criteria** • Mukura forest reserve harbors 243 plant species, 77 birds including *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 which is vulnerable (ARCOS, 2012). • Mammals were dramatically reduced from *14* to *4* species, which request appropriate conservation actions. • Mukura forest also acts as a sponge, absorbing excess water and preventing runoff and erosion, and then stabilizing agriculture in surrounding areas. **Scientific and hydrological criterion** • Mukura forest provides vital local water catchment for Rwanda and an important hydrological network for the Akagera/Nile and Congo River systems. It contributes to water cycle and climate maintenance. • The main permanent 11 springs and streams having the source in Mukura Natural Forest are Ntaruko, Ndaba and Rutanzongera to name a few. **Socio-economic criteria** • Once Gishwati and Mukura will be restored and constituted one national park, there shall be potential economic resource for the Ecotourism project planned by Gishwati Area Conservation Program (GACP). The reserve offers also several forest products to local communities.	**High**

Reference to the common features of biodiversity between Gishwati and Mukura natural reserves, both ecosystems situated along the Congo-Nile divide with similar habitats, an ecological corridor is therefore proposed linking the two ecosystems (Annex-figure below 3), principally in order to allow the remained population of isolated chimpanzees *(Pan troglodytes)* to expand their foraging area and preservation of other bird (Turacos) and mammal species.



Annex-figure 3. Ecological corridor between Mukura and Gishwati

4. Volcanoes National Park-Rugezi Wetland-Buhanga Forest Reserve

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Volcanoes National Park (VNP)	**Scientific and ecological criteria** • VNP has sensitive Afro-Alpine habitats with ***13*** species of orchids listed by the CITES, ***10*** plant species endemic to Albertine Rift and wetland where inhabit rare and endemic species, including ***endangered and endemic Grauer's rush warbler*** (*Bradypterus graueri*). • VNP is home of well-known Mountain Gorilla, whose current population in the VVR is 480 individuals. ***13*** bird species and 16 subspecies endemic to the Virunga and Ruwenzori Mountains as well as two vulnerable bird species, Shelley's crimson-wing (*Criptospiza shelleyi*) and the Kivu ground thrush (*Zoothera tanganyicae*). **Scientific and hydrological criterion** • VNP constitutes an important area for the hydrology of the Akagera/Nile system and water catchment zone for the region. It contributes to water cycle and the reduction of water loss by evaporation. **Socio-economic criterion** • Prosperous tourism industry which attracted 23,800 visitors in 2012 and generated much money. The park offers several forest products to local people includes bee-keeping.	**High**
Rugezi Wetland Complex (RWC)	**Scientific and ecological criteria** • Rugezi wetland harbors *7* endemic species to Albertine Rift and the world's largest population of Grauer's Swamp warbler *Bradypterus graueri*. It contains one species of amphibian endemic to Rugezi wetland (Fischer, E., 2011).	**High**

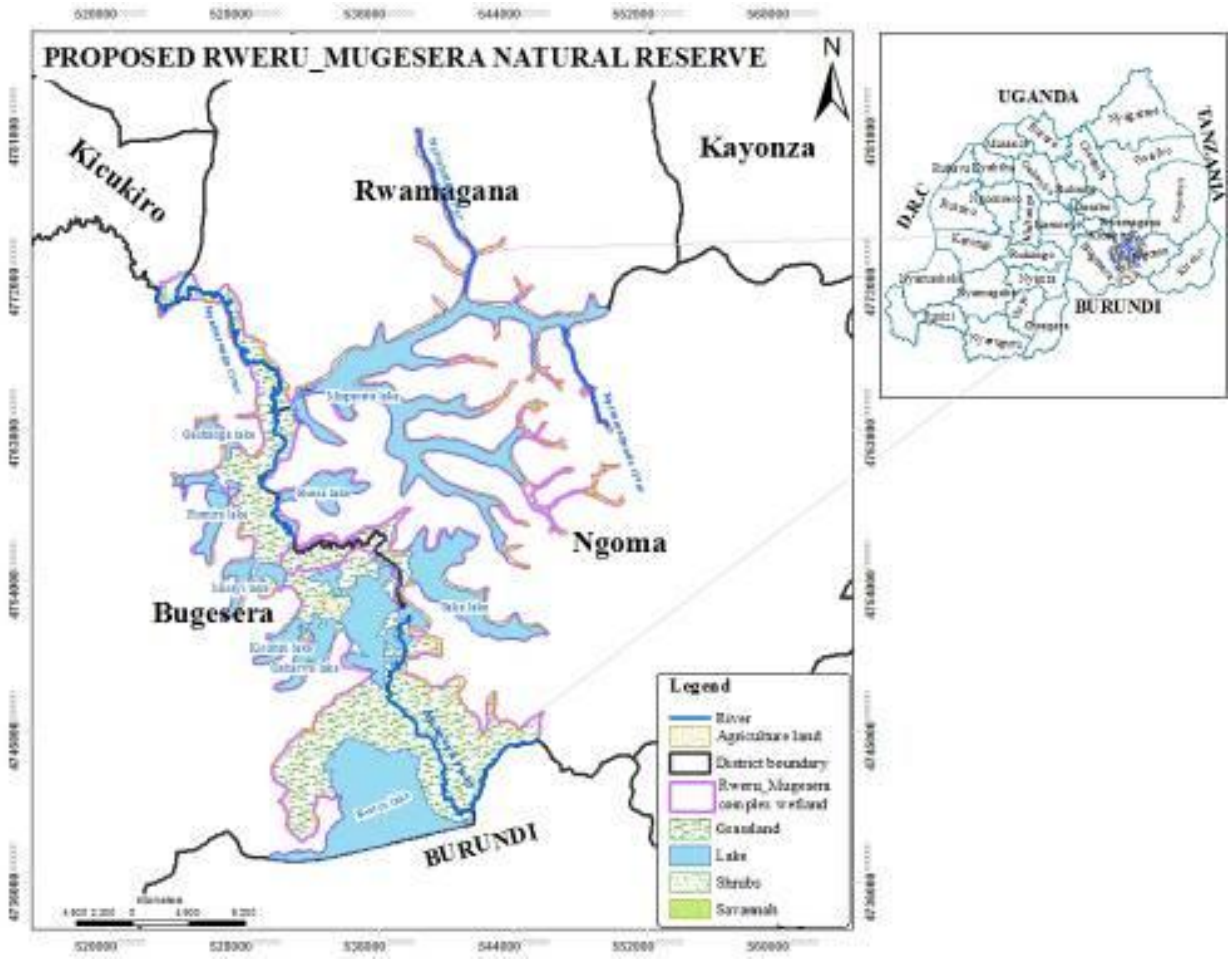
	Scientific and hydrological criterion • Rugezi plays an important hydrological role as reservoir of water flowing down to Bulera and Ruhondo lakes. It contributes to Akagera/Nile system and local water reserve for communities. The wetland contributes to water cycle and the reduction of water loss by evaporation. **Socio-economic criteria** • Important Hydropower generation for the country and potential eco-tourism development. It offers various marshland products to local communities.	
Buhanga Forest Reserve	**Scientific and ecological criteria** • Buhanga is inhabited by some animal species threatened with extinction: the porcupine (*Hystrix africae),* the jackal, the partridge, and leopard. • The reserve has two migratory species, African Pitta (*Pitta angolensis*) and Wahlberg's Eagle (*Aquila wahlbergi*) and ***4*** species endemic to the Albertine Rift. **Scientific and cultural criterion** • Buhanga is with a greatest originality by the fact that it is seen by history and folk traditions as the cradle of Rwandan civilization. **Socio-economic criteria** • With its touristic assets, Buhanga mini Park presents natural and cultural opportunities for the promotion of scientific cultural and ecological tourism.	**High**

The rational exploitation of tourism in Rwanda constitutes an economic imperative for the country's development. Reference to the rich biodiversity harbored by the three ecosystems, the hydrological and economical roles played by Rugezi wetland as well as cultural values of Buhanga forest reserve, recommendation is about to assign to Rugezi wetland and Buhanga Forest Reserve a higher protection status, through their inclusion as entirely part of Volcano National Park. Furthermore, a management plan is required for Rugezi wetland that will help to delimitate the ecologically most important areas of the marsh that should be preserved for eco-tourism.

5. Rweru-Mugesera Wetland Complex

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Rweru–Mugesera Wetlands	**Scientific and ecological criteria** • The complex harbors a rich biodiversity composed of 53 species of vascular plants, 14 species of amphibians, 6 species of reptiles, 40 species of birds and 16 species of mammals. • The complex has also a large population of the bird *Laniarius mufumbiri, 3* species of anuran and 1 species of reptile endemic to Great lakes region. **Scientific and hydrological criterion** • The wetlands complex plays an important hydrological role for Rwanda and the Victoria-Nile region and water reservoir for a large population of the region. It includes an important swampy area which contributes to water cycle and the reduction of water loss by evaporation. **Socio-economic criterion** • Important fishery activities are developed in numerous lakes and in Nyabarongo/Akagera River. A ray of agriculture products and other wetlands goods are benefited to local communities	**High**

Due to its important hydrological role played for the Victoria-Nile region and rich biodiversity inhabiting lakes and swampy areas, including several migratory birds from palearictic regions, which sojourn in the region during winter, the recommendation is to confer the protection statute of the Rweru-Mugesera wetlands complex (Annex-figure 4) as Natural Reserve with specific regulations for its use.



Annex-figure 4: Rweru - Mugesera wetland complex, proposed as Natural Reserve

6. Mashyuza Natural Forest

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Mashyuza Natural Forest	**Scientific and ecological criteria** • The Mashyuza Natural Forest hosts particular rare species that do not exist elsewhere in Rwanda such as *Sterculia tragacantha* and endemic species that cannot be met anywhere else in the world, namely *Nymphaea thermarum.* **Scientific and hydrological criterion** • Mashyuza forest contributes enormously in protecting the several water sources feeding the large hot spring located in the downward plain. It is likely useful for water retention **Socio-economic criterion** • This hot spring is very attractive and potentially important for recreation, scientific research and income generation from tourism. • Mashyuza is considered by local people as containing healing properties that can treat fracture and bodily fatigue.	**Medium**

Mashyuza Natural Forest harbors some rare and endemic species that cannot be met elsewhere in the world, namely *Nymphaea thermarum.* According to IUCN protected areas categories, Mashyuza ecosystem fits better to the category II: ***area managed mainly for ecosystem protection and recreation.*** Thus, Mashyuza Natural Forest constitutes uniqueness and does not exist elsewhere in Rwanda. The recommendation is about to confer Mashyuza Natural Forest a conservation statute as ***Natural Reserve***.

7. Lake Kivu Islands

Type of ecosystem	Criteria Fulfilled	Level of priority for conservation
Lake Kivu Islands	**Scientific and ecological criteria** • Rich biodiversity composed of 142 plant species, 80 species of birds, 52 invertebrates, 6 mammals, 6 reptiles, 5 species of amphibian and 26 fish species. • Islands have endangered species, already registered on IUCN red list, such as Marsh Mongoose (*Atilax paludinosus*: inzibyi), some water birds and snakes like *Bitis nasicornis* and *Naja melanoleuca.* • Islands hold 15 endemic fish species and three migratory species (*Cossypha natalensis*, *Milvus migrans* and *Bulbucus ibis.* **Scientific and hydrological criterion** • Lake Kivu constitutes the big water reservoir for the region, regulates water cycle and by the way climate change. **Socio-economic criterion** • Prosperous fishery industry in Lake Kivu, methane gaze exploitation and transport facilities. • High Eco-tourism potentiality in Kivu islands, which can become a relevant income generation source for Rwanda and ecosystem services.	**High**

In order to protect the great richness of Lake Kivu Islands and raising incomes generation for the country, there is an urgent need for elaboration of their Management plan taking into account key zones for biodiversity conservation, tourism development and recreation etc. Lake Kivu and its islands have high potential for income generation and sustainable enhancement of local community livelihood. Based on previous studies conducted on Lake Kivu and its biodiversity, the recommendation is about the creation of Biosphere Reserve for Lake Kivu Islands, but more investigations are needed to support the proposition. Eco-tourism development constitutes a high priority for the Lake Kivu islands in order to create more employment opportunities for local communities and reduce pressure on natural resources. The development of tourism will increasingly lead to more off-farm employments thus improving the living standards of people.

ANNEX 2: PERSONS CONSULTED

Names	Positions	Institutions
Eng. Coletha Ruhamya	Director General	REMA
Ms Marie Laetitia Busokeye	Director of Research, Environmental Planning and Development; CBD Focal Point	REMA
Mr Canisius Kayitera	NBSAP Project Coordinator	REMA
Ms Gisèle Umuhumuza	Research Officer	REMA
Mr Emmanuel Kabera	Cartagena Protocol on Biosafety (CPB) Focal Point	REMA
Mr Richard Niyomugabo	Biodiversity Facilitator	REMA
Mr Nsanzimana Djuma	CHM National Focal Point	REMA
Mr Kabalisa Vincent de Paul	Deputy Director General in charge of Integrated Water Resources Management Department	RNRA
Mr Dismas Bakundukize	Director of Forest Management Unit	RNRA
Mr Anastase Niyigaba	Water Data and Information Manager	RNRA
Ms Manikuzwe Marie-Goretti	Biodiversity Officer	RNRA
Mr HAKIZA S. Jackson	Professional in charge of Tourism Policy	MINICOM
Dr. Mudakikwa Antoine	Head of Veterinary service	RDB
Mr Bizimungu François	Head of Research and Monitoring service/ Focal Point	RDB
Mr Telesphore Ngoga	Head of Conservation Department	RDB
Mr Faustin Karasira	Head of Tourism Department	RDB
Mr Musana Abel	Conservation Warden	VNP/RDB
Mr Nasasira K. Richard	Principal	Kitabi College of Conservation and Environmental Management (KCCEM)
Mr Hategekimana Joseph	Park guard	RDB/VNP/Buhanga
Mr Rurangwa Raphael	Director General of Planning	MINAGRI
Mr Twagirayezu Emmanuel	Professional in load of Soils Conservation and Policy Mechanization	MINAGRI

Dr Hirwa Marie Claire	Coordinator of Livestock program	RAB
Ms Nishimwe Immaculée	Researcher in Banana program	RAB
Ms Kajuga Joelle	Researcher and RAB Biosafety Representative	RAB
Dr Ngaboyisonga Claver	Coordinator of Maize program	RAB
Mr Gapusi R. Jean	Curate of Rwanda National Gene Bank	RAB
Mr Munanira Emmanuel	Manager of Ibanda - Makera forest	RAB
Mr Nsengimana Joseph	Lecturer	UR
Mr Nshutiyayesu Samuel	Assistant Lecturer	UR
Mr Jes Gruner	Park Manager	ANP
Mr Birasa André	Agrostologist	RAB-Karama
Mr Nsengimana Serge	Coordinator	ACNR
Mr Mugabo Buda	Former Research and Monitoring Warden	ANP
Mr Nsabagasani Claudien	Landscape Conservation Program Manager	ARCOS
Mr Mukunzi Emile	DFO	Bugesera District
Ms Uwambajemaria Florence	Vice Mayor Social Affairs	Burera District
Mr Nkezabera Come	District Environment Officer (DEO)	Burera District
Mr Manirafasha Sylvestre	REMA-District Environment Facilitator (DEF)	Burera District
Mr Gasasira Juvenal	Community member	Community around Makera-Ibanda remnant forest
Mr Mubirigi Augustin	Community member	Community around Mukura forest
Mr Rumiya Patrice	Community member	Community around Mukura forest
Mr Ntaganda Jean Damascene	Community member	Community around Mukura forest
Mr Zigiranyirazo Joseph	President	COOPAV-MARIRO
Mr Uwiringiyimana Francois	Member	COOPAV-MARIRO
Mr Bonheur Innocent	President	Cooperative Uburumbuke
Mr Tuyisingize Deogratias	Researcher	DFGFI
Ms Vecellio Veronica	Gorilla Program Manager	DFGFI
Mr Abiyingoma Jules	ITC manager	DFI
Mr Karambizi Benjamin	CBO member	Gishwati CBO/community
Mr Mbonyimpa Silas	Ex Conseiller Cyambara	Gishwati community

Mr Safari Patrick	Regional Coordinator	Global Water Partnership
Ms Mukamana Béatrice	Deputy manager/Accountant	Gorilla Organization (GO)
Mr Nshimiyimana Manassé	Coordinator	Green Cover Initiative-Bugesera
Mr Rurangwa Eugene	TBNRM/Advocacy Coordinator	IGCP
Mr Kayijamahe	Research and Monitoring	IGCP
Mr Bititi fred	DFO	Kirehe District
Mr Mfashingabo Mathiew	DEO	Kirehe District
Mr Alexis Murasira	REMA-District Environment Facilitator (DEF)	Musanze District
Mr Musoni Protais	District Forest Officer (DFO)	Musanze District
Mr Jean Pierre	DEO	Musanze District
Mr Minani Vedaste	Researcher	NIRDA
Mr Ndikubwimana Innocent	Research and Monitoring Warden	NNP/RDB
Mr Habyarimana Emmanuel	Executive Secretary	Nyabihu District
Mr Karambizi Benjamin	DEO	Nyabihu District
Mr Nabimana Jean De Dieu	DEF	Nyabihu District
Mr Mutsinzi Aimé	Project Environmentalist	PDAB/PAIRB/MINAGRI
Mr Rwigyema Othieno Andrew	Head of Research and Policy Analysis	PSF
Ms Birungi Yvonne	Administrative Assistant	SACOLA
Dr Masozera Michel	Rwanda Country Director	WCS
Mr Hakizimana Vincent	Beekeeping Development Officer	WCS
Ms Nyiratuza Madeleine	Project Manager	WCS/FHA