

**United Nations Development  
Programme**

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BASELINE STUDY AND  
DEVELOPMENT OF INDICATORS  
AND TARGETS FOR  
“FOREST LANDSCAPE  
RESTORATION IN THE MAYAGA  
REGION PROJECT”

FINAL REPORT

t20042 February 2021



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# **BASELINE STUDY AND DEVELOPMENT OF INDICATORS AND TARGETS FOR “FOREST LANDSCAPE RESTORATION IN THE MAYAGA REGION PROJECT”**

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## **Final Report**

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## ACRONYMS

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AP/FFS – Agro-pastoralist/ Farmer Field School  
ARCOS – Albertine Rift Conservation Society  
BDF – Business Development Fund  
BZ – Ministry of Foreign Affairs of Netherlands  
CAVM – College of Agriculture, Animal Sciences and Veterinary Medicine (University of Rwanda)  
CMIP3 – Climate Monitoring International Partnership Phase 3  
CSO – Civil Society Organizations  
DDP – District Development Plan  
DDS – District Development Strategy  
DFMP – District Forest Management Plans  
DFO – District Forestry and natural resources Officer  
EDPRS – Economic Development and Poverty Reduction Strategy  
EIA – Environmental Impact Assessment  
EICV – Integrated Household Living Survey  
ENR – Environment and Natural Resources  
ESSP - Energy Sector Strategic Plan  
FAO – Food and Agriculture Organisation  
FFS – Farmer Field School  
FGD – Focus Groups Discussions  
FIP – Forest Investment Plans  
FLR – Forest Landscape Restoration  
FONERWA – Rwanda Green Fund  
FRW – Rwandan Franc  
GEF – Global Environment Fund  
GGCRS – Green Growth and Climate Resilience Strategy  
GHG – Greenhouse Gases  
GIS – Geographic Information System  
GIZ – *Deutsche Gesellschaft für Internationale Zusammenarbeit* (German Society for International Cooperation)  
GIZ – German Technical Cooperation Agency  
GMO – Gender Monitoring Office  
GoR – Government of Rwanda  
HH – Households  
ICRAF – World Agroforestry  
IDP – Integrated Development Programme



ILO – International Labour Organization  
IPAR – Institute of Policy Analysis and Research – Rwanda  
IPCC – Intergovernmental Panel on Climate Change  
IUCN – International Union for Conservation of Nature  
IWRM – Integrated Water Resources Management  
JADF – Joint Action Development Forum  
LDN – Land Degradation Neutrality  
LPG – Liquefied Petroleum Gas  
LTRP – Land Tenure Registration Program  
MIGEPROF – Ministry of Gender and Family Promotion  
MINAGRI – Ministry of Agriculture and Animal Resources  
MINALOC – Ministry of Local Government  
MINECOFIN - Ministry of Finance and Economic Planning  
MINEDUC – Ministry of Education  
MINEMA – Ministry in charge of Emergency Management  
MINICOM – Ministry of Trade and Industry  
MINILAF – Ministry of Lands and Forestry  
MININFRA – Ministry of Infrastructure  
MINIRENA – Ministry of National Resources  
MoE – Ministry of Environment  
MoH – Ministry of Health  
M&E – Monitoring and Evaluation  
NAEB – National Agriculture Export Development Board  
NAMA – Nationally Appropriate Mitigation Action  
NBSAP – National Biodiversity Strategy and Action Plan  
NCPD – National Council of People with Disabilities  
NDC – Nationally Determined Contribution (to global climate action)  
NFC – New Forest Company  
NGO – Non-Government Organization  
NIRDA – National Industrial Research and Development Agency  
NISR – National Institute of Statistics of Rwanda  
NLUDMP - National Land Use and Development Master Plan  
NST – National Transformation Strategy  
NST1 – First National Transformation Strategy  
NTFP – Non-Timber Forest Products  
NWC – National Women Council  
NYC – National Youth Council  
PIR – Project Implementation Report

PRA – Participatory Rural Appraisal  
PSF – Private Sector Federation  
RAB – Rwanda Agriculture and Animal Resources Development Board  
RDB – Rwanda Development Board  
REDD+ – Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stock  
REMA – Rwanda Environment Management Authority  
RFA – Rwanda Forestry Authority  
RLMUA – Rwanda Land Management and Use Authority  
RMA – Rwanda Meteorological Agency  
RSB – Rwanda Standards Board (RSB)  
RWB – Rwanda Water Board  
SEP – Stakeholder Engagement Plan  
SFM – Sustainable Forest Management  
SHE – Safety, Health and Environmental  
SLF – Sustainable Livelihoods Framework  
SLM – Sustainable Land Management  
SME – Small and Medium Enterprises  
SNV – Netherland Development Organization  
SSP – Sector Strategic Plan  
SWG – Stakeholder Working Groups  
TEV – Total Economic Value  
TSC – Tree Seed Centre  
UNDAP – United Nations Development Assistance Plan  
UNDP – United Nations Development Programme  
UNEP – United Nations Environment Programme  
UNFCCC – United Nations Framework Convention on Climate Change  
UR – University of Rwanda  
US\$/ USD – United States Dollar  
WFP – United Nations World Food Programme  
WRI – World Research Institute  
WVR – World Vision Rwanda



## 1. Introduction

The present document is the Final Report of *International consultancy firm to conduct a baseline study and development of indicators and targets for “Forest Landscape Restoration in the Mayaga region project”*, conducted by Nemus – Gestão e Qualificação Ambiental, Lda., for United Nations Development Programme (UNDP).

The aim of this consultancy is to carry out a baseline study, which will provide guidance and tools required to the effective implementation of the project mentioned above and its ultimate objectives in four districts (Kamonyi, Ruhango, Nyanza, Gisagara). This baseline study establishes: an updated project results framework; a project measurement framework; and baseline information for the project indicators against which the project performance and impact will be measured.

Aiming to document the strategies for carrying out the assignment and answer the above questions, the Final Report has the following **structure**:

- Chapter 1 – Introduction;
- Chapter 2 – Assignment background, objectives, and scope;
- Chapter 3 – Baseline reports;
- Chapter 4 – Results framework and evaluation;
- Chapter 5 – Conclusion;
- Chapter 6 – References.
- Appendix (Maps).
- Annexes.

Each Baseline Report is presented in Chapter 3, namely:

- 3.2 – Socioeconomic and Household Energy Report.
- 3.3 – Social and Environmental Safeguards Report.
- 3.4 – Vulnerability Assessment Report.
- 3.5 – Legal Policy and Institutional Report.
- 3.6 – Local Market Development Report.
- 3.7 – Sustainable Land Management & Sustainable Forest Management Practices Report.
- 3.8 – Gender Analysis Report.
- 3.9 – Forest Productivity Report.
- 3.10 – Biodiversity Report.

- 3.11 – Stakeholders Analysis Report.
- 3.12 – GIS Report.

Finally, in the Appendix it is possible to consult the following Maps:

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## 2. Assignment background, objectives, and scope

The main purpose of the assignment is to update the **baseline study** and create a definitive **list of indicators and targets** for the “**Forest Landscape Restoration in the Mayaga region project**”, considering stakeholders’ consultations, including local communities, implementing partners and government officials, among others.

The following sections provide Nemus’ understanding of the assignment’s background, objectives and scope of work, laying the foundations for the detailed methodologies to be presented in the next chapter.

### 2.1. Background

Forests of Rwanda occupy 724,662 hectares of the total country land (30,4%). The less afforested districts are mainly Ngoma District with 12%, Gisagara and Nyanza with 13% and Kamonyi and Ruhango with 14% of land under forest use.

Afforestation efforts are still needed in Mayaga, Bugesera and Eastern lowlands in order to mitigate consequences related to lack of forests in these regions. Forest degradation has taken three pathways in Mayaga: quantitative loss; qualitative loss, and fragmentation, caused largely by encroachment for agriculture and overharvesting of forest products.

Recently, Rwanda Environment Management Authority (REMA) has received through the United Nations Development Programme (UNDP) a grant from the Global Environment Fund (GEF) to implement a “Forest Landscape Restoration in the Mayaga Region project”. This 6-year project will be implemented in four districts of Mayaga region namely Kamonyi, Ruhango, Nyanza and Gisagara and its main objective is “*to secure biodiversity and carbon benefits while simultaneously strengthening the resilience of livelihoods, through forest landscape restoration and upscaling clean technologies in four Districts of the Mayaga region*”.

## 2.2. Objectives

The aim of this consultancy is to carry out baseline study, which will provide guidance and tools required to the effective implementation of the “*Forest Landscape Restoration in the Mayaga region project*” and its ultimate objectives in four districts (Kamonyi, Ruhango, Nyanza, Gisagara). This baseline study will establish:

- An updated project results framework;
- A project measurement framework;
- Baseline information for the project indicators against which the project performance and impact will be measured.

These will guide the project management team, the technical team, and stakeholders with monitoring tools. Moreover, the project will provide a coordination mechanism for Forest Landscape Restoration planning and individual, institutional capacities to enable its implementation in the four districts.

### 2.3. Scope of work

Geographically, the focus of the assignment is the Mayaga region in Rwanda, which includes the districts of Kamonyi, Ruhango, Nyanza, Gisagara (see Figure 1). The next sections present the Forest Landscape Restoration in the Mayaga region project.

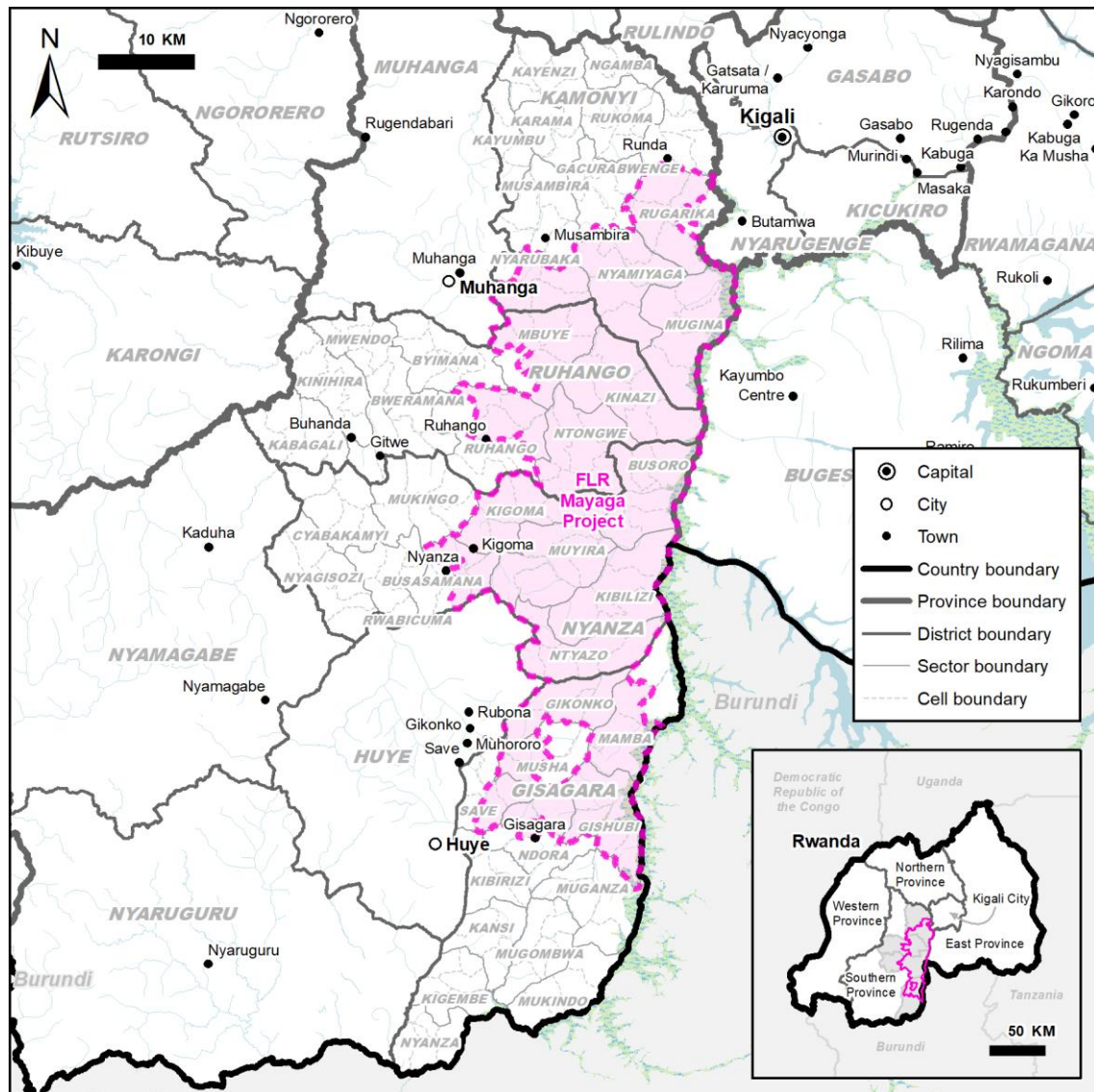


Figure 1 – Location of the four districts (Kamonyi, Ruhango, Nyanza, Gisagara).

### 2.3.1. The Forest Landscape Restoration in the Mayaga region project

Despite the efforts of Rwanda to increase forest cover, most forests are found in the West, while the East and the Mayaga region, in particular, are characterized by a low forest cover of 5%. The scattered indigenous forest of the Mayaga region is of significant importance for holding relevant plant biodiversity, carbon stocks and ensuring watershed services essential to livelihoods, namely to agriculture (e.g., by providing protection against erosion).

Within this context, the ***Forest Landscape Restoration in the Mayaga Region project*** has as main objective to secure the biodiversity and carbon benefits provided by the forest ecosystem and, at the same time, strengthen the livelihoods' resilience, through forest landscape restoration and upscaling clean technologies applied to the selected target areas of four districts located in Southern Province and covered by the Mayaga landscape: Kamonyi, Gisagara, Ruhango and Nyanza.

#### 2.3.1.1. Outcomes, and outputs of the project

The project pretends to achieve its objective through the following three main outcomes:

1. Forest restoration plans with institutional and legislative frameworks to guide afforestation, natural resources management and agriculture in four districts;
2. Enhancement of individual and institutional capacities for planning and implementing gender sensitive forest landscape restoration strategies, supported by knowledge management;
3. Implementation of Forest Landscape Restoration Plans that will secure 555 ha of natural forests, bring 300 ha of forests under participatory forest management, increase the productivity of agriculture and planted forests on 25,000 and 1,000 ha respectively, and, finally, reduce wood consumption by at least 25%. Four Forest Landscape Restoration plans will be delivered. This restoration plans should contribute for avoiding the emission of 4,700,825 tons of carbon dioxide equivalent in five years and the emission of 12,950,839 tons of indirect GHG emissions in 20 years.

Outcome 1 includes two outputs:

*Output 1.1. - Legislation and coordination mechanisms in place for effective FLR:*

- Clearly define the concept of Sustainable Forest Management (SFM) and Forest Landscape Restoration (FLR) in the National Forest Policy, including a reference to their contribution for the different ecosystem services that help meeting Rwanda's current and future needs regarding forest products;
- Facilitate the Joint Action Development Forum (JADF) to adopt the SFM definition and the development of a FLR coordination system, namely by bringing the relevant ministries and their agencies on board to strengthen inter-sectoral collaboration on the FLR plans development;
- Establish a thematic group on FLR under the JADF composed of key stakeholders already identified which will form the basis for collaboration. The group will review legislation focusing on how the implementation and enforcement of FLR related national policies at the local level can be supported. The integration of sectoral policies to improve the assessment and management of competing objectives and trade-offs will be a priority as well. In addition, a participatory process, considering gender issues, will be facilitated to set up recommendations and lobby for the adoption of such policies. In particular, environmental fines and penalties to deter illegal activities should be enforced.

*Output 1.2. – Four FLR plans ready for implementation, covering 263,270 ha:*

- Facilitate the development of a FLR plan by each of the four districts, under the methodology established by the World Resources Institute (WRI) and IUCN and according to the review applied for the Gatsibo FLR baseline conditions assessment. The methodology includes: 1) Geospatial analysis to quantify the areas of degraded land with potential for forest and landscape restoration; 2) Economic analysis regarding the costs and benefits of degraded and restored land; 3) Designing a restoration action plan based on the in-dept assessment of the conditions required for the FLR implementation; 4) An additional step will be added for the cases of physical displacement of people settle in protected areas, which should include the development of an Environmental and Social Impact Assessment, followed by an Environmental and Social Management Plan, a Resettlement Plan and an Indigenous Peoples/ Ethnic Minority plan, if deemed necessary.

Outcome 2 comprises three outputs:

*Output 2.1. - Training programs implemented for all stakeholders, increasing the average individual score on the UNDP Capacity Assessment by 20 percentage points in stakeholder groups:*

- Design and implementation of skills development programs for concerned ministries technical staff and for land users;
- Technical staff will be provided with skills on data collection, data quality control and data analysis, as well as related cost-and-time saving technologies. Moreover, land users will be offered training on improved tree husbandry and other sustainable forest and land management (SFM/SLM) techniques;
- Community groups and cook stove technicians will also be trained on the use and maintenance of improved cook stoves. In addition, charcoal producers will be trained on the concept of sustainable charcoal production applied to the entire process (harvesting, processing, packaging, and marketing). Producers of non-timber forest products will receive similar training.

*Output 2.2. – Institutional capacity for the extension service and community knowledge sharing forums increased by 25 percentage points on the UNDP Capacity Assessment for all stakeholder groups:*

- Providing resources for the operations of the three community platforms that contribute for knowledge dissemination which are the Monthly Community Work (*Umuganda*), the parents evening forum (*Umugoroba w’ Ababyeyi*) and general villages assemblies (*Inama Rusange y’ Abaturage*).

*Output 2.3. – Monitoring & evaluation plans, knowledge management and gender mainstreaming strategy in place:*

- Facilitate the implementation of monitoring and evaluation plans, knowledge management plan and a gender mainstreaming strategy to ensure that:
  - The implementation of the FLR is monitored thus supporting adaptive management and allowing the continuous of successful initiatives post project. The monitoring and evaluation plan is designed so that the lessons from the FLR implementation are proactively tracked, documented, and shared, aiming at maintaining the motivation of local communities towards participatory monitoring process;

- The knowledge management plan will detail what knowledge will be created by the project and how it will be managed and disseminated;
- Gender is mainstreamed into all aspects of project management, namely that the inherent responsibilities and benefits are equitably distributed to all gender groups. This gender strategy will be built on the principles established by the IUCN FLR gender mainstreaming work;
- Reinforce the importance and potential of FLR in improving the livelihood of local population is recognised amongst all stakeholders;
- Ensure that an exit strategy is prepared by the end of the fourth year of the project.

Outcome 3 has four outputs:

*Output 3.1. – Enhanced management on 555 ha of high conservation value forest, including increasing the protection status of 354 ha of the 555 ha:*

- Preparation of the necessary documents to upgrade the Kibirizi-Muyira Natural Forest reserve to IUCN Category IV protection status and lobby for the approval for the nomination files;
- Assess the possibility of re-establishing the connectivity of the currently separate, but neighbouring, Kibirizi and Muyira relict savanna forests, which were once connected. This would be done in line with the Environmental and Social Management Plan (ESMP), and its related plans, developed under Output 1.2., to make sure that the impact on existing settlements will be considered;
- Facilitate the development of a set of management and business plans for the protected areas, with the participation of key stakeholders. Stakeholder working groups will be established for such areas with representatives of local communities, CSOs, NGOs, research and educational institutions, private sector, and other government agencies with interest in the protected area. The stakeholder working groups should be gender balanced, to the extent possible. The stakeholder working groups could be further developed to institutionalized forums, in accordance with the governance scheme established for protect areas.

*Output 3.2. – Buffer zones and hill-tops afforested with a mix of indigenous trees and higher productivity plantations:*

- Facilitate the Participatory Forest Management of 300 ha of forest with at least ten community groups, including the development and negotiation of co-arrangements. One of the communities' responsibilities will be to reforest the degraded forest and to clear existing invasive species, namely the *Lantana camara*. These tasks will be supported by the *Umurenge* Programme which provides cash transfers to public works and, on the other hand, by youth groups interested in converting *Lantana Camara* into charcoal briquettes. In addition, the communities will benefit from harvesting of non-timber forest products and from training on such processes (as described under outcome 2);
- Assist the Tree Seed Centre in improving the genetic quality and variety of their species stock;
- Training on tree husbandry, planting, processing, and marketing timber products, following the premises and financial support delivered under outcome 2.

*Output 3.3. – SLM/ SFM practices implemented in more than 25,000 ha of agriculture land, including agroforestry on 1,000 ha of consolidated land:*

- Facilitation of new and/ or revival of existing farmer field schools through which the support on SLM and SFM will be disseminated in at least 25,000 ha, with focus on the Nyanza District;
- Adoption of a value chain approach where households are encouraged to promote collectively the consolidation of at least 1,000 ha of land, namely by growing one tree crop, in addition to food crops. Further support and linkages to agro-processors and markets will also be provided to ensure agroforestry generates significant and sustainable income to households;
- Increase, in all districts, the percentage of households with livestock. As demonstrated by the One Cow per Poor Family programme, keeping livestock in homes promotes sustainable land management practices by providing organic manure, encouraging planting of fodder crops, and improving the families' diet and income and, consequently, their livelihood. Therefore, the project will facilitate the acquisition of livestock by at least 2,000 homesteads (minimum 10,000 people). Distribution of

livestock will be gender sensitive. Farmers will also be supported with veterinary services;

- Increase the percentage of a household's land under terracing, as terraces contribute for land consolidation if design properly to avoid negative impacts.

*Output 3.4. – Reduction of wood consumption by 25% by improving household and institutional cooking energy technologies:*

- Improve the efficiency of the charcoal value chain by encouraging charcoal producers and sellers to form cooperatives or join already existing ones;
- Support at least ten charcoal producers and sellers' cooperatives in the adoption of carbonization, processing, and packaging technologies/ techniques, to improve the value, quality and marketing of the charcoal produced. In addition, the project will improve the distribution links between producers and markets and add value through the labelling and branding of certified green charcoal;
- Provide incentives for the adoption of improved cooking stoves by households and institutions, namely financial incentives such as a start-up grants to cover the cost of producing improved stoves, and an end-user rebate for rural households to subsidize the cost of acquiring such stoves;
- Dissemination of at least 10,000 cookstoves each year, resulting on a total of about 60,000 by the end of the project (with 1% being institutional cookstoves). This will reduce the pressure on the forests and emissions by at least 2 tCO<sub>2e</sub> per stove per year.

#### **2.3.1.2. Main threats to forest ecosystem services**

In the Mayaga region, native forests are mostly threatened by agricultural expansion and overharvesting of products, which have led to significant deforestation. The existence of such pressures, even in Rwanda's most important ecosystems, is linked to its geographic and socio-demographic context. One of the main reasons is the fact that Rwanda has a small surface area, but a high and growing population, which in addition is highly dependent on agriculture for subsistence and economic growth, while also depending on wood fuel for energy generation.

Furthermore, the agricultural practices and technologies currently employed lead to land degradation and increase the pressure on forest ecosystems. Considering that a significant part of the population depends on agriculture for their livelihood, farmers tend to continuously cultivate the available soil, leading to nutrients depletion which, consequently, will reduce crops yields in the future. On the other side, the recurrent practice of cultivating in steep slopes without adequate ground cover, contributes for soil erosion.

Particularly in the Mayaga region, ecosystem degradation comprehends three main aspects: 1) quantitative loss meaning a decline in the areal extent of discrete ecosystems types; 2) qualitative loss implying the degradation of the structure, function, and composition of different ecosystems; 3) fragmentation caused mainly by agriculture excessive expansion (Hambiyambere, et al., 2009).

Land deterioration, namely soil loss, deforestation, and forest degradation, are affecting the fertile arable land of the Mayaga region and causing a reduction of carbon stocks. Some causes include the previously referred inappropriate agricultural practices of cultivating in very steep hills, which can be observed in *Ijuru rya Kamonyi* and “*Cubi na Marenga*”, and the transformation of wetlands into farms without respecting conservation measures, namely avoiding riverbanks and deforestation. The replacement of perennial crops for annual crops that has been noticed in the region also increases the pressure on soil's health, as it demands higher resources allocation, leading to erosion and carbon loss.

The focus on the Mayaga region, and in particular in the four Districts target within the project, emerges also from the fact that, contrarily to the tendency of afforestation observed in the rest of the country (following national policies), the forest areas in these Districts continue to be pressured by unplanned agriculture expansion. In some areas, demarcation between farms and forest patches does not even exist.

In line with the national context, forest resources in the Mayaga region are also threatened by overharvesting for energy generation using fuel wood. More than 80% of the households in the four targeted Districts depend on wood or charcoal. According to the Energy Sector Strategic Plan (2018/19 – 2023/24), sustainable biomass solutions need to be put in place in order to halve the number of households using traditional cooking technologies. Moreover, strict tree harvesting regulations are already in place, but there is space left for afforestation programs.

In addition to agricultural expansion and overharvesting of tree products, the region's ecosystems are threatened by illegal exploitation, invasive species, and climate change. Flora has been particularly affected by the illegal exploitation of *Osyris lanceolata* and the dissemination of invasive species of *Lantana camara*. The Baseline Climate Change Vulnerability Index for Rwanda predicts an increase in temperature of 2.5° by 2050, although the projections are limited to high climate heterogeneity and poor long-term meteorological data.

Nevertheless, the projections from the Climate Monitoring International Partnership Phase 3 (CMIP3) also suggest an increase of the temperature and also refer to an increase of the average annual rainfall, including the intensity and frequency of heavy rain fall. This climate context should have a significant impact on Rwanda's agriculture, as most of the crops depend solely on rain to ensure water demand. On the other side, landslides events are more likely to occur.

As known, climate change is prone to exacerbate extreme events. Considering that Rwanda's current climate is characterised by strong seasonality, being affected by floods, landslides, and periodic droughts, it is expected that the occurrence of these events will increase. The Mayaga region is specially affected by periodical droughts, which, in turn, contribute to soil erosion due to different factors, from sparse vegetation to the need of exploring sensitive areas, such as riverbanks (for often being the remaining viable areas).

Tackling the above-referred threats through the increase of forest and agroforest cover in the Mayaga region faces three main barriers:

1. Inadequate knowledge to support decisions on forest planning and management;
2. Inadequate capacity/skills to employ smart technologies and agricultural practices for productivity improvement and ecosystems restoration;
3. Inadequate market-based incentives to adopt energy-efficient technologies.

At the national level, the first barrier is linked to the lack of investment in knowledge generation regarding biodiversity, namely forest species and genetic material. For instance, plantation diversity is low, as tree cover is dominated by Eucalyptus species, and the material quality is weak as well. Indeed, the country imports high-quality wood materials and there are no seed orchards dedicated to the generation of quality seeds.

The low levels of knowledge regarding harvesting techniques also affect the germplasm quality.

Whereas at the Mayaga level, the lack of knowledge is mostly regarding the inexistence of updated assessments on the value and benefits offered by native forests and their biodiversity, even though the communities commonly recognized the importance of the resources provided by these ecosystems. Accordingly, comprehensive assessments on the advantages of increasing forest cover and land productivity through agroforestry are also essential.

Farmers poor technical skills and the inadequate institutional capacity to support smart agricultural practices (which are solutions already developed, but not yet applied in the country) constitute a second barrier for forest restoration. The relation between research and extension services is weak and research findings remain largely un-disseminated, leading to insufficient multi-sectoral development in land management, in general, and in soil and water conservation, in particular.

Some examples include the employment of incorrect practices that contribute for the degradation of watersheds, such as inadequate water harvesting, or the adoption of short rotations resulting in the exhaustion of stumps. Only in the last three decades, the annual wood increment dropped more than 50%. While difficulties due to lack of coordination between institutions include the inexistence of a national common vision and framework for ecological restoration, inconsistencies between policies and strategies within different Ministries, overlapping of responsibilities between entities and the allocation of multiple uses for the same area.

The third barrier concerns energy consumption, namely the need to reduce biomass consumption, improve the access of households to efficient energy consumption technologies and increase opportunities for sustainable forest-based income activities. In the Mayaga region, biomass energy remains the most affordable option and cooking using wood fuel is ingrained in the cultural behaviour of the region. Furthermore, unlike the rest of the country, charcoal regulations and licensing regime for tree harvesting and replacement, is not well understood by the majority of households in the Mayaga region.

To overcome this barrier, incentives for local economic development based on climate friendly solutions, as well as efficient production of energy, combined with a program for expanding the adoption of high-efficient cook stoves should be carried out. For instance, sustainable charcoal investment could contribute for the reduction of wood consumption,

thus contributing to emissions cutting. In addition, the charcoal value chain in Rwanda is currently predominantly an informal private sector driven system, thus the development of a formal and organized value chain would also result in fairer payments for charcoal producers and increased tax revenues.

### **2.3.1.3. Baseline programs**

A large baseline investment to the project is allocated through six programs:

- **Government investments in Vision 2020** – US\$ 40 million for the Mayaga region (2018-2025): regarding forest sector the government has set the following targets: i) reduce the number of households depending on biomass as a source of energy for cooking from 83% (2014) to 42% by 2024; ii) sustain forest cover of 30%; iii) increase the percentage of public forest allocated to private operators from 5% (2017) to 80% by 2024; iv) increase the percentage of private forest converted into productive forests and managed by Forest Owners Associations from 0% to 50% by 2024;
- **The National Energy Sector Strategic Plan (2008-2020)** - US\$ 5 million: The government pretends to i) reduce fuel wood consumption from 94% to 50%, mainly through the adoption of biogas, and ii) ensure that 52% of the households have electricity from off-grid sources by 2017/18. In addition, the Government wants 80% of the cooking fuels to be provided by renewable energies;
- **Land consolidation and *Imidugudu* roll out program 2013-2020** – To avoid fragmentation, the program appeals that farmers consolidate their small plots into commercial farming. It should be done by helping farmers identifying commercial crops to be grown by the majority of farmers, as well as recruiting enough farmers to join the scheme and thus sustain an agro-processing plant. Additionally, the program foresees the creation of green villages, equipped with climate friendly technologies (e.g., biogas plants, solar lighting, communal cattle sheds, etc.);
- **The Bonn Challenge 2011 to 2020 and the IUCN/German Government project on Piloting Multiple-Benefit Investment Packages through forest/landscape restoration and REDD+ in Rwanda for scaling up in Africa** – US\$ 5 million: The country has committed to the Bonn Challenge with the

restoration of 2 million hectares of forest and agricultural land. The Department of Forestry and Nature Conservation, with support from IUCN and WRI (World Research Institute) has already concluded a countrywide assessment to identify restoration opportunities, including the respective cost and benefit analysis. This assessment provided the basis for future investment to implement restoration practices;

- **Environment and Climate Change Fund (FONERWA)** – US\$ 10 million: A national basket fund through which climate change finance is channelled, programmed, disbursed, and monitored. It is expected that the fund will provide loans and grants of up to US\$ 10 million during the life of the project to be allocated both to the business sector and governmental agencies;
- **United Nations Development Assistance Plan (UNDAP) 2013-2018** – US\$ 5 million: The United Nations will invest in the implementation of Outcome 3 of Results Area 1: Rwanda development of improved systems for sustainable management of the environment, natural resources and renewable energy resources, energy access and security, for environmental and climate change resilience. An investment of US\$ 5 million to support energy and environment programs in the Mayaga region is predicted.

### 3. Baseline Reports

#### 3.1. Introduction

##### 3.1.1. Methodology

The development of the baseline study for the “Forest Landscape Restoration in the Mayaga region project” was primarily supported by a comprehensive literature review. The technical team collected and assessed available data from trustworthy sources of information to better understand and diagnose the current environmental and socioeconomic situation of the region.

The following relevant information was compiled for the study area:

- Environmental and social regulatory framework;
- Relevant plans, programs, land management and environmental protection objectives;
- Biophysical aspects such as:
  - Ecosystems;
  - Land cover.
- Social and economic aspects such as main land uses and human activities;
- Governance issues, including roles and responsibilities, main actors and decision-makers, regulations, and norms.

Experts simultaneously analysed and reviewed compiled data, including:

- Analysis of the relevance of contents to achieve the general and specific objectives of the assignment;
- Assessment of the level of trust that can be attributed to the contents (normally related to the source);
- Cross reference of contents to check for incongruences and incompatible data, in order to determine which should be considered and to combine the data in a structured manner.

In addition to the in-desk analysis of published documents (technical studies and reports; scientific papers; books and publications and legal documents, on a local, regional, national, and international level), relevant stakeholders, environmental authorities and direct observation of the study area will also have an important role as sources of

information. Hence, while data collection for the purpose of this study focuses on secondary data, site visits were undertaken following an initial phase of in-desk data gathering, in order to allow for a deeper understanding of the complexities of the area, both socially and geographically (see Figure 2).



**Figure 2 – Data collection strategy.**

**Qualitative research** like this produces large amounts of textual data in the form of transcripts and observational fieldnotes; the systematic and rigorous preparation and analysis of these data is time consuming and labour intensive (Pope, Ziebland, & Mays, 2000) so, data analysis took place alongside data collection to allow questions to be refined and new avenues of inquiry to develop. In this context, a qualitative data analysis method was applied. Qualitative data analysis is a process that seeks to reduce and make sense of vast amounts of information, often from different sources, so that impressions that shed light on a research question can emerge; it is a process where descriptive information is used to offer an explanation or interpretation. The approach in this case is the so called “framework analysis”, which consists of examining the findings with a pre-defined framework, which reflects the aims, objectives and interests of the conducted data collection activity; this approach is closely aligned with policy and programmatic research which has pre-determined interests and allows to focus on particular answers and abandon the rest (Pope, Ziebland, & Mays, 2000).

Regarding the **quantitative data**, the secondary data collection was also focused on information that can be broken down geographically, through the use of microdata or statistics at district or even lower level. Data examples include: The Integrated Household Living Conditions Survey 5 (2016-2017); Rwanda Seasonal Agriculture Survey 2018; Rwanda Labor Force Survey 2017; among others.

### 3.1.2. Primary data collection

Regarding the **primary data collection**, a data collection tool was developed to collect data from the key informant interviews and focus group discussions. A digital data collection tool is the ideal given that this eliminates potential data entry errors and facilitates the data analysis process. Therefore, two digital templates of data collection were created for: i) the focus groups discussions; ii) the key informant interviews.

Table 1 and Figure 3 show data for each focus group discussions held in Mayaga region in 2020 in preparation for this report. A total of eight FGDs were held with different communities in the Mayaga region, in all four districts (Gisagara, Kamonyi, Nyanza and Ruhango). Main findings from FGDs held in the Mayaga region can be found in Table 2, and all templates for the eight focus groups with the registered answers can be found in Annex 5 (without some photos and participants' names for privacy reasons).

**Table 1 – Focus Group Discussions held in Mayaga region (2020).**

Districts	Sector	Cell	Community
Gisagara	Gikonko	Gikonko	Cyiri
	Musha	Bukinanyana	Musha
Kamonyi	Mugina	Cyeru	Mugina
	Nyamiyaga	Nkoto	Nyamiyaga
Nyanza	Kibirizi	Nyamiyaga	Kibirizi
	Muyira	Nyamiyaga	Muyira
Ruhango	Kinazi	Burima	Nyarugenge
	Ntongwe	Kebero	Cyeru

**Table 2 – Main findings from FGDs held in Mayaga region (2020).**

Topic	Main findings
Forest-related issues	<ul style="list-style-type: none"> <li>• Dependence on firewood for cooking</li> <li>• Limited accessibility to tree seedlings</li> <li>• Limited improved forest species that can adapt to the area</li> <li>• Limited knowledge in forest and woodlots management</li> <li>• High population density that influences deforestation</li> </ul>

Topic	Main findings
Agriculture-related issues	<ul style="list-style-type: none"> <li>• Soil erosion</li> <li>• Low crop productivity due to low yields</li> <li>• Lack of raw material for compost</li> <li>• No rainwater harvesting equipment</li> <li>• Delays in inputs distribution</li> <li>• Land scarcity</li> </ul>
Energy-related issues	<ul style="list-style-type: none"> <li>• High dependence on firewood yet forests are scarce</li> <li>• Limited energy efficiency options</li> <li>• Limited community capacity in efficient options</li> <li>• Need for community owned approaches</li> <li>• Low number of cooking stoves</li> </ul>
Issues that women face that can be addressed by project	<ul style="list-style-type: none"> <li>• Times spend in search for firewood, animal feeds</li> <li>• Income generation</li> <li>• Low level of awareness in environment conservation activities</li> <li>• Low level of involvement in restoration related projects</li> <li>• Advocacy for more women involvement in forest related matters</li> </ul>
How can the restoration program support directly the women in the communities	<ul style="list-style-type: none"> <li>• Support local women initiatives through capacity building and financial support</li> <li>• Advocate for their rights in matters related to rights to forest ownership</li> <li>• Incentives such as the distribution of small livestock</li> <li>• Planting of fruits trees</li> <li>• Provision of cooking stoves</li> </ul>
Significant issues facing youth that can be addressed by the project	<ul style="list-style-type: none"> <li>• Limited vocational training</li> <li>• High rates of unemployment</li> <li>• Use of young people in project related activities</li> </ul>
How can the restoration program support directly the youth in the communities	<ul style="list-style-type: none"> <li>• Through jobs created by project' activities</li> <li>• Support of local initiatives in employment diversification</li> <li>• Offer start-ups funds for micro projects related to forestry</li> <li>• Training on nursery and agriculture practices</li> </ul>

Source: Data collected in FGDs.

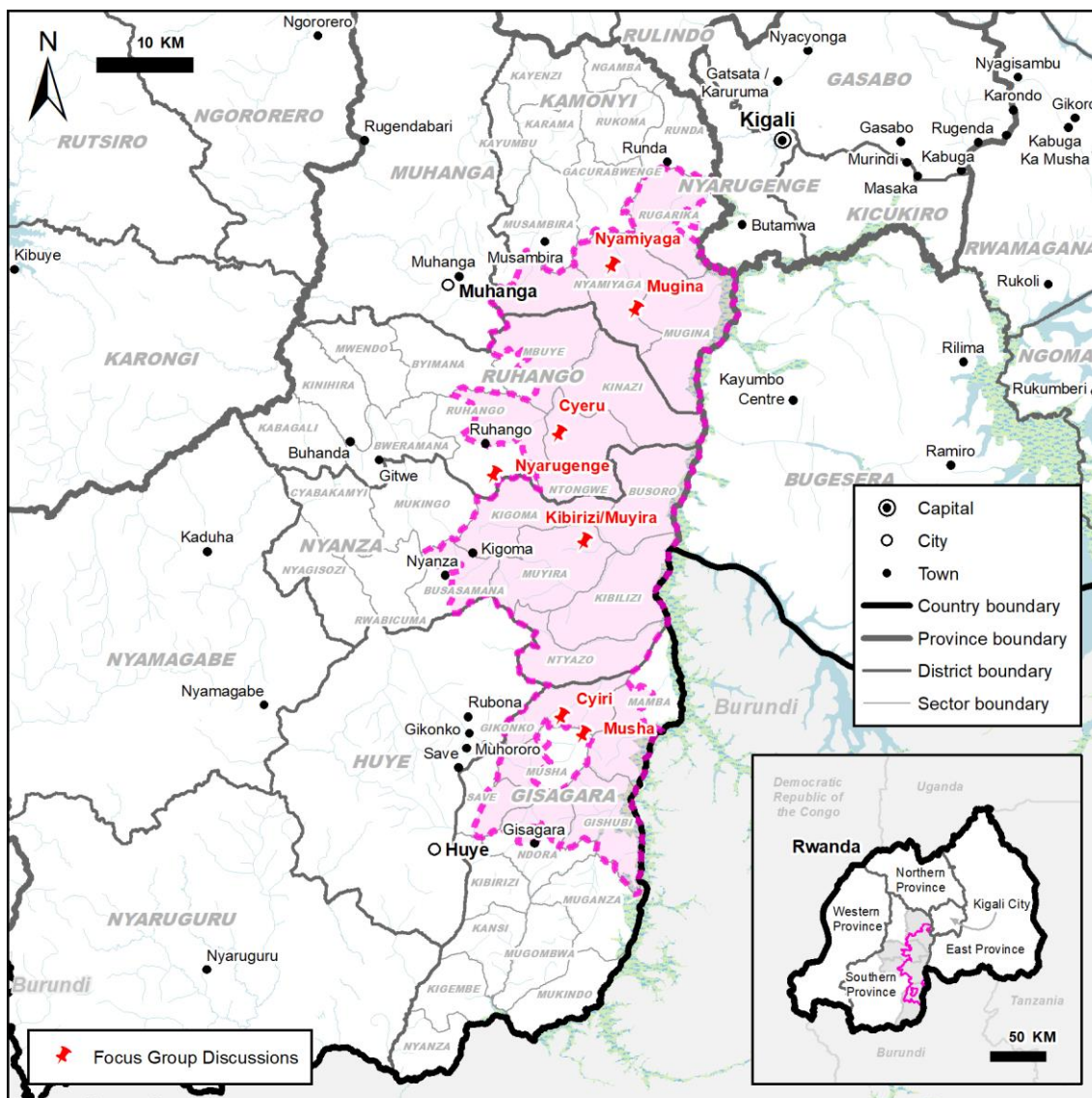


Figure 3 – Focus Group Discussions held in Mayaga region.

Furthermore, Table 3 and Figure 4 show data for each key informant interview held in Mayaga region in 2020 in preparation for this report. A total of 17 key informants were contacted by the consulting team, in the Mayaga region, in all four districts (Gisagara, Kamonyi, Nyanza and Ruhango). Main findings from conversations held in the Mayaga region can be found in Table 4.

**Table 3 – Key informant interviews held in Mayaga region (2020).**

Districts	Institution	Position
Gisagara	Gisagara District	Vice Mayor in Charge of Economic and Development
	Gikonko Sector	Executive Secretary
	Musha Sector	Executive Secretary
	Save Sector	Executive Secretary
Kamonyi	Kamonyi District	Vice Mayor in Charge of Economic and Development
	Mugina sector	Executive Secretary
	Nyamiyaga sector	Executive Secretary
Nyanza	Nyanza district	Vice Mayor in Charge of Economic and Development
	Muyira sector	Executive Secretary
	Kibirizi sector	Executive Secretary
	Busoro sector	Executive Secretary
	Kigoma sector	Executive Secretary
Ruhango	Ruhango district	Vice Mayor in Charge of Economic and Development
	Kinazi sector	Executive Secretary
	Mbuye sector	Executive Secretary
	Ntongwe sector	Executive Secretary
	Ruhango sector	Executive Secretary

**Table 4 – Main findings from key informant interviews held in Mayaga region (2020).**

Topic	Main findings
Forest-related issues	<ul style="list-style-type: none"> <li>Limited knowledge in forest and woodlots management</li> <li>Dependence on firewood for cooking which influence unsustainable harvesting of forest</li> <li>Limited knowledge and awareness on the benefits of forests other than firewood</li> <li>Limited tree seedlings (tree nurseries) for the communities</li> </ul>
Energy-related issues	<ul style="list-style-type: none"> <li>High dependence on firewood</li> <li>Limited energy efficiency options</li> <li>Limited community capacity in maintaining biogas resources</li> </ul>

Topic	Main findings
Issues that women face that can be addressed by project	<ul style="list-style-type: none"> <li>• Scarce firewood for cooking</li> <li>• Level of awareness in environment conservation activities</li> <li>• Low level of involvement in restoration related projects</li> <li>• Lack of women cooperatives/ or women in cooperatives</li> <li>• Forest ownership</li> </ul>
How can the restoration program support directly the women in the communities	<ul style="list-style-type: none"> <li>• Building capacity of women in conservation related activities</li> <li>• Provision of adequate improved cooking stoves</li> <li>• Creation of women business oriented cooperatives</li> <li>• Provision of jobs to women in all project activities</li> <li>• Planting of fruits trees which can reduce malnutrition problems</li> </ul>
Major concerns regarding the feasibility of the project	<ul style="list-style-type: none"> <li>• Low level of awareness about the project</li> <li>• Delay in nursery establishment</li> <li>• Covid-19 may affect community mobilization</li> <li>• Support to the decentralized actors</li> <li>• Project ownership by farmers</li> </ul>
Capabilities needed for the implementation and monitoring of the project	<ul style="list-style-type: none"> <li>• Capacity building in forest management and monitoring for district officials</li> <li>• Forest mapping equipment for monitoring</li> <li>• Strengthening of cooperatives</li> <li>• Capacity building for communities in forest-woodlots management</li> </ul>
How to boost employment in forestry, energy/ sustainable agriculture activities	<ul style="list-style-type: none"> <li>• Training of youth and women in tree nursery that can generate incomes in sustainable ways</li> <li>• Jobs provisions in restoration activities planned in this project</li> <li>• Use of local companies, cooperatives, and communities in all planned project activities</li> </ul>

Source: Data collected in key informant interviews.



### 3.1.3. Baseline reports

The *baseline study for “Forest Landscape Restoration in the Mayaga region project”* comprises the following individual reports, presented in the following sections, namely:

- 3.2 – Socioeconomic and Household Energy Report.
- 3.3 – Social and Environmental Safeguards Report.
- 3.4 – Vulnerability Assessment Report.
- 3.5 – Legal Policy and Institutional Report.
- 3.6 – Local Market Development Report.
- 3.7 – Sustainable Land Management & Sustainable Forest Management Practices Report.
- 3.8 – Gender Analysis Report.
- 3.9 – Forest Productivity Report.
- 3.10 – Biodiversity Report.
- 3.11 – Stakeholders Analysis Report.
- 3.12 – GIS Report.

Each report incorporates key findings from data collected in the field (FGDs and key informant interviews, see section 3.1.2), and provides conclusions and recommendations regarding the development of the “Forest Landscape Restoration in the Mayaga Region Project”.



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## **3.2. Socioeconomic and Household Energy Report**

### **3.2.1. Introduction**

This report presents information on the socio-economic conditions in Rwanda, in general, and more specifically in the target districts of Gisagara, Nyanza, Ruhango and Kamonyi, in the Mayaga region. In particular, the document examines the following: socioeconomic description of Mayaga region (population; housing; education levels; production and employment; agriculture); poverty; energy sources; forest benefits and restoration opportunities.

Data collection for the present reports includes desk data collection, key informant interviews and focus group discussions on the districts with communities in the target area (see section 3.1.2).

In 2020, around 1.5 million people lived in the four districts under analysis, with all districts with a population between 360 and 410 thousand. Rural population is the majority in the area under study (around 93% in 2012). Regarding type of habitat, imidugudu and isolated rural houses are the most common. Literacy levels are relatively low but improving in the young generations. Employment in agriculture is the most common, with the majority of agricultural households producing crops and livestock. Maize, cassava, and bush beans are the most important crops in the area.

Environmental issues affected 24% of households in Ruhango in 2016/17, with destructive rains being the most common problem. In the Mayaga region, poverty was unfortunately very common in 2016/17, predominantly in Gisagara. Regarding energy, solar panels were very common for lighting, with firewood being the primary fuel for cooking (2016/17). Forest cover in the districts under analysis represents around 13%-14% of total area, with the majority being plantations (2019).

Except for the present introduction, this section report is organized in five chapters:

- Chapter 3.2.2 presents the socioeconomic description of Mayaga region;
- Chapter 3.2.3 shows the poverty levels in the districts under analysis;
- Chapter 3.2.4 presents the energy sources used in the target area;
- Chapter 3.2.5 presents the forest benefits and restoration opportunities.
- Finally, recommendations are presented in the last chapter.

### 3.2.2. Socioeconomic description of Mayaga region

#### 3.2.2.1. Population

Total population in the Mayaga region was almost one million in 2002, as can be seen in Table 5. Ten years later, in 2012, population in the region grew to more than 1.3 million, averaging almost 3% per year growth in the decade. All four districts of the region (Gisagara, Kamonyi, Nyanza and Ruhango) had more than 300 thousand inhabitants in 2012, with Kamonyi totalling 340 thousand (the district with the largest population) and Ruhango having a total of almost 320 thousand people (the district with the smallest population). However, it is in Nyanza that the population grew more in the 2002-12 decade, 3.7% per year. Moreover, total population in the sectors of the FLR Mayaga Project was about 686 thousand, in 2012.

**Table 5 – Total population for districts within the study area (2002 and 2012).**

Districts/ total	Population		Density in 2012	Average annual growth rate 2002-12
	2002	2012		
Gisagara	262,128	322,506	474.6/ km <sup>2</sup>	+2.1%
Kamonyi	261,336	340,501	519.5/ km <sup>2</sup>	+2.7%
Nyanza	225,209	323,719	481.5/ km <sup>2</sup>	+3.7%
Ruhango	245,833	319,885	510.6/ km <sup>2</sup>	+2.7%
<b>Total</b>	994,506	1,306,611	496.1/ km <sup>2</sup>	+2.8%

Source: (NISR, 2014).

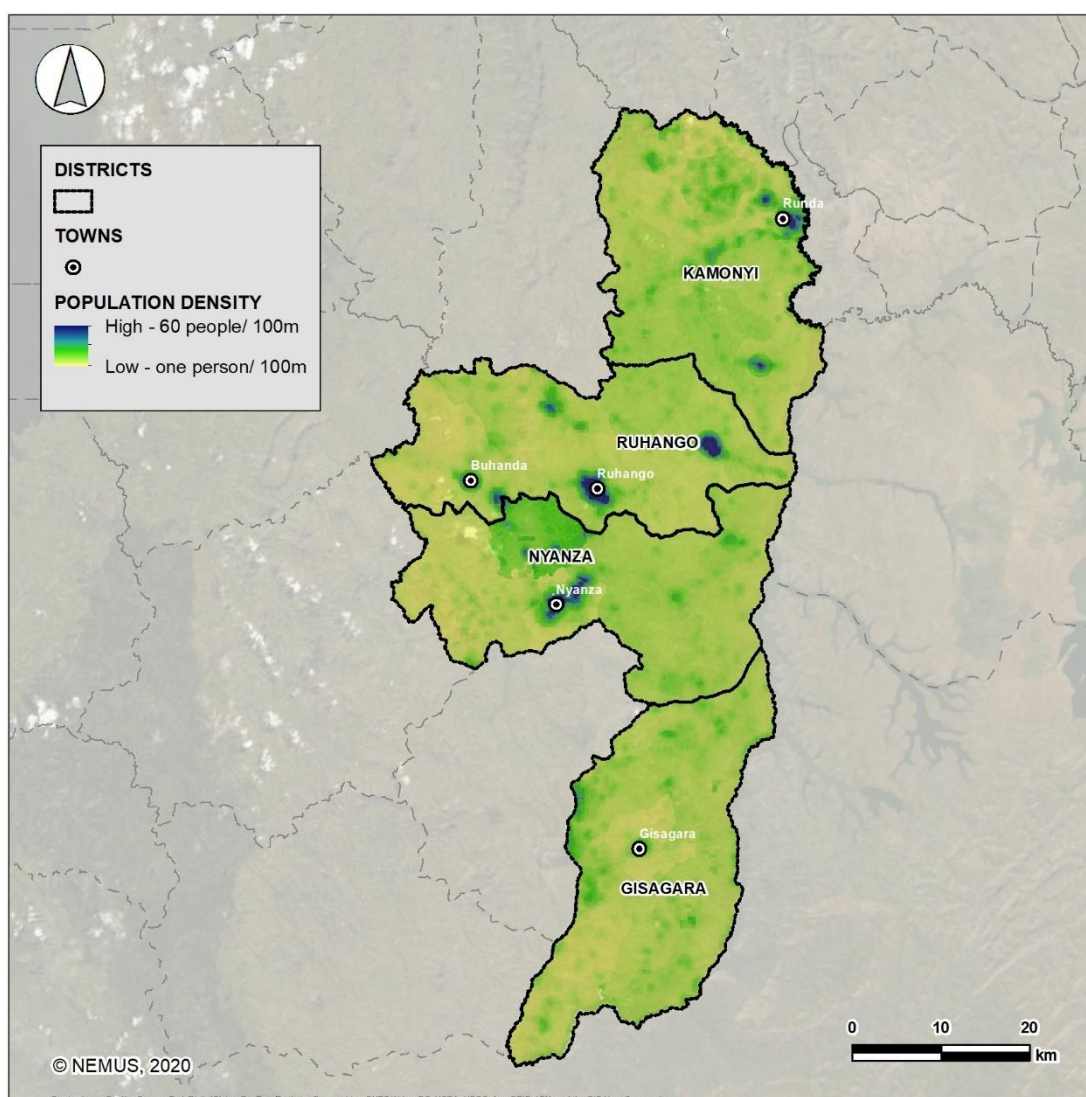
Regarding population density, this ranges from 475 people per km<sup>2</sup> in Gisagara to 520 people per km<sup>2</sup> in Kamonyi, with an average in the region of almost 500 people per km<sup>2</sup>, as can be seen in Table 5. Population projections for 2020 are presented in Table 6. Nyanza is set to be the most populous district of the four with more than 400 thousand inhabitants in 2020, according to the projections. Furthermore, total population in the sectors of the FLR Mayaga Project is estimated to be about 813 thousand, in 2020.

**Table 6 – Population estimates for districts within the study area (2020).**

Districts/ total	Population		Average annual growth rate 2012-20
	2012 (count)	2020 (projection)	
Gisagara	322,506	361,655	+1.4%
Kamonyi	340,501	401,234	+2.1%
Nyanza	323,719	410,812	+3.0%
Ruhango	319,885	374,661	+2.0%
<b>Total</b>	1,306,611	1,548,362	+2.1%

Source: Census (2020) and NISR (2014).

Figure 5 presents the population density in the four districts, and Maps 3a to 3d in Appendix present specific data for each district. Gisagara district does not present any areas with high population density, contrary to what happens in the remaining three districts. Kamonyi presents several high population density spots, most of them near the city of Kigali. Ruhango also presents some areas of high population density areas, in Ruhango city, Kinazi and Buhanda. Regarding the Nyanza district, the areas of high population density are in the surroundings of Nyanza city.



Source: (WorldPop, 2018).

**Figure 5 – Population density in Kamonyi, Ruhango, Nyanza and Gisagara.**

As can be understood from Figure 5, Gisagara is the most rural district of the four under study, with only 1.6% of urban population (around five thousand people) in 2012 (see also Table 7). Mostly because of its proximity with Kigali, Kamonyi district is, of the four, the most urbanized, with almost 12% of urban population in 2012. Nyanza and Ruhango districts are similar in this regard, with both averaging around 8% of urban population by 2012.

**Table 7 – Urban and rural population for districts within the study area (2012).**

Districts/ total	Population		Proportion (%)	
	Urban	Rural	Urban	Rural
Gisagara	5,011	317,495	1.6%	98.4%
Kamonyi	39,035	301,466	11.5%	88.5%
Nyanza	25,417	298,302	7.9%	92.1%
Ruhango	26,059	293,826	8.1%	91.9%
<b>Total</b>	<b>95,522</b>	<b>1,211,089</b>	<b>7.3%</b>	<b>92.7%</b>

Source: (NISR, 2014).

### 3.2.2.2. Housing

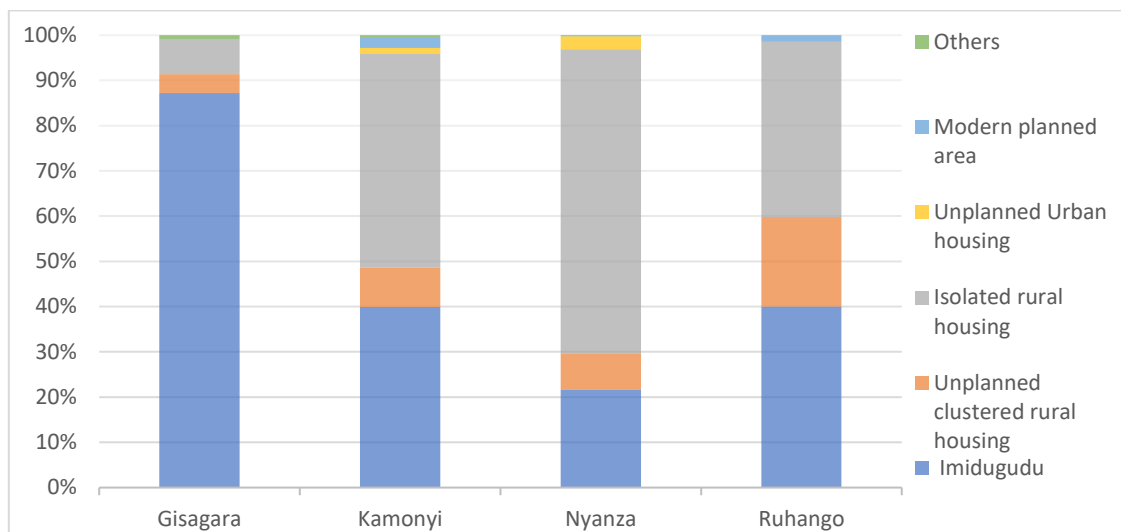
A total of 312 thousand households were living in the four districts under analysis in 2012. This number is expected to reach almost 370 thousand in 2020 (see Table 8). Housing conditions for the area under study are presented in the following figures (Figure 6 to Figure 9). In regard to type of house, *Imidugudu* is most common in Gisagara, whereas in the remaining districts, isolated or clustered rural houses are more usual. Urban housing or planned areas are almost insignificant in the districts under analysis.

**Table 8 – Households for districts within the study area (2020).**

Districts/ total	Households		Average size of household (2012)
	2012 (count)	2020 (projection)	
Gisagara	77,259	86,108	4.2
Kamonyi	80,468	95,532	4.2
Nyanza	77,522	100,198	4.1
Ruhango	76,968	89,205	4.2
<b>Total</b>	<b>312,217</b>	<b>368,658</b>	<b>4.2</b>

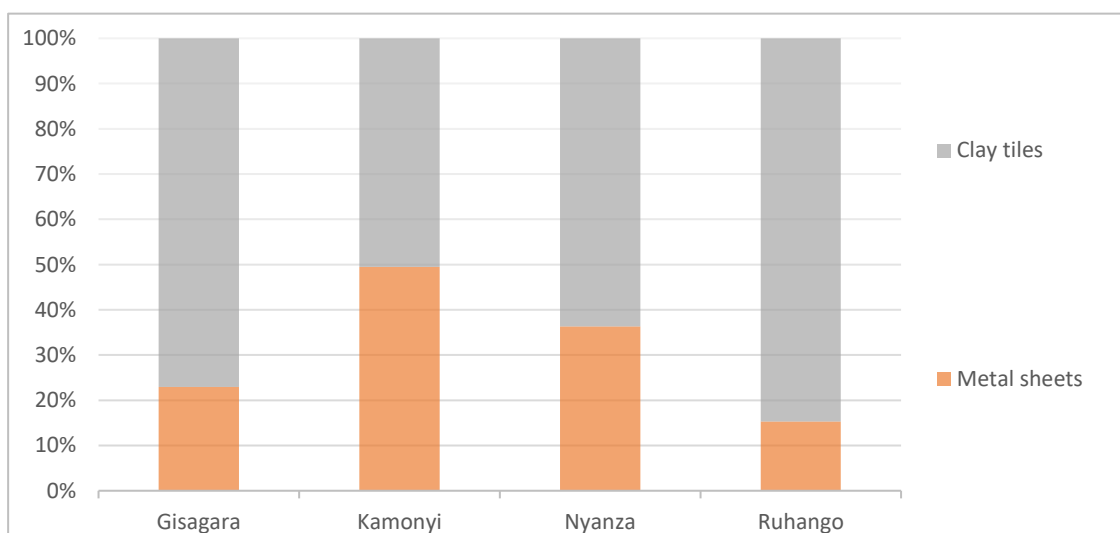
Source: Census (2020) and NISR (2014).

Regarding type of roofing, as Figure 7 shows, clay tiles are the most common in all districts, except in Kamonyi where metal sheets are equally used.



Source: (NISR, 2018b).

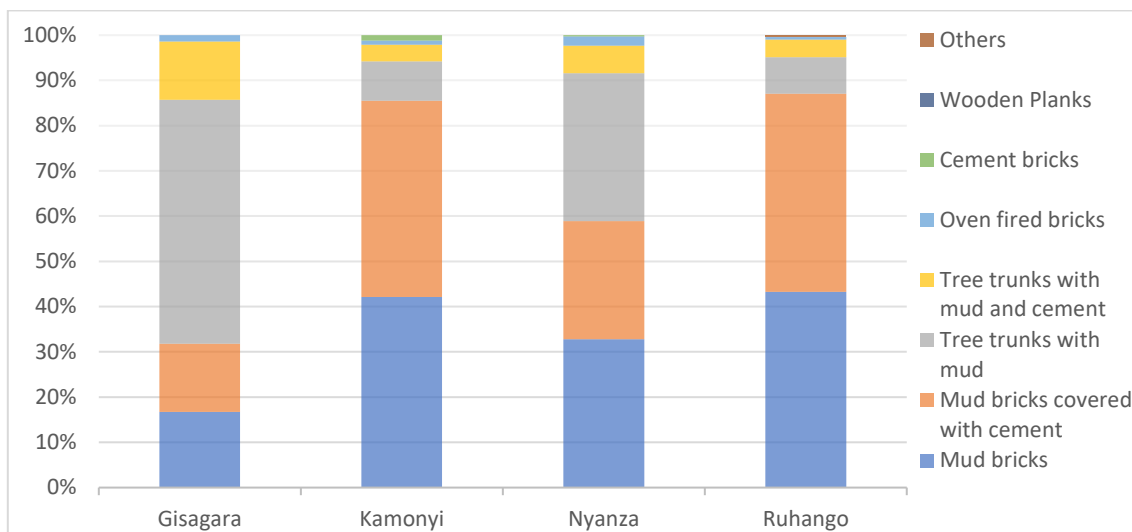
**Figure 6 – Type of habitat in Kamonyi, Ruhango, Nyanza and Gisagara.**



Source: (NISR, 2018b).

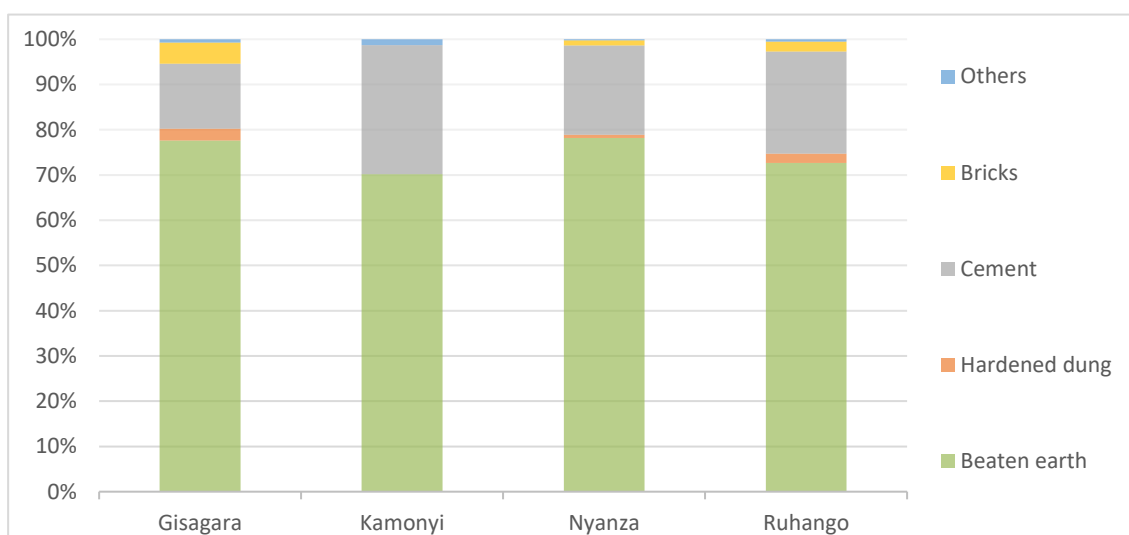
**Figure 7 – Type of roofing (dwelling) in Kamonyi, Ruhango, Nyanza and Gisagara.**

Wall material are relatively diverse in the districts (see Figure 8): tree trunks with mud are used by 54% of houses in Gisagara but only by less than 10% in Kamonyi and Ruhango; mud bricks with cement are relatively common in Kamonyi and Ruhango (43% and 44% of houses, respectively); and mud bricks without cement are also usual in Kamonyi (42%), Nyanza (33%) and Ruhango (43%). Finally, in relation to type of floor, beaten earth is the most common type in all districts (see Figure 9).



Source: (NISR, 2018b).

**Figure 8 – Type of wall material (dwelling) in Kamonyi, Ruhango, Nyanza and Gisagara.**



Source: (NISR, 2018b).

**Figure 9 – Type of floor material (dwelling) in Kamonyi, Ruhango, Nyanza and Gisagara.**

### 3.2.2.3. Education levels

With regard to literacy levels, Kamonyi presents the highest rate, with 77% of literacy rate for population aged 15 and above, and 92% for youth population (aged between 15 and 24 years of age) (see Table 9). The difference between literacy levels in the youth and with the general population is significant (almost 20 percentage points in Nyanza). Gender differences are also noteworthy: in youth (15 to 24 years) gender differences are

less prominent and more varied; whereas in the total population, females have in general a 4 to 5 percentage point disadvantage.

**Table 9 – Literacy rate (2016/2017).**

Districts	Youth population (15-24)			Population aged 15 above		
	Male	Female	Both	Male	Female	Both
Gisagara	75.0%	84.4%	79.7%	66.7%	62.7%	64.5%
Kamonyi	94.5%	90.2%	92.3%	79.0%	74.7%	76.7%
Nyanza	87.3%	96.9%	91.6%	74.9%	69.4%	72.1%
Ruhango	81.8%	80.6%	81.3%	73.0%	68.5%	70.5%

Source: (NISR, 2018b).

Ruhango presents the highest share of individuals between 16 and 30 with tertiary education (see Table 10), 3.5%, almost double the rate of Gisagara. However, this indicator does not match with the distribution of workers according to attained level of education (see Table 11).

**Table 10 – Population who attended tertiary education (2016/2017).**

Districts	Population aged between 16 and 30 who attended tertiary education		
	Male	Female	Both
Gisagara	0.4%	3.0%	1.8%
Kamonyi	2.2%	1.9%	2.1%
Nyanza	1.5%	2.6%	2.1%
Ruhango	2.4%	4.5%	3.5%

Source: (NISR, 2018b).

The level of education of workers reveals the more urban aspect of Kamonyi, as can be seen in Table 11. Although the majority of workers in the Kamonyi district had no formal education in 2016/17 (when the last household living conditions survey took place), this indicator, 52%, is the smallest of the four districts with a wide margin. Regarding workers with primary, post primary, lower secondary, or upper secondary education, Kamonyi leads the other three districts, with 31%, 5%, 4% and 6%, respectively. Regarding workers with university diplomas, Gisagara leads with 1.8%, followed by Kamonyi with 1.5%. Nyanza and Ruhango both show similar patterns regarding these indicators. Regarding workers' formal education, Gisagara obtain the least favourable indicators but for the indicator of workers with superior education.

As stated before, the level of education of workers translates the rurality and urbanity of these four districts almost completely. Kamonyi stands out, Nyanza and Ruhango show

comparable indicators, and Gisagara has a large majority of workers without formal education, which is comprehensible considering that 98% of the population lives in rural areas.

**Table 11 – Distribution of workers according to attained level of education (2016/2017).**

Districts	Level of education					
	None	Primary	Post primary	Lower Secondary	Upper Secondary	University
Gisagara	71.9%	19.9%	2.3%	1.2%	2.9%	1.8%
Kamonyi	52.2%	31.3%	5.0%	4.0%	6.0%	1.5%
Nyanza	63.4%	24.4%	4.3%	3.7%	3.0%	1.2%
Ruhango	60.0%	27.6%	4.8%	2.8%	3.4%	1.4%

Source: (NISR, 2018b).

#### 3.2.2.4. Production and employment

Another indicator which reflects the greater rurality of Gisagara is the distribution of workers into broad economic activities (as can be seen in Table 12). More than  $\frac{3}{4}$  of the working population in Gisagara worked in agriculture, with 17% working in services and the remaining 7% in industries. This indicator (7% of workers in industry in Gisagara) in 2016/2017 is the lowest of the four districts, with Kamonyi presenting an indicator of 12%, Nyanza and Ruhango 11%. However, working to population ratio is the highest in Nyanza and Gisagara (90% and 89%, respectively) and the lowest in Kamonyi and Ruhango (84% and 83%, respectively).

**Table 12 – Distribution of workers and broad economic activity (2016/2017).**

Districts	Working population ratio	Broad economic activity		
		Agriculture	Industry	Services
Gisagara	88.6%	76.0%	7.2%	16.8%
Kamonyi	83.5%	71.7%	12.4%	15.9%
Nyanza	89.8%	72.0%	10.8%	17.2%
Ruhango	83.1%	74.8%	11.0%	14.2%

Source: (NISR, 2018b).

Not surprisingly, wage and non-wage farmers account for the majority of workers in all four districts (see Table 13). Wage non-farm jobs account only 11% in Gisagara and 19% in Kamonyi. Moreover, independent non-farmers account to 8% of all workers in Kamonyi, double the same indicator for Gisagara and Nyanza. Unpaid non-farm jobs

(unpaid work not performed in agriculture, e.g., unpaid family work) account for a residual 1% of all cases in Kamonyi, as well in Gisagara and Nyanza.

**Table 13 – Distribution of workers according to job status in main usually job (2016/2017).**

Districts	Distribution of workers according to job status in main usually job				
	Wage farm	Wage non-farm	Ind.* farmers	Ind.* non-farmers	Unpaid non-farm
Gisagara	24.5%	10.7%	60.1%	3.9%	0.8%
Kamonyi	13.5%	19.0%	58.6%	7.8%	1.1%
Nyanza	14.4%	13.8%	67.4%	3.8%	0.6%
Ruhango	17.7%	11.2%	65.4%	5.4%	0.3%

Note: \* - Independent.  
Source: (NISR, 2018b).

### 3.2.2.5. Agriculture

Giving the importance of agriculture in these four districts, it is imperative to present some data regarding this sector. Maps 4a to 4d in Appendix present specific data for each district regarding agricultural areas (open areas; seasonal and perennial agricultural areas), based on 2018 land use and land cover.

It is possible to see in Table 14 that the great majority of agricultural households produce both crops and livestock. Moreover, although some agricultural households produce crops exclusively (20% in Gisagara and 25% in Nyanza, for example), it is more uncommon for agricultural households to focus exclusively on livestock production.

**Table 14 – Main agricultural activity and sex of agricultural households' population (2017).**

Districts	Main agricultural activity			Sex (agricultural households' population)	
	Crop production	Livestock production	Both	Male	Female
Gisagara	19.9%	0.6%	79.6%	47.1%	52.1%
Kamonyi	22.7%	2.1%	75.2%	46.9%	53.1%
Nyanza	25.0%	1.7%	73.3%	49.0%	51.0%
Ruhango	19.1%	1.0%	79.9%	47.1%	52.9%

Source: (NISR, 2018a).

The most important crops in the four districts under study in the season A of 2017, considering the percentage of households producing, are: bush beans; maize; cassava; sweet potato, soybean and climbing bean (see Table 15). Nevertheless, there are some regional disparities, as well as some commonalities:

- Bush bean is the most common crop in all four districts, with more than 80% of all agricultural households producing this type of bean in the first season of 2017;
- Maize is more common in the south part of the Mayaga region, with 43% of Gisagara and 37% of Nyanza agricultural households producing this cereal in the in the first season of 2017;
- Cassava is more common in Ruhango (56%) than in any other district (regarding the first season of 2017);
- Sweet potato is relatively common in all districts, although only 28% of Gisagara agricultural households produced it in 2017's first season (37% in Kamonyi);
- Climbing bean is fairly widespread in Gisagara, Nyanza and Ruhango;
- Soybean is one of the most common crops in Ruhango (27% of agricultural households produced it in 2017), and also fairly widespread in the remaining districts (16%, 19% and 15% of agricultural households produced it in Gisagara, Kamonyi and Nyanza, respectively).

As can be noticed when checking the most important crops, market-oriented crop production is common in all four districts under analysis (see Table 16). Around 62% to 65% of all agricultural households produced market-oriented crops in Ruhango district in 2017. Additionally, this indicator was greater than 55% in all districts in 2017, for both agricultural seasons.

**Table 15 – Percentage of crop-producing household per different crop in season A (2017).**

Crop	Gisagara	Kamonyi	Nyanza	Ruhango
<b>Cereals</b>				
Maize	42.7%	26.1%	37.1%	11.0%
Sorghum	1.8%	-	1.8%	0.2%
Paddy rice	8.3%	2.4%	3.8%	1.4%
Wheat	-	-	-	-
<b>Tubers and roots</b>				
Cassava	19.5%	23.6%	35.2%	56.2%

Crop	Gisagara	Kamonyi	Nyanza	Ruhango
Sweet potato	27.8%	37.4%	34.3%	31.3%
Irish potato	2.9%	2.4%	0.9%	3.6%
Yams and taro	1.6%	1.7%	3.1%	8.2%
<b>Banana</b>				
Cooking banana	9.5%	7.7%	2.5%	0.1%
Dessert banana	2.5%	2.0%	1.0%	2.0%
Banana for beer	9.7%	15.8%	1.8%	3.3%
<b>Legumes and pulses</b>				
Bush bean	84.9%	92.1%	89.5%	81.0%
Climbing bean	17.9%	8.1%	15.9%	22.4%
Pea	0.4%	1.5%	3.9%	2.7%
Groundnut	5.3%	11.2%	7.3%	15.9%
Soybean	16.4%	18.7%	14.8%	26.9%
Vegetables	1.4%	2.6%	2.3%	0.6%
Fruits	0.2%	0.3%	-	-

Source: (NISR, 2018a).

Other interesting indicator in Table 16 reveal that, although not a widespread institution, cooperatives (or agricultural associations) are relatively widespread in Gisagara (26% of agricultural households belonged to one). The same cannot be said of Ruhango agricultural households. Gisagara also leads in the case of agricultural extension received in 2017 (42% of agricultural households), which is almost double the same indicator for Ruhango (22%) and almost five times the percentage for Nyanza (9%).

Another indicator where Gisagara leads is in the percentage of agricultural households who requested a loan in 2017 (4.5%), 50% more than the same indicator for Ruhango (3%) and almost double the case in Kamonyi and Nyanza (2.5% and 2.4%, respectively). In contrast, 5% of all agricultural households in Nyanza received government funds for agricultural purposes, which is more than double the case of Kamonyi (2.1%), and around five times the cases of Ruhango (1.1%) and Gisagara (0.8%). Additionally, Ruhango's farmers did receive more support from NGOs in 2017 than any other district. Finally, in Season B, almost half of Nyanza's agricultural households used improved seeds. This indicator was only 33% for Ruhango and Gisagara, and 28% for Kamonyi.

**Table 16 – Percentage of agricultural household regarding different indicators (2017).**

Indicator (% of agricultural households)	Gisagara	Kamonyi	Nyanza	Ruhango
Engaged in market-oriented crop production (Season A/ B)	59.2%/ 59.9%	56.4%/ 55.4%	57.6%/ 61.1%	64.8%/ 62.4%
Belonging to agricultural cooperative or association	26.1%	15.5%	13.0%	8.4%
With at least one person who received agricultural extensions	42.2%	34.4%	8.9%	22.0%
Who requested agricultural loan	4.5%	2.5%	2.4%	3.0%
Who receive funds for agricultural purpose from government	0.8%	2.1%	5.0%	1.1%
Who receive funds for agricultural purpose from NGOs	0.3%	0.3%	-	1.2%
Who used improved seeds (Season A/ B)	27.7%/ 33.4%	8.5%/ 27.9%	23.8%/ 47.6%	5.1%/ 33.0%

Source: (NISR, 2018a).

Regarding the **type of ownership of agricultural land**, in the majority of cases, the land cultivated was inherited and was owned by the households cultivating it (see Table 17). That was the case for 73% of households cultivating any parcel in Gisagara in 2016/17. That indicator was lower for the remaining districts, 63% in Kamonyi, 64% in Nyanza and 68% in Ruhango. Moreover, there were also many cases of families cultivating land that had previously been purchased: this was the case for 40% of households cultivating any parcel in Gisagara, and around 34% to 36% in the remaining districts. Additionally, 40% of households cultivating any parcel in Nyanza stated that at least one parcel was received (for free or as a loan). That indicator was lower for the remaining districts (Gisagara – 34%; Kamonyi – 22%; Ruhango – 24%).

Leased parcels were also very common in most districts, mostly in Gisagara, Nyanza and Ruhango. Finally, regarding the type of ownership of agricultural land, sharecrops were relatively common (15% of households in Kamonyi were cultivating at least one share parcel in 2016/2017; 11% in Gisagara, 10% in Nyanza and 8% in Ruhango).

**Table 17 – Land indicators (2016/2017).**

Indicator	Gisagara	Kamonyi	Nyanza	Ruhango
Total no. of HHs cultivating land for crop production (10 <sup>3</sup> )	76	85	73	68
<b>% of HHs cultivating any parcel that was:</b>				
Inherited	72.9%	63.1%	64.1%	68.2%
Purchased	39.8%	36.3%	34.2%	35.4%
Received as gift	7.3%	6.1%	13.0%	10.5%
Received for free use or as loan	33.8%	21.5%	39.5%	23.9%
Appropriated	1.0%	0.6%	0.5%	0.0%
Sharecropped	11.2%	15.1%	10.4%	8.2%
Leased	34.2%	15.1%	30.8%	30.3%

Source: (NISR, 2018b).

Comparing land rights between 2013/14 and 2016/17, it is possible to observe some key differences: in Gisagara and Nyanza, more than ¾ of families had land rights (to sell or use it as a guarantee), but that proportion was only 72% and 68% in Kamonyi and Ruhango, respectively (see Table 18). Fertilizer use is presented in Table 19. As can be seen, chemical fertilizers are the most used, with more than 1/3 of households using it in Gisagara. Organic fertilizer was less common, but still utilized by at least 10% of households in all districts.

**Table 18 – Households with the right to sell any land or use it as a guarantee (2016/2017).**

Districts	Households (%)	
	2013/14	2016/17
Gisagara	80.1%	86.5%
Kamonyi	88.4%	72.1%
Nyanza	73.8%	77.0%
Ruhango	79.6%	67.5%

Source: (NISR, 2018c; UNDG, 2020).

**Table 19 – Fertilizer use (2016/2017).**

Districts	% of HHs incurring expenditure on fertilisers	
	Chemic fertilizer	Organic fertilizer
Gisagara	38%	10%
Kamonyi	15%	10%
Nyanza	21%	11%
Ruhango	18%	13%

Source: (NISR, 2018a).

Regarding environmental issues, Table 20 presents the most common problems per district and affected households. Environmental issues affected almost ¼ of households in Ruhango, the majority of problems related to destructive rains. This was the more common problem in all districts. Furthermore, mountain slides were responsible for 21% of problems resulting from environmental issues in Kamonyi; and floods were particularly worrisome in Gisagara. Moreover, in 2016/17, regarding land indicators, irrigated land represented from 4% to 10% of total cultivated land in the area (see Table 21). Land protected against soil erosion varied between 62% in Kamonyi and 83% in Nyanza; with land affected by consolidation varying between 2% in Kamonyi and 11% in Gisagara.

**Table 20 – Problems resulting from environment issues (2016/2017).**

<b>Dwellings affected by environmental destruction</b>	<b>Gisagara</b>	<b>Kamonyi</b>	<b>Nyanza</b>	<b>Ruhango</b>
Affected households (%)	6.2%	16.0%	15.5%	23.8%
Floods (% of total)	21.7%	3.5%	1.4%	12.5%
Mountain slides (% of total)	0.0%	20.7%	2.8%	2.5%
Destructive rains (% of total)	77.3%	72.2%	80.9%	69.9%
Others (% of total)	1.0%	3.7%	14.9%	15.1%

Source: (NISR, 2018b).

**Table 21 – Land indicators (II) (2016/2017).**

<b>Indicator</b>	<b>Gisagara</b>	<b>Kamonyi</b>	<b>Nyanza</b>	<b>Ruhango</b>
Land irrigated (%)	5.9%	8.1%	3.6%	9.5%
Land protected against soil erosion (%)	66.0%	61.8%	82.5%	74.1%
Land affected by land consolidation (%)	11.1%	2.4%	5.2%	6.0%

Source: (NISR, 2018b).

### 3.2.3. Poverty

The measure of poverty in Rwanda is equal to real consumption per adult equivalent. For each household, total consumption was obtained by adding up the amounts spent, and goods produced and consumed at home. The total household consumption is then divided by the number of adult equivalents to arrive at a measure of consumption per adult equivalent. This measure is then adjusted for regional and monthly differences in prices and expressed in the prices of January 2014. The headcount poverty rates are

obtained by comparing real consumption per adult equivalent to the poverty line (RWF 159,375 per year) or the extreme poverty line (RWF 105,064). At the national level, the poverty rate was 38.2% in 2016/17, around one percentage point less than the indicator of 2013/14. Extreme poverty rate was 16% in 2016/17, almost the same as three year prior (NISR, 2018c).

**Table 22 – Households in poverty and extreme poverty (2013/14; 2016/17).**

Districts	Households (%) in			
	Poverty		Extreme poverty	
	2013/14	2016/17	2013/14	2016/17
Gisagara	53.3%	55.6%	20.6%	25.6%
Kamonyi	25.9%	22.3%	6.0%	8.7%
Nyanza	38.0%	46.5%	17.6%	16.0%
Ruhango	37.8%	38.0%	28.2%	15.0%

Source: (NISR, 2018c; UNDG, 2020).

In the Mayaga region, poverty was unfortunately very common in 2016/17, predominantly in Gisagara. In this district, more than half (56%) of households lived in poverty, more 2 percentage points than in 2013/14.

The same occurred in 47% of households in Nyanza (more 9 percentage points than in 2013/14) and 38% of households in Ruhango (equal to the 2013/14 value). Only in Kamonyi, poverty rates were less than  $\frac{1}{3}$  in 2016/17 (and 4 percentage points less than in 2013/14). Moreover, more than  $\frac{1}{4}$  of households in Gisagara were living in extreme poverty in 2016/17, almost three times the case of Kamonyi.

### 3.2.4. Energy

Focusing on the **sources of fuel** for lighting, as can be seen in Table 23, solar panels were very common in all four districts in 2016/17. Moreover, electricity was only used for lighting in around 20% of households in Ruhango, as well as 18% in Kamonyi, but only in 14% and 10% of households in Nyanza and Gisagara. In this last district, firewood was still used in 12% of households. Batteries were also fairly common in Nyanza.

**Table 23 – Primary fuel used for lighting (2016/2017).**

Fuel	Gisagara	Kamonyi	Nyanza	Ruhango
Electricity	10.3%	18.2%	14.3%	19.8%
Oil lamp	0.2%	3.5%	0.3%	2.2%
Firewood	11.7%	0.6%	1.6%	2.2%
Candle	3.3%	8.3%	2.1%	2.5%
Lantern	2.0%	5.1%	4.9%	4.6%
Solar panel	64.6%	57.7%	62.5%	65.0%
Batteries	7.0%	6.0%	14.3%	3.4%
Others	1.0%	0.7%	0.0%	0.4%

Source: (NISR, 2018b).

Regarding **sources of fuel** for cooking, as can be seen in Table 24, firewood was used by the overwhelming majority of households in 2016/17 in all districts under analysis, with around 95% of households using wood in Gisagara and Ruhango, as well as 94% in Nyanza and 89% in Kamonyi. Charcoal was relatively common in Kamonyi, where 10% of households use this source for cooking. In the remaining districts, charcoal was less used for cooking, with only 6% of Nyanza households and 3% of households in Gisagara and Ruhango reportedly using it for cooking.

**Table 24 – Primary fuel used for cooking (2016/2017).**

Fuel	Gisagara	Kamonyi	Nyanza	Ruhango
Firewood	95.9%	88.8%	93.5%	94.8%
Charcoal	3.2%	10.4%	5.5%	3.1%
Crop waste	0.0%	0.7%	0.0%	0.8%
Others	0.5%	0.0%	1.0%	1.3%

Source: (NISR, 2018b).

With regard to type of cooking stove, the majority of households in all districts used three stone cookstoves in 2016/17, ranging from 58% in Gisagara to 66% in Nyanza (see Table 25). Self-built stoves were somewhat common in Gisagara (28% of households); whereas efficient cookstoves were relatively usual in Kamonyi (24%) and Ruhango (19%) and less in Nyanza (14%). Moreover, the area usually used for installation of the cooking stove was a separate dwelling, in Kamonyi, Nyanza and Ruhango. In contrast, in Gisagara, the cooking stove was installed in the main dwelling in 53% of cases.

Table 25 – Type of cooking stove and area of installation (2016/2017).

Indicator	Gisagara	Kamonyi	Nyanza	Ruhango
<b>Type of stove</b>				
Three stone	57.7%	61.7%	65.7%	63.0%
Self-Built	27.9%	1.6%	7.0%	12.6%
Manufactured	0.5%	0.0%	0.0%	0.0%
Charcoal/fire	7.9%	12.8%	12.0%	4.5%
Efficient cookstove	5.9%	23.8%	14.1%	18.6%
Other	0.1%	0.0%	1.2%	1.3%
<b>Area of installation</b>				
In dwelling, not in sleeping area	52.7%	14.4%	25.2%	21.6%
In dwelling, in a sleeping area	13.0%	9.3%	8.4%	6.2%
In a separate dwelling	28.7%	61.1%	56.0%	68.7%
In a veranda	0.0%	0.2%	0.2%	0.4%
Outdoors	5.6%	15.0%	9.2%	2.0%
Other	0.0%	0.0%	1.0%	1.1%

Source: (NISR, 2018b).

Several initiatives for promoting improved cookstoves have been carried out in the region:

- The Community-assisted Access to Sustainable Energy (CASE) project distributed almost 7,000 improved cookstoves in Gisagara (5,921 of which were distributed freely) in 2010 and 2011, and provided training to more than 2,000 people in improved stove making in the same district (*Munyehirwe and Munyampundu, 2011*);
- An improved cookstoves program executed by the Energy, Water and Sanitation Authority in collaboration with Practical Action Consultancy – the program introduced in 2011 the production and distribution of a new improved charcoal stove – the *Canarumwe ivuguruye* – for mainly urban customers, and two improved firewood stove models (the Canarumwe and Tekavuaba ceramic liners destined to be integrated in a mud hearth as fixed firewood stove) (*Butare and Munyampundu, n.d.*);

- In 2013, the government – with support from SNV – started pilots in support of the development of the improved stove market, building on the market for the same type of improved stoves that Practical Action Consulting (PAC) had initiated; The “Market based for sustainable access to cooking solutions” project funded by the World Bank helped cooperatives in the country to produce almost more 25 thousand *Canarumwe* stoves in 10 districts until 2014 (SNV Rwanda, 2015);
- The project “One Improved-Stove Per Household Initiative to Enhance Forests Conservation” distributed around 1,800 affordable improved cookstoves in Gisagara district (300 free to poor households) (Karenzi, 2019).

### 3.2.5. Forest benefits and restoration opportunities

#### 3.2.5.1. Forests in Mayaga

Between 1960 and 2007, natural forest area declined in Rwanda by about 64 per cent, from 659,000 ha in 1960 to 240,747 ha in 2007 (REMA, 2009). Deforestation was a result of the anarchy and state collapse in 1994, and the aftermath, with the return of refugees, for land for settlements, agriculture and livestock, and firewood. Indeed, an estimated 90% of the population and 70% of the country’s land area are devoted to subsistence agricultural production, while a further 16% of land area is allocated to fuel wood and timber production to meet the country’s energy needs (MINIRENA, 2014). Nduwamungu (2011) demonstrated that growing population pressure on natural resources has resulted in Rwanda in various forms of land degradation, soil erosion, deforestation, loss of biodiversity and pollution.

Currently most of the remaining natural forests are protected either as national parks or as protection forest reserves. Between 2007 and 2015, the area under forest cover increased in Rwanda from 240,747 ha to 696,402 ha, which represented 29.5% of the country’s surface. According to the Rwanda Forest Cover Mapping Report of November 2019 (Ministry of Environment, 2019), the forest cover in the four target districts amounted to 36,131 ha in 2019, of which 95% was man-made plantations (see Table 26). Forest cover in all four districts ranged from 13% to 14% of total area.

**Table 26 – Forest cover per district (2019).**

Districts	Forest cover					
	Forest Cover Type (ha)				Total	
	Plantation	Natural/ Bamboo	Shrub	Wooded savannah	Ha	%
Gisagara	8,214	7	798	1	9,201	13.3%
Kamonyi	8,796	49	166	5	9,016	13.8%
Nyanza	8,375	11	560	4	8,949	13.3%
Ruhango	8,958	0	7	0	8,965	14.3%

Source: (Ministry of Environment, 2019).

Furthermore, in the last decade there has been an increase in forest area in all districts under analysis, as can be seen in Table 27. Afforestation rates were superior to deforestation rates in all areas, ranging from 29% in Nyanza to more than 40% in Ruhango.

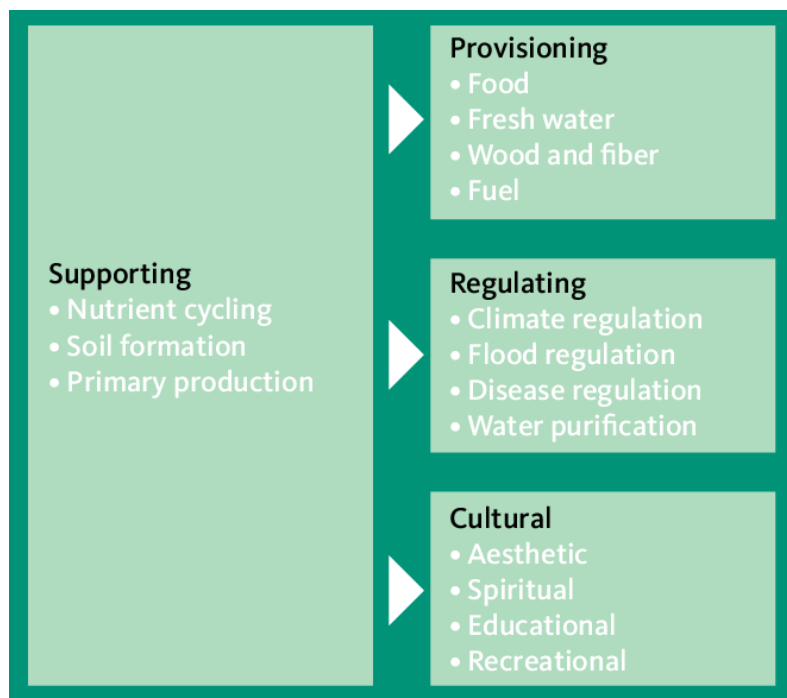
**Table 27 – Deforestation and afforestation (2009 – 2019).**

Districts	Deforestation and afforestation					
	Forest Cover (ha)		Deforestation		Afforestation	
	2009	2019	Ha	%	Ha	%
Gisagara	8,204	9,021	2,701	32.9%	2,901	35.4%
Kamonyi	7,630	9,016	1,321	17.3%	2,214	29.0%
Nyanza	7,623	8,949	1,611	21.1%	2,682	35.2%
Ruhango	6,860	8,965	1,540	22.4%	2,824	41.2%

Source: (Ministry of Environment, 2019).

### 3.2.5.2. Benefits provided by forests in Mayaga

Ecosystems provide significant services. As illustrated in Figure 10, forest ecosystems offer provisioning services, such as the production of food, wood, fiber, or fuel; regulating services, such as the control of climate and diseases and protection against weather events; cultural services, such as aesthetic, spiritual, educational, or recreational benefits; and supporting benefits, such as soil formation or nutrient cycling.



Source: (Samuelson, et al., 2015).

**Figure 10 – Forest ecosystem services.**

## A) Provisioning services

Forests provide a wide variety of ecosystem services in Mayaga. To begin with, they provide provisioning services. This includes both timber products, such as firewood, timber for construction and furniture and charcoal, and non-timber forest products (NTFP), such as essential oils, tannins, resins, gums, medicinal plants, spices, insecticides, soap substitutes, dyes, cork, wild fruits, mushrooms, and honey. Desk review, interviews and focus groups have provided some information on the products provided by the forests in Mayaga.

With regard to timber products, more than 90% of people in the districts under analysis used firewood for cooking, as stated before (see Table 24). Moreover, traditional cooking stoves were the most common, with efficient cookstoves reaching only between 6% (in Gisagara) to 24% (in Kamonyi) of households in Mayaga region. Other provisioning services provided by forest products are related to the production of timber for construction and also for furniture production.

According to the Rwanda Supply Master Plan for Fuelwood and Charcoal, woodfuel is the most important provisioning service provided by forests in Mayaga region (see Table

28 and Table 29). Moreover, construction represents only about 1% to 2% of total consumption of wood in the region. In a business-as-usual scenario, total consumption of wood products in the area could increase from 28% to 48% in a decade. Only with a more ameliorated demand scenario (assuming an increased use of improved stoves, higher efficiency in charcoal production and a higher use of LPG in urban areas), could the increase in consumption of wood products be more sustainable in the region.

**Table 28 – Total household wood consumption (2009 – 2020 scenarios).**

Districts	Woodfuel (oven dry ton.)			Construction (oven dry ton.)		
	2009	2020		2009	2020	
		BAU scenario	AME scenario		BAU scenario	AME scenario
Gisagara	113,466	152,213	133,605	2,265	1,684	1,684
Kamonyi	108,000	139,196	125,485	2,250	1,662	1,662
Nyanza	113,865	169,821	137,779	1,952	1,464	1,464
Ruhango	111,848	153,783	125,991	1,977	1,370	1,370

Notes: BAU – Business as usual; AME – Ameliorated scenario.

Source: (MINIRENA, 2013).

**Table 29 – Total wood consumption (2009 – 2020 scenarios) (oven dry ton.).**

Districts	Household sector total			Total (household and others)		
	2009	2020		2009	2020	
		BAU scenario	AME scenario		BAU scenario	AME scenario
Gisagara	115,731	153,897	135,289	117,630	157,155	137,466
Kamonyi	110,250	140,858	127,147	111,852	143,136	128,733
Nyanza	115,817	171,285	139,243	122,368	181,547	145,762
Ruhango	113,825	155,153	127,361	122,683	167,927	137,160

Notes: BAU – Business as usual; AME – Ameliorated scenario.

Source: (MINIRENA, 2013).

The estimated balance of supply and demand for wood products for 2009, for the districts under analysis is shown in Table 30, assuming three scenarios for plantation productivity (low productivity of 11.2 m<sup>3</sup> ha<sup>-1</sup> yr<sup>-1</sup>; medium productivity of 16.3 m<sup>3</sup> ha<sup>-1</sup> yr<sup>-1</sup>; high productivity of to 21.4 m<sup>3</sup> ha<sup>-1</sup> yr<sup>-1</sup>). Under these conditions, all districts would have a deficit with low productivity; Gisagara and Kamonyi would have a surplus with medium productivity; and only Ruhango would have a deficit with high productivity (reducing forest area that way). As the forest cover variation analysis shows (see Table 27), forest

cover increased in the last decade in all districts, which was essentially due to the growth of planted areas.

**Table 30 – District-level supply/demand balance in 2009 (10<sup>3</sup> tons, oven dry).**

Districts	2009 balance		
	Low prod.	Medium prod.	High prod.
Gisagara	-15.8	11.2	38.1
Kamonyi	-12.5	9.0	30.6
Nyanza	-41.1	-18.4	4.4
Ruhango	-49.1	-30.6	-12.2

Notes: estimated balance for 3 productivity variants  
Source: (MINIRENA, 2013).

Data collected through interviews and focus groups coincide in the key timber products obtained from forests in the target area. In private lands, the main timber products are firewood and timber for construction of houses. Timber for medium quality furniture comes from agroforestry or more generally from isolated trees. State and district forests are not regularly exploited. While they do not typically enter directly in the community provision dynamic, trees are cut in these areas illicitly.

Furthermore, according to focus groups and interviews, availability of timber products is decreasing. Main reasons provided by focus groups were: smaller area of forest due to large-scale deforestation; restrictions on forest products/ use by government rules; increased demand for the product due to greater collection of outsiders for own use; and climate change (floods/ less rain).

Unfortunately, statistical data on non-timber forest products is non-existent for Mayaga. Focus groups point out that some honey is produced in the area and also indicate that forests provide fruits and grazing for livestock, but statistical data on this does not exist. Furthermore, according to data from the inventory of biodiversity in natural remnant forests of Rwanda (RECOR/ CARPE, 2011), trees harvested from the natural forests in the region are sold locally and traded internationally for its essential oil. Roots and wood are scented and used to make cosmetics and perfume.

## **B) Regulating and cultural services**

According to data from the inventory of biodiversity in natural remnant forests of Rwanda, by the Central African Regional Programme for Environment and the Rwanda

Environmental Organization (RECOR/ CARPE, 2011), Mayaga region harboured 0.14% of natural forests in 2011, including the Kibirizi-Muyira forests. These are two remnant natural forests, savanna relict forests, with savannah plant species. They host a large biodiversity, supporting approximately 123 plant species (some of them are endemic species), 79 bird species. Moreover, these forests are home to different mammals. As a result, these natural forests provide an important regulating service, maintaining nursery populations and habitats (Including gene pool protection). Moreover, these biodiversity hotspots provide also other important services regarding scientific investigation or the creation of traditional ecological knowledge.

Furthermore, these natural forests (and also plantations) provide important regulation services, specifically the regulation of the chemical composition of the atmosphere (e.g., carbon retention). Erosion control, buffering of mass movements, pollination, and pest control, are other examples of important regulation services provided by natural forests, as well as plantations.

### 3.2.5.3. Existing analyses of forest services in Rwanda

Regarding **forest services**, the Albertine Rift Conservation Society (ARCOS) conducted a Total Economic Valuation (TEV) study of the Mukura Forest landscape in 2014 (located in the west of Rwanda). As can be seen in Table 31, the study estimated that the monetary and non-monetary benefits of this forest at a total of Rwanda Francs (RWF) 1,168 million (around US\$ 1.7 million). These benefits translated in a value of around US\$ 800 per hectare per year, a value comparable to most productive forest landscapes.

The most important use values in regard to total economic valuation were: water for consumption (both domestic, urban supply and for livestock); and firewood. Important non-use value included aesthetic value/ ecotourism, and carbon storage and sequestration.

**Table 31 – Total Economic Valuation in the Mukura Forest landscape (2014).**

Resource/ Benefit	10 <sup>6</sup> FRW	10 <sup>3</sup> US\$
<b>Use values</b>	-	-
Water for domestic use	349	514
Water urban supply/ gravity scheme	43	63
Water for livestock	85	125
Firewood	70	104

Resource/ Benefit	10 <sup>6</sup> FRW	10 <sup>3</sup> US\$
Bean stakes	9	13
Honey	6	9
Obuhura	1	1
Grass for grazing and beds for cattle	3	4
Ropes and fibres	3	4
Wild fruits	6	8
Vegetables	2	3
Mushrooms	2	3
Medicinal plants	5	8
Bush meat	6	9
Poles for fencing	11	17
Hand sticks	1	2
Handicrafts	1	1
Timber	17	26
<b>Sub-Total Use Values</b>	622	914
<b>Non-use values</b>	-	-
Aesthetic Value/Ecotourism	440	647
Carbon Storage & Sequestration	27	40
Existence Value	2	4
Pharmaceutical value	2	3
Landslide and flood control	57	85
Pollination	17	25
<b>Sub-Total Non-use values</b>	546	803
<b>Total</b>	1,168	1,717

Source: (ARCOS, 2014).

Masozera (2008) estimated the ecosystem services value of the Nyungwe National Park to be about USD 285 million per year (watershed protection: USD 118 million per year; biodiversity protection USD: 2 million per year; carbon sequestration and storage: USD 162 million per year; Recreation and tourism: USD 3 million per year), about USD 2,938 per hectare (97,000 hectare park).

In addition, the contribution of forest to water regulation and flood risk reduction was estimated at approximately USD 14 million per year for two export-oriented tea states in the southwest of the country (MINIRENA, 2014). The same study found that these states require 60 million cubic meters of water per year and would incur in USD 82 million in additional costs on water treatment without this water supply. Estimates have also been provided for hydropower, which provides more than half of Rwanda's current power

output and is slated to more than double its capacity if government goals for rural electrification are realized. The annual cost associated with excess sedimentation of just one hydropower plant in Gishwati, in the north of Rwanda, is approximately USD 1.15 million, with an associated energy loss of 38% of total production (MINIRENA, 2014). Reforestation and afforestation along the water catchment would increase water availability and reduce soil erosion and therefore soil sedimentation, reducing the abovementioned costs. It would also reduce the frequency and intensity of floods that can damage infrastructure.

Arguments can also be provided for agriculture. MINIRENA (2014) shows that 40 per cent of cultivated land in Rwanda is at risk of severe erosion and requires anti-erosion investments before cultivation begins. Some reports have estimated that as much as 10 tons of soil is lost per hectare each year, flowing directly into rivers and streams that are not adequately protected. Forests contribute to retain soil, reducing the costs in agriculture associated with soil erosion.

Moreover, some figures can also be provided regarding tourism. FAO (2017) highlights that the tourism industry accounts for a significant portion of foreign revenue. Estimates of tourism revenue in 2007 and 2008 make up almost as much as the entire export base – USD 209 million in 2008 compared to USD 262 million for official exports. Local investment in tourism was also significant: RWF 140 billion, or 16 per cent of total local investment between 2000 and 2009, going to hotels, restaurants, and tourism.

Furthermore, Dawson & Martin (2015) assessed the contribution of ecosystems to human wellbeing in Western Rwanda, focusing on forests, but not providing numbers. Importantly, however, they found that the cultural services go beyond worship, recreation and inspiration and are linked to the use or consumption of material things, with an overlap of provisioning and cultural services. In this sense, they found that only a single regulating service was widely perceived to be of benefit to participants: 81% of all households regarded the influence of forests on climate as beneficial for agriculture (through rainfall and frosts creating soil moisture), and also for health (the cold creating unfavourable conditions for malarial mosquitos). In this sense, climate regulation was a key factor explaining the presence of dense human populations at the forest edge in Rwanda's mountains. By the same token, fear of disrupting local rainfall patterns was the major reason that many people supported forest protection despite the loss of ecosystem services (collection of firewood, for example) due to strict conservation.

A recent analysis of forest ecosystem services was done by Bagstad (2019). According to the results (Table 32), forests in Rwanda provide important services regarding carbon storage, sediment export and retention, and water services.

**Table 32 – 2015 physical supply table – contribution per ecosystem unit (Rwanda).**

Indicator	Forest	Shrubland	Total
Carbon storage (T)	17.1%	13.1%	30.1%
Sediment export (T)	28.1%	12.4%	40.5%
Sediment retention (T)	9.9%	5.8%	15.7%
Water yield (m <sup>3</sup> / year)	38.8%	5.7%	44.5%
Local recharge (m <sup>3</sup> / year)	25.7%	10.8%	36.4%
Quick flow (m <sup>3</sup> / year)	38.3%	5.1%	43.4%
Nitrogen export (kg)	7.4%	6.9%	14.3%
Phosphorous export (kg)	1.7%	2.4%	4.1%
Nitrogen load (kg)	1.5%	1.4%	2.9%
Phosphorous load (kg)	4.6%	5.7%	10.3%

Source: Bagstad (2019).

**Table 33 – 2015 physical supply table in selected districts.**

Indicator	Gisagara	Kamonyi	Nyanza	Ruhango
Carbon storage (T)	10,244,624	10,984,599	11,054,940	9,573,915
Sediment export (T)	354,504	365,744	303,409	288,455
Sediment retention (T)	6,253,919	6,981,985	6,167,093	5,346,526
Water yield (m <sup>3</sup> / year)	204,378,088	161,977,838	211,913,241	192,318,307
Local recharge (m <sup>3</sup> / year)	73,054,222	53,562,757	84,399,693	87,070,921
Quick flow (m <sup>3</sup> / year)	120,913,098	102,688,094	115,957,388	93,291,903
Nitrogen export (kg)	437,492	337,281	399,332	333,911
Phosphorous export (kg)	218,242	167,828	199,030	166,587
Nitrogen load (kg)	1,173,891	1,110,743	1,124,750	1,093,570
Phosphorous load (kg)	580,131	548,080	553,865	541,509

Source: Bagstad (2019).

In the districts under analysis, nitrogen and phosphorous loads and exports were very significant in 2015 (ranging from 16% to 22% of Rwanda's total). Changes in the last decades (1990-2015) in Table 37 also show the significant growth of nitrogen and phosphorous loads and exports in the four districts.

Carbon storage in the four districts in 2015 represented 9% of Rwanda's total (see Table 33), and the change since 1990 was also significantly negative (-22.2% in Ruhango to -37.7% in Gisagara). Sediment retention also had a negative change from 1990 to 2015, but much lower (-2.0% in Nyanza to -2.6% in Kamonyi).

**Table 34 – 1990 – 2015 % of change.**

Indicator	Gisagara	Kamonyi	Nyanza	Ruhango
Carbon storage (T)	-37.7%	-25.6%	-25.6%	-22.2%
Sediment export (T)	63.0%	102.7%	70.1%	68.4%
Sediment retention (T)	-2.2%	-2.6%	-2.0%	-2.1%
Water yield (m <sup>3</sup> / year)	13.8%	2.4%	6.1%	1.0%
Local recharge (m <sup>3</sup> / year)	-11.9%	-22.2%	-16.3%	-15.3%
Quick flow (m <sup>3</sup> / year)	-5.1%	36.1%	25.3%	34.8%
Nitrogen export (kg)	917.5%	1,163.9%	1,052.6%	1,003.1%
Phosphorous export (kg)	1,133.6%	1,413.7%	1,162.6%	1,086.3%
Nitrogen load (kg)	612.5%	578.2%	588.1%	577.0%
Phosphorous load (kg)	911.6%	1013.8%	914.0%	870.9%

Source: Bagstad (2019).

### 3.2.5.4. Economic analysis of forest landscape restoration opportunities

#### A) Forest landscape restoration opportunities

In line with the assessment conducted by MINIRENA, the International Union for the Conservation of Nature (IUCN) and the World Resources Institute (WRI) in 2014, there are basically four main opportunities for restoring forest landscapes in Mayaga and increase the services they provide. Given the limited availability of land – there is little room if any for new woodlots – and the importance of agriculture for its population, the most significant opportunity in Mayaga is agro-forestry. This would also provide important specific benefits, such as increased soil fertility for crops and if focused on fruit trees, contribution to food security. Fodder trees would also contribute to livestock ranging. Agro-forestry can be promoted on all types of cultivated and pastureland, but primarily in steeply sloped land in the region.

The second opportunity resides in improving the productivity of existing woodlots and plantations. FAO estimates that average Eucalyptus yield in Rwanda is around 9.5 m<sup>3</sup>

per ha per year, which is well below the regional average. Small woodlots have even lower productivity.

Furthermore, there is room for restoring sensitive sites, such as steep slopes, ridge tops and riparian areas, as required by law, reducing soil erosion and sedimentation (improving soil retention and water quality). Commercial native timber and non-native fruit tree species could be used, as well as bamboo along water courses. Finally, there is opportunity to restore degraded natural forests, which could improve biodiversity and encourage eco-tourism.

MINIRENA (2014) identified how many hectares are suitable in the country for each of these opportunities. It conducted this exercise also for the South of the country. In these areas, there is potential for agroforestry in 328,914 ha, for improving management in 104,224 ha, for protective forests in 45,199 ha and for restoration of natural forest in 7,163 ha. That is, agroforestry accounts for 68% of identified opportunities; improving management, for 21%; protective forests, for 9%; and restoration of natural forests, for 2%. Table 35 presents this information together with the figures at the national and south levels. As shown, the South of the country comprises a great portion of existing forest landscape restoration opportunities in Rwanda (around 32%).

**Table 35 – Forest landscape restoration opportunities in Rwanda/ South (2014).**

Intervention		Total	South	
Type	Specific intervention	National	Ha	%
Agroforestry	On steeply sloping land	705,162	250,504	36%
	On flat and gently sloping land	405,314	78,410	19%
	<b>Total</b>	<b>1,110,476</b>	<b>328,914</b>	<b>30%</b>
Improve management	Existing woodlots	255,930	96,343	38%
	Existing timber plantations (eucalyptus and pine)	17,849	7,881	44%
	<b>Total</b>	<b>273,779</b>	<b>104,224</b>	<b>38%</b>
Protection and restoration of natural forests	100m buffer of closed natural forest	3,456	315	9%
	Restore degraded forest in parks/reserves	10,477	6,848	65%
	<b>Total</b>	<b>13,933</b>	<b>7,163</b>	<b>51%</b>
Protective forests	Protective forests on ridge tops with very steep slopes (>30°/55%)	10,745	2,762	26%

Intervention		Total National	South	
Type	Specific intervention		Ha	%
	Protective forests on ridge tops with steep slopes (12-30°/20-55%)	31,695	11,266	36%
	20-m riparian buffer – replace eucalyptus with native species	3,152	1,454	46%
	20-m riparian buffer – reforest non-forested areas	19,586	6,873	35%
	50-m buffer of wetland perimeters	57,362	22,844	40%
	<b>Total</b>	<b>122,540</b>	<b>45,199</b>	<b>37%</b>
<b>Total</b>		<b>1,520,728</b>	<b>485,500</b>	<b>32%</b>

Source: (MINIRENA, 2014).

District Development Strategies of the four districts (2018-2024) provide clear paths for forest cover growth, both by agroforestry and also by increasing planted forestry (see Table 36:

- **Gisagara** – overall objective of area covered by forestry and agroforestry will be increased by 13,430 ha to be planted:
  - Output 11.5 – Productive and Sustainable soil erosion infrastructures increased: number of ha of radical terraces protected with Pennisetum and agro forest trees developed and valorised: overall objective of 1,250 (2018-2024);
  - Output 16.1 – Forest cover productivity increased and maintained: 150 hectares of public forests rehabilitated; 930 ha of forestry planted; 2,100 hectares of agro-forestry planted; 15,600 ornamental trees planned in households/public places;
- **Kamonyi** – interventions to create 80 ha of radical terraces with agro forestry trees; planting of 1,100 ha of forestry and 5,600 ha of agroforestry; and rehabilitation of 250 ha of forestry;
- **Nyanza** – priority of increasing the surface covered by forestry (500 new ha) and surface covered by agro-forestry (4,000 new ha);
- **Ruhango** – priority for increase forest cover to 25% by strengthening forestation and reforestation area focusing on commercial forests; and for planting agroforestry trees to control soil erosion & soil nutrient (16,794 ha will be covered).

**Table 36 – District-level goals for forestry and agroforestry (2018-2024).**

Districts	Forestry and agroforestry growth goals (ha)		
	Forestry	Agroforestry	Total
Gisagara	1,080	3,350	4,430
Kamonyi	1,100	5,600	6,700
Nyanza	500	4,000	4,500
Ruhango	w.i.	w.i.	5,000

Notes: w.i. – without information.

Source: DDS Gisagara, Kamonyi, Nyanza and Ruhango.

## **B) Economic analysis of forest landscape restoration opportunities**

There is no detailed information available to assess the cost and benefits of forest landscape restoration opportunities in the four target districts. However, existing literature provides interesting insights. MINIRENA (2014) estimated the net present value (NPV) and return on investment (RoI) of different approaches to forest landscape restoration in Rwanda. In particular, it focused on six types of ecosystems (deforested and degraded land, woodlots, traditional agriculture land, agroforestry, protective forests, and natural forests) and six types of transitions:

- Deforested and degraded land to protective forests on ridge tops and steep slopes;
- Deforestation and degraded land to naturally regenerated forests;
- Poorly managed woodlots to well managed with best practices;
- Poorly managed woodlots to well managed with spacing only;
- Traditional agriculture to agroforestry with maize;
- Traditional agriculture to agroforestry with beans.

The assessment considered monetary and non-monetary costs, and labour and non-labour costs, such as the costs of material inputs (seedlings, fertilizer, and small agriculture equipment). In terms of benefits, it considered four primary benefits: i) timber yields; ii) crop yields; iii) prevented erosion, contributing to access to clean water; and iv) carbon sequestration. The first two benefits are private, and the last two, public. The study assumed that increased forest cover increases timber yields, prevents erosion, and increases carbon sequestration. In addition to this, agroforestry in agricultural land improves crop production. Improvement management of existing woodlots reduces

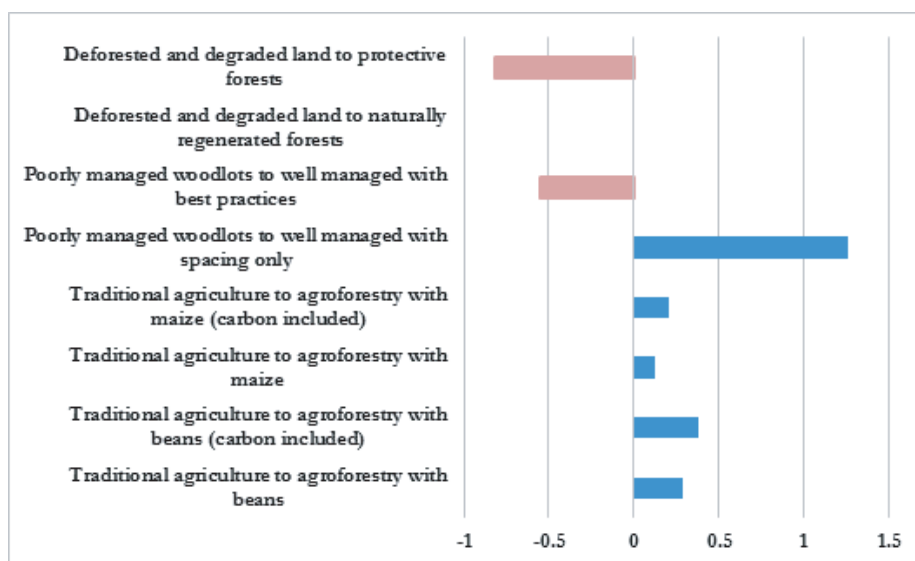
pressure to collect firewood from natural and protective forests, therefore contributing to biodiversity conservation.

On this basis, the study examined the net present value of the transitions presented above from a landowner perspective. It found that the restoration transition from agriculture to agroforestry with beans has the highest NPV of all of the restoration interventions compared to traditional agriculture with beans. While agroforestry with maize creates on average higher NPV than traditional agriculture with maize, it may not provide a net benefit in each and every case.

Regarding woodlots, the study found that improving the management of existing eucalyptus woodlots for fuel wood and timber with erosion prevention measures and tighter spacing would create between RWF -85,295 to RWF 386,896 /ha in additional revenue over a twenty-eight-year rotation period, respectively, compared to poorly managed eucalyptus woodlots. In contrast, the NPV of the transition from poorly managed eucalyptus woodlots to improved management with best practices is negative. Indeed, while it involves a large amount of labour to establish fire lines and erosion-prevention ditches, the increase in timber yield is not enough to compensate for the additional expenses.

Regarding the transition from deforested land to forests, the study found that the transition to naturally regenerated forest has the potential to pay for itself through sale of carbon credits on the voluntary market if high levels of carbon dioxide are sequestered. However, the transition to protective forest has a negative NPV if carbon is the only source of revenue, even under the most optimistic ecological scenarios.

The assessment reached similar conclusions regarding ROI. It found that, from the perspective of a private landowner, the transition from traditional agriculture to agroforestry has a positive ROI, regardless of the crop being considered and whether carbon revenue is included. Indeed, while the ROI does change, in a range from 12 per cent to 38 per cent, it is positive in all cases. The ROI of improving the management of woodlots is positive if it only considers spacing and negative if it follows all best practices. The study also found the transition from deforested and degraded land to naturally restored forests has an average ROI of zero per cent as the carbon revenues are great enough to just offset the costs in most cases. Finally, according to this assessment, the transition from deforested land to protective forests on ridge tops and steep slopes has a negative ROI. Return on investment results for restoration options can be seen in Figure 11.



Source: (MINIRENA, 2014).

**Figure 11 – Return on investment for restoration transitions.**

Given these results, the fact that the District Development Strategies of the four districts consider primarily the option for agroforestry is not a surprise. At least 13,000 hectares of agroforestry are planned for the four districts for the next four years.

### 3.2.6. Conclusion and recommendations

In 2020, around 1.5 million people lived in the four districts under analysis, with all districts with a population between 360 and 410 thousand. Rural population is the majority in the area under study (around 93% in 2012). Regarding type of habitat, imidugudu and isolated rural houses are the most common. Literacy levels are relatively low but improving in the young generations. Employment in agriculture is the most common, with the majority of agricultural households producing crops and livestock. Maize, cassava and bush beans are the most important crops in the area.

Environmental issues affected 24% of households in Ruhango in 2016/17, with destructive rains being the most common problem. In the Mayaga region, poverty was unfortunately very common in 2016/17, predominantly in Gisagara. Regarding energy, solar panels were very common for lighting, with firewood being the primary fuel for cooking (from 89% in Kamonyi to 96% in Gisagara) (2016/17).

Forest cover in the districts under analysis represents around 13%-14% of total area, with the majority being plantations (2019). Furthermore, 2015 physical supply data

shows that forests provide significant services in the area, namely carbon storage, sediment retention, and also provide important ecosystem services regarding the water supply. However, since 1990 these services show a negative evolution in all districts (Gisagara, Kamonyi, Nyanza and Ruhango). The majority of forest landscape restoration opportunities in the region are related to agroforestry, but also to improve management. The investment in these opportunities can bring about positive changes in the ecosystem services listed above, stopping the negative evolution observed since the 1990s. Moreover, investments in education and vocational training, in energy sustainability and transition (primary regarding energy for cooking), and in increased marketing and business opportunities are viewed as essential to promote human development and sustainability in the region. The following actions/ strategies are listed to tackle these issues.

The following strategies can contribute to **increase human development** and decrease poverty and extreme poverty in the districts of Gisagara, Nyanza, Ruhango and Kamonyi:

- Design and implement additional measures to increase farm income:
  - Promote agricultural cooperatives and associations;
  - Promote training for cooperatives and associations on sustainable agricultural practices and agricultural practices to increase yields with a sustainable approach;
  - Increase extension services capacity (number of human resources);
  - Promote direct grants to small agricultural households or the distribution of improved seeds;
  - Promote distribution of agricultural tools at low prices/ free for poor households;
  - Support climate smart agriculture;
  - Support afforestation and reforestation initiatives as well as the improved management of existing woodlots;
  - Create an equitable sharing of carbon revenues – create a benefit allocation system for communities and agricultural households who engage in agroforestry;
  - Create a payment for ecosystem services pilot scheme for poor households who engaged in sustainable agricultural practices in a cell or district.

- Design and implement strategies to increase off-farm income:
  - Assess the non-farm potential of the Mayaga region, in general, and each of the target districts, in particular; design local economic development strategies; and implement them;
  - Expand vocational training in key sectors, inclusively regarding the energy sector (production of sustainable charcoal; local production of improved cookstoves), and agriculture sector (improve market conditions, and cooperatives management).
- Increase access to social services:
  - Increase access to education and health.
  - In addition, target social security programmes, such as VUP and performance contracts, to poor households;
  - Introduce and promote family planning;
  - Promote gender equality (specific recommendations for this are provided in the corresponding report).

Furthermore, two cross-cutting strategies should be promoted to support the previous aspects:

- Promote rural group settlements. Increased densities enable a more efficient provision of education and health services as well as infrastructure services, such as water, energy, transport, and adequate waste management. In addition, increased densities boost economic activity given agglomeration and scale economies. Furthermore, increased densities liberate land for agriculture and forestry.
- Promote private sector development. Specific recommendations for this are provided in the Local Market Development Report (see chapter 3.6).

Regarding **energy**, the recommendations are the following:

- Promote electricity grid connections to rural group settlements;
- Distribution of solar panels and batteries at low prices for local families;
- Distribution of energy saving lamps at low prices for local families;
- Give local entrepreneurs capacity building and technical knowledge in order to promote local production of efficient cookstoves;
- Promote sustainable charcoal production in local communities, agricultural cooperatives, and associations;

- Promote crop waste use for cooking with distribution of technical specifications and tools adapted to the local culture and language.

Finally, regarding **forests**, the following recommendations are provided:

- **Raise awareness** on the services provided by forests:
  - Advocate for strengthening ongoing national efforts on national environmental accounting. Advocate for developing a forest component, and to the extent possible regional assessments (for the Southern Province, if not for Mayaga);
  - Advocate for comprehensive economic studies on forestry in Mayaga, at least as comprehensive as MINIRENA (2014);
  - Advocate for DFMPs having a more comprehensive approach in terms of the transitions and the benefits they consider. In this sense, economic analyses should include the restoration of natural forests and agroforestry, and a range of services covering NTFP and regulating, cultural and supporting services, in addition to the provision of timber;
  - Train district officials (and increase the number of district officials regarding forests), including but not limited to the district forest officers and extension services, to inform planning as well as improve the information that is disseminated to farmers;
  - Conduct awareness raising campaigns for farmers, focusing on cooperatives and associations, where the costs of investing on FLR can be shared and therefore (with a lower upfront investment) the short-term is less urgent. These organizations also support other farmers, so the opportunities for scaling up are greater. Awareness raising efforts could include the design and broadcasting of a FLR module for community radios. Short Message Service (SMS) could also be used. These trainings should highlight the benefits of a diverse range of trees, including native species.
- **Promote innovative economic mechanisms:**
  - As noted by MINIRENA (2014: 19) “restoring degraded land requires policies to correct the market failures leading to degradation and preventing restoration”. This implies addressing challenges regarding the distribution of costs and benefits of FLR. At this regard, payment for ecosystem services mechanisms or systems can help transfer resources

from those that benefit from the services to those that bear the costs of ensuring these are provided;

- Promote eco-tourism as a mechanism to transfer resources from those that enjoy forests to the individuals and groups that bear the cost of maintaining them. Eco-tourism is particularly promising around existing natural forests. In this sense, in Mayaga the most promising areas are Kibirizi and Muyira forests, in Nyanza, and in Rukaragata forest, in Kamonyi;
- Register carbon sequestration benefits and try to get compensation for this global benefit and distribute directly to local communities and agricultural households.
- Promote **local market development** and private sector development (see also chapter 3.6 and 3.7):
  - Promote land consolidation programmes;
  - Provide climate information, both long-term and, more importantly, short, and medium term, so that economic players can make informed decisions, reducing uncertainty;
  - Carry out land improvement techniques to restore land;
  - Promote organic and non-organic pesticides to fight pests and diseases;
  - Organize campaigns to cut and extract the roots of Lantana camara;
  - Strengthen coordination mechanisms, including public private partnerships;
  - Strengthen technical capacities through training and learning by doing (adjusting to that end tendering processes);
  - Promote access to financial services, transportation, marketing, commercialization, and administrative and legal support.

### **3.3. Social and Environmental Safeguards Report**

#### **3.3.1. Introduction**

This report presents the updated Social and Environmental Standard Plan (SESP) for the project “Forest Landscape Restoration in Mayaga” (the “Project”), in accordance with the Social and Environmental Standards (SES) of the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF). Moreover, this document is an updated and reviewed version of the 2018 report.

The SESP aims to reduce and minimize risks and adverse social or environmental impacts of the Project within and on bordering populations. In particular, this SESP drives to:

- List all potential environmental and social impacts that the implementation of the project could potentially have;
- Rate the likelihood of the listed negative impacts materializing during the implementation of the project using high, medium, and low likelihood ratings;
- Rate the level of impact of the listed negative social and environmental impacts using low, moderate, and high-level ratings;
- Develop brief draft mitigation strategies for the listed negative environmental and social impacts that were rated as moderate to high likelihood of occurring and with a high level of impact;
- Identify any actions that might be needed to further address any opportunities identified during an environmental and social screening of the project proposal.

The report is structured in eight chapters. Chapter 3.3.2 includes UNDP’s SES and examines the standards that might apply and be triggered to the Mayaga landscape restoration project. Chapter 3.3.3 presents key environmental and social impacts and mitigation or enhancement measures comprising the assessment of positive impacts and enhancement measures and potential negative impacts and mitigation measures. Chapter 3.3.4 presents the likelihood rate of negative impacts (those rated moderate and/or high). Chapter 3.3.5 displays the Monitoring plan of potential negative impacts. Finally, chapter 3.3.6 concludes.

### 3.3.2. Social and Environmental Standards

UNDP's Social and Environmental Standards (SES) reinforce UNDP's commitment to mainstream social and environmental sustainability in its Programs and Projects to support sustainable development. The SES presents an integrated framework for achieving a consistent level of quality in UNDP's programming.

The objectives of the SES are to:

- Strengthen the social and environmental outcomes of UNDP Programs and Projects;
- Avoid adverse impacts to people and the environment;
- Minimize, mitigate, and manage adverse impacts where avoidance is not possible;
- Strengthen UNDP and partner capacities for managing social and environmental risks;
- Ensure full and effective stakeholder engagement, including through a mechanism to respond to complaints from project-affected people (if any).

UNDP's overarching policy and principles are human rights; gender equality and women's empowerment; and environmental sustainability (UNDP, 2014) . The following are the seven project-level standards in which environmental and social aspects and considerations are regrouped at project level:

1. Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management;
2. Standard 2: Climate Change Mitigation and Adaptation;
3. Standard 3: Community Health, Safety and Working Conditions;
4. Standard 4: Cultural Heritage;
5. Standard 5: Displacement and Resettlement;
6. Standard 6: Indigenous Peoples;
7. Standard 7: Pollution Prevention and Resource Efficiency.

Furthermore, Table 37 presents which of these standards might apply to the Forest Landscape Restoration in Mayaga project.

**Table 37 – Standards that might apply to and be triggered for the project.**

Standard no	Explanation	Triggered?
1. Biodiversity Conservation and Sustainable Natural Resource Management	The project does affect biodiversity rich zones, by trying to restore and protect natural forests. The environmental assessment process of sub-projects will take this issue into account, considering the sensitivity of each of the sub-project locations. Mitigation or compensation measures may be needed to reinforce biodiversity-rich zones, such as protected areas or areas allocated for conservation of native species. The development and management plan will also guide sub-projects authorized in the protected area and the peripheral zones.	Yes
2. Climate Change Mitigation and Adaptation	This is a key concern of the proposed project. The project will mainly support and undertake actions foot printing this standard. The planting of new forests and management of existing ones will help mitigate climate change by removing CO <sub>2</sub> from the atmosphere. Combined with the sun's energy, the captured carbon is converted into trunks, branches, roots and leaves via the process of photosynthesis. It is stored in this "biomass" until being returned back into the atmosphere, whether through natural processes or human interference, thus completing the carbon cycle. Moreover, the project will contribute to adaptation by protecting and restoring ecosystem services. For instance, trees increase water filtration and reduce water runoff and soil erosion, thus diminishing the risk of flooding and landslides after heavy rains.	Yes
3. Community Health, Safety and Working Conditions	The project will positively impact on the community in the targeted Mayaga region through creation of business opportunities from increased agricultural yields due to proper land use management and carbon sequestration. During the implementation, the community will benefit through job creation mainly during site preparations, nursery beds, planting, and monitoring. Landscape restoration contributes to almost all Sustainable Development Goals (SDGs).	Yes

Standard no	Explanation	Triggered?
4. Cultural Heritage	The project will not support activities that are expected to impact physical cultural resources. The substructure investments will be very small scale and most of the project area has only recently settled, and there are no indications of particular cultural resources concerns.	No
5. Displacement and Resettlement	The project will explore the possibility of re-establishing the connectivity of the Kibirizi and Muyira forests patches. The demarcation of boundaries to many remnant forest patches on hill-tops may lead to physical displacement of people who may have encroached the natural forests (especially those who may have cultivated fields and charcoal burning activities in restricted use areas).	Yes
6. Indigenous Peoples	The project will not have an impact on this, as there are no populations qualifying as Indigenous peoples within the project target areas.	No
7. Pollution Prevention and Resource Efficiency	The project will have an impact on this, as it will support activities aiming at reducing greenhouse gas emissions and promoting resource efficiency.	Yes

### 3.3.3. Impacts and enhancement and mitigation measures

#### 3.3.3.1. Introduction

The objective of the series of environmental and social analyses is to highlight the main issues during the implementation of the project components and to identify, describe, and evaluate negative and positive impacts.

The following is presented:

- Enhancement measures are proposed to strengthen the positive impacts;
- Mitigation measures are suggested to address the negative impacts;
- Monitoring plan of potential negative impacts.

### 3.3.3.2. Positive impacts and enhancement measures

The main positive impacts to be derived from the Project will include:

- The reduction of the GHG emissions;
- Increased resilience of smallholder farmers vulnerable to climate change;
- Better access to energy sources for people living in Mayaga area;
- Protection of around 500 hectares of natural habitats of high biodiversity value and maintenance of ecosystem services;
- Rehabilitation of plantations, woodlots, and gardens, increasing revenues and ecosystem services;
- Establishment of a financial support path or funding's to continue to finance adaptation and mitigation activities.

Table 38 presents the positive impacts and the enhancement measures based on activities planned under each component of the Project.

**Table 38 – Positive impacts and enhancement measures.**

Project activities	Positive impacts	Rating	Enhancement measures
The project plans to improve land productivity, increase agroforestry, increase the access to improved seeds, and organic fertilizers, and diversify crops	<ul style="list-style-type: none"> <li>- Higher profitability of agricultural activities</li> <li>- Increased food security</li> <li>- Increased resilience to climate change</li> <li>- Improved social and economic situation</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- No exploitation of high flood and erosion-prone soils</li> <li>- Regular review of climate information</li> <li>- Integration of agroforestry and agriculture research results like the intercropping systems, canopy structure, roots distribution of trees, the application of different agronomic measures in distinct ecological context</li> </ul>
As the project plans to increase the number of trees in farms, forests plantations, vacant spaces and along roads, apiculture will be much benefiting on this habitat that will be in place	<ul style="list-style-type: none"> <li>- From a biological perspective: improved pollination</li> <li>- From a socioeconomic perspective: income increase</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- Training of beekeepers in ecological apiculture</li> <li>- Training in honey transformation</li> <li>- Development of the local honey segment by training farmers on the use of modern hives, efficient mode of honey harvesting and quality honey production</li> </ul>
The project is intending to promote a better access to funding and markets	<ul style="list-style-type: none"> <li>- Improved management of property by households</li> <li>- Gradual creation of an entrepreneurship culture</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- For some adequate areas (based on the context), the project should initiate: supports to community funding such as a payment of ecosystem services or farmers groups' savings initiatives; supports to remove potential bottlenecks (lack of initial funds, administrative bottlenecks, etc.)</li> </ul>

Project activities	Positive impacts	Rating	Enhancement measures
Project to scale up the access to drinking water	<ul style="list-style-type: none"> <li>- Improved health and quality of life for the populations vulnerable to climate change by providing clean water</li> <li>- Reduction of time spent on water collection for both women and children</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- Provision of enough clean water access points for project beneficiaries</li> <li>- Capacity-building for the management of water infrastructure by the beneficiaries through existing water supply actor's partnership (e.g., WASAC and/or Water for People)</li> </ul>
Capacity building to be dispensed at all levels sectorial and cell planning	<ul style="list-style-type: none"> <li>- Human resources with the capacities to catalyse efforts to reduce climate risks</li> <li>- Individual and institutional capacities enhancement for planning and implementing gender sensitive forest landscape restoration strategies</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- The project should use techniques related to climate-smart landscapes for trainings and these should be shared during local workshops and through sectorial organisation, namely farmers groups (e.g., employment of the Agro-pastoralist/Farmer Field School (AP/FFS) approach).</li> <li>- Integration of strategies and actions identified in national policies on climate change in regional and local planning;</li> <li>- Creation and provision of capital investments in a trust fund on climate change</li> <li>- Provision of human resources to local government (Districts, Cells)</li> <li>- Creation of local jobs to improve income levels in Mayaga</li> <li>- Ensuring training on gender issues and their importance to achieving and sustaining forest landscape restoration</li> </ul>

Project activities	Positive impacts	Rating	Enhancement measures
Project to promote alternative sources of energy	<ul style="list-style-type: none"> <li>- Reduction of deforestation and forest degradation, including in natural forests</li> <li>- Reduction of GHG emissions</li> <li>- Access to electricity</li> <li>- Valorisation of waste</li> <li>- Reduction of time spent on biomass collection for both women and children</li> <li>- Increased resilience to climate change impacts on the energy sector</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>- The project shall enhance private activities on biomass energy, potentially under bioenergy/biofuel initiatives as alternative energy source: <ul style="list-style-type: none"> <li>o Initiation of investment funds for renewable energy facilities in project areas in collaboration with line Ministry of Infrastructure, other governmental agencies projects and other private investors operating in renewable energies</li> </ul> </li> <li>- Create fuelwood and charcoal distribution system and provide free improve cookstoves to impoverished households</li> <li>- Community groups and cook stove technicians must be trained on the use and maintenance of improved cook stoves and charcoal producers on the concept of sustainable charcoal production</li> <li>- Promote local production of improve cookstoves</li> <li>- Distribution of solar panels, batteries and energy saving lamps at low and capped prices</li> </ul>

Project activities	Positive impacts	Rating	Enhancement measures
The project prearrangements for restoration, reforestation, protection of natural habitats and development of low-emission agricultural techniques	- Effectiveness of REDD+	HIGH	<ul style="list-style-type: none"> <li>- Comply with verified carbon standards for the GHG reduction efforts in targeted forests and trees in-farms</li> <li>- Investment to develop other REDD+ programs and projects throughout Mayaga, aligned with the governmental REDD+ strategy.</li> <li>- Equitable sharing of carbon revenues – create a benefit allocation system for communities</li> </ul>

### 3.3.3.3. Negative impacts and mitigation measures

The potential adverse impacts of the project activities are presented in Table 39.

**Table 39 – Potential adverse impacts of the project.**

Potential adverse impacts	Mitigation measures
- Loss of biodiversity due to the extension of croplands	- Collective monitoring of compliance with the Districts Forest Management plans
- Contamination of soils and sub-soils due to fertilizers and pesticides and change in soil characteristics due to the introduction of resistant seeds	- Technical assistance on climate smart agriculture, including appropriate use of seeds, fertilizers, and pesticides
- Increased vulnerability to tree diseases and pests due to reduce species diversity	- Increased species diversity
- Shortage of water resources downstream due to increasingly intensive use upstream and inefficient water infrastructures - Social conflicts on the management of water resources, related to the irrigation canals	- Integrated and participatory management of water resources at all levels (regional, local/community), including a watershed management approach and a focus on efficient water harvesting, storage, and distribution infrastructure
- Planning, framing and regulations that are not compatible with local aspirations and contexts	- Participatory planning, implementation, monitoring and evaluation of the project
- Loss of income for some households from the reduced trade in fuel wood and charcoal	- Training modules adapted to local and project context
- Relocation of households or goods forced by re-establishing the connectivity of the Kibirizi-Muyira Natural Forest	- Development of a resettlement plan and an Ethnic Minority plan within the scope of the Environmental and Social Management Plan (ESMP)

**Table 40 – Potential risks, mitigation measures and responsibilities.**

Project activities	Potential negative impacts	Rating	Mitigation measures	Implementing entities
The project plans to improve land productivity, increase agroforestry, increase the access to improved seeds, and organic fertilizers, and diversify crops	<ul style="list-style-type: none"> <li>- Increased pressure on natural resources due to the extension of croplands</li> <li>- Change of soil characteristics due to fertilizers and resistant seeds</li> <li>- Risk of increase of pest plant species from introduced invasive species</li> <li>- Shortage of water resources in streams due to increasingly intensive use</li> <li>- Loss of water (due to poor irrigation systems) with impact on fish-farming and harvest fishing</li> <li>- Social conflicts on the management of water resources, related to the irrigation canals</li> <li>- Dominance of exotic and specific tree species which might contribute to soil depletion, suppression of native species and decrease of biodiversity</li> </ul>	LOW	<ul style="list-style-type: none"> <li>- Collective monitoring of compliance with the Districts Forest Management plans</li> <li>- Technical assistance to the communities on organic farming</li> <li>- Reduced use of chemical farm inputs</li> <li>- Integrated management of water resources including the establishment of water supply points</li> <li>- Training on efficient irrigation practice</li> <li>- Setting of community guidance's on shared water and other resources to prevent conflicts</li> <li>- Prioritization of sub-projects based on a territorial approach and according to an integrated land-use and management plan at the community or village level</li> <li>- Planting of variety of species both economical, native and agroforestry</li> <li>- Identify and isolate specific site for conservation of native species</li> </ul>	<ul style="list-style-type: none"> <li>- Districts according to the relevant sectors</li> <li>- Local Communities</li> <li>- Conservation entities</li> <li>- Other local partner, NGO (Non-Governmental Organization)</li> <li>- CBOs (Community Based Organizations)</li> <li>- Local private developers</li> </ul>

Project activities	Potential negative impacts	Rating	Mitigation measures	Implementing entities
As the project plans to increase the number of trees in farms, forests plantations, vacant spaces and along roads, apiculture will be much benefiting on this habitat that will be in place	<ul style="list-style-type: none"> <li>- Abusive and immoderate practice of “modern” apiculture (e.g., frame hives) threatening healthy colonies</li> </ul>	LOW	<ul style="list-style-type: none"> <li>- Training farmers on how to mount beehives in trees around the forest and in trees in-farms and how to harvest the honey in a proper way, and assistance in carrying out a quality control of the honey to ensure maximum production</li> <li>- The modern beehives facilitate honey harvesting without disturbing the queen. It is important not to disturb the queen because once she is disturbed, she leaves the hive together with other bees</li> <li>- Full integration of livelihoods and forest resources management in Mayaga FLR project areas, where expected that they will easier adapt to the climate change</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Agriculture and Animal Resources (MINAGRI), Rwanda Agriculture and Animal Resources Development Board (RAB)</li> <li>- Specialized NGO</li> <li>- Private Sector Federation (PSF)</li> <li>- Local communities</li> <li>- Local Government</li> </ul>
The project is intending to promote a better access to funding and markets	<ul style="list-style-type: none"> <li>- Indebtedness due to the lack of knowledge on microfinance mechanisms</li> </ul>	LOW	<ul style="list-style-type: none"> <li>- Training in finance</li> <li>- Creation of grant mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>- Local microfinance institutions</li> <li>- Conservation entities (local, International)</li> </ul>

Project activities	Potential negative impacts	Rating	Mitigation measures	Implementing entities
Project to scale up the access to water	<ul style="list-style-type: none"> <li>- Water contamination</li> <li>- Pressure on water resources</li> <li>- Competition among users</li> </ul>	MODE-RATE	<ul style="list-style-type: none"> <li>- Protection of water sources</li> <li>- Compliance with technical specifications on the location of sources: minimal distance and location from latrines and waste pits.</li> <li>- Increasing local clean water points at a shorter distance for domestic use</li> <li>- Establishment of irrigation water dam for farm uses</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Infrastructure (MININFRA),</li> <li>- Water and Sanitation Authority (WASAC)</li> <li>- Specialized NGOs</li> <li>- Local Community</li> <li>- Local Government</li> </ul>
Capacity building to be dispensed at all levels Sectorial and territorial planning	<ul style="list-style-type: none"> <li>- Planning, framing and regulations that are not compatible with local aspirations and contexts</li> </ul>	LOW	<ul style="list-style-type: none"> <li>- Participatory development of reference and framework documents</li> <li>- Training modules adapted to the local context</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Environment; Rwanda Forestry Authority</li> <li>- Districts</li> <li>- Rwanda Environmental management Authority</li> <li>- Conservation entities (Local &amp; International)</li> <li>- Partners</li> </ul>

Project activities	Potential negative impacts	Rating	Mitigation measures	Implementing entities
Project to promote sustainable sources of energy	<ul style="list-style-type: none"> <li>- Competition with food crops and forest rich in biodiversity</li> <li>- Disturbance of water resource distribution because of infrastructure: destruction of vegetation cover, loss of forest products (wood, non-timber forest products)</li> <li>- Loss of income for some households from the reduced trade in fuel wood and charcoal</li> <li>- Pollution due to biomass combustion and waste</li> </ul>	LOW	<ul style="list-style-type: none"> <li>- Application of the integrated land-use planning and management</li> <li>- Establishment and implementation of an alternative affordable energy distribution plan for communities/farmers</li> <li>- Create fuelwood and charcoal distribution system and provide free improve cookstoves to impoverished households</li> <li>- Promote local production of improve cookstoves</li> <li>- Distribution of solar panels, batteries and energy saving lamps at low and capped prices</li> </ul>	<ul style="list-style-type: none"> <li>- Districts</li> <li>- Private developers</li> <li>- Partners in the line with the project</li> </ul>
The project prearrangements for restoration, reforestation, protection of natural habitats, development of low-emission agricultural techniques	<ul style="list-style-type: none"> <li>- Introduction of exotic species</li> <li>- Disturbance of forest ecosystems</li> <li>- Restriction of arable lands</li> <li>- Reduction of agricultural productions</li> <li>- Social conflicts</li> <li>- Relocation of households or goods</li> </ul>	MODE-RATE	<ul style="list-style-type: none"> <li>- Collective monitoring of compliance with the Districts Forest Management plans</li> <li>- Implementation and monitoring of SLM/ SFM practices implemented</li> <li>- Technical assistance provided by Districts and sectors</li> <li>- Implementation and monitoring the Environmental and Social Management Plan (ESMP) and Resettlement plan</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Environment; Rwanda Forestry Authority; Rwanda Environmental management Authority</li> <li>- Districts</li> <li>- Rwanda Environment Fund</li> <li>- Conservation International</li> <li>- Local NGOs</li> <li>- CBOs</li> <li>- International Partners</li> </ul>

### 3.3.4. Ranking and likelihood of impacts

In addition to the direct impacts of the Project activities, potential risks might have adverse impacts. Advance knowledge on these risks is an asset for the sound environmental and social management of the Project. Table 41 provides more details on such risks.

**Table 41 – Environmental and social risks ranking.**

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Impacts of improved livelihoods of populations vulnerable to climate change	Better access to market might be an incentive to increase the cultivated areas or the size of herds. In the absence of viable land management and natural resource protection systems, this might lead to overexploitation or degradation of resources in some areas.	LOW	<ul style="list-style-type: none"> <li>- Under the approach followed, the project will implement a monitoring and evaluation arrangement for the project and sub-projects in order to observe and understand unexpected impacts and to take corrective measures on time.</li> </ul>	<ul style="list-style-type: none"> <li>- The project could also assist farmers in all stages of forest chain management, in terms of technical skills and establishment of local supporting projects that would help them earn a living.</li> <li>- Consider specific support to cooperatives and agricultural associations.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Poverty and pressure on land	The current level of poverty in the project area, population growth, and shortage of productive lands accessible to smallholder farmers represent potential risks. These aspects are the main drivers of deforestation and will remain a threat to the project.	MODE-RATE	<ul style="list-style-type: none"> <li>- The Project is designed with a participatory forest management approach; local communities will be fully involved in management and protection of the sites.</li> <li>- The sustainable use zones and the usage right zones will be well defined, both inside the areas planned to be protected and farm woodlots and trees in-farm. This will secure the local populations' access to the forest products they need (based on well-defined specifications). This will stimulate the local communities to take more protection initiatives.</li> <li>- Protected areas fall under the prevailing legislation. This legal protection strengthens the application of regulations prohibiting deforestation, mining, and hunting inside the project intervention zones.</li> </ul>	<ul style="list-style-type: none"> <li>- The project could engage farmers together with incentives and motivations to ensure full involvement (grants and funding).</li> <li>- Create a mechanism for poor households to have access to parcels of agricultural land.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Migration and increasing demographic pressure	The Project investments might contribute to attract migrants to the beneficiary communities, in order to benefit from the improvements. This might lead to frictions or conflicts between the established communities and migrants and exert additional pressure on already limited resources.	LOW	<ul style="list-style-type: none"> <li>- The project will work with the populations using protection and conflict mitigation measures in order to durably support the investments. It will ensure that the most vulnerable groups are included.</li> <li>- The Project will involve local authorities (at the level of the cells) to assess the status of potential migrations and put in place management strategies.</li> </ul>	<ul style="list-style-type: none"> <li>- The project should also establish a management framework for capturing areas of possible occurrences before it happens.</li> </ul>
Illegal and non-controlled mining	Forest areas, which constitute the Project's intervention areas, are subject to unlawful mining or rushes that might exacerbate deforestation, loss of biodiversity, significant forest degradation, pollution of surface waters downstream, and social conflicts.	LOW	<ul style="list-style-type: none"> <li>- Enforce a Joint Monitoring and inspections, encourage ownership at basic local authorities and early decision-making on unlawful exploitation; Streamline mineral licensing and decentralize mining technical capacity at lower level.</li> <li>- The Mining – Forests interagency committees to be established by helping solve or reach a consensus in most conflicts in a partnership process.</li> <li>- Strengthen mine inspection and monitoring tools (regulations and standards).</li> </ul>	<ul style="list-style-type: none"> <li>- The project shall advocate for a better and fully implementation of ESMPs developed by miners through an integrated partnership among project areas users.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Failure to identify right tree species	Project will distribute and use variety of trees and these trees should be of high quality due to the ecology of the area and adaptive.	LOW	<ul style="list-style-type: none"> <li>- Ensure the identification of right tree species with first growing and agro-ecologically fit with high germination rate, climate variability tolerance, abilities and with multifunction's.</li> <li>- Engage local community and private partnership in identifying trees species.</li> </ul>	<ul style="list-style-type: none"> <li>- The project could prioritize related study's findings and recommendation on trees fitness according to Rwandan agro-ecological zones.</li> <li>- Provide adaptative crop seeds to local farmers.</li> </ul>
Risk of shortage of firewood	Target households rely on tree logging for fetching firewood and this one is rated as threat to the forest/trees growing and existence.	MODE-RATE	<ul style="list-style-type: none"> <li>- The project shall provide alternative cooking energy to the affected communities prior to respect the project provisions (e.g., tree logging).</li> <li>- Addition to energy alternatives provisions, the project will assist in the development of cook stoves by local actors.</li> </ul>	<ul style="list-style-type: none"> <li>- Provide technical data and information for the local production of improved cooking stoves.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Poor planting techniques	Planting technique (including planting season) is the key for the successful germination and survival rate and knowledge on this is limited.	LOW	<ul style="list-style-type: none"> <li>- The project will put in place competent techniques, planting period as per dedicated seasons. Plant at an early stage of rainy seasons.</li> <li>- Provide basic training to the local communities on tree seed preparation, planting, and monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>- Create local teams to provide quick and sustained assistance.</li> </ul>
Risk of employment to outsiders	In the private/state's land where the project requires external manpower, different groups could be employed. Employing outsiders might generate conflicts and less earning to the communities in targeted area.	LOW	<ul style="list-style-type: none"> <li>- During project implementation, the employment opportunities should prioritize the local capacity before outsourcing from other places.</li> <li>- Strictly the families whose lands will be used for plantation should be priorities for any opportunity. Vulnerable groups if capable to work and PAPs be grouped in groups of savings for stability.</li> </ul>	<ul style="list-style-type: none"> <li>- The project could also make sure that if occurred to employ outsiders, their management shall be efficient to avoid these possible conflicts.</li> <li>- Engage local authorities during the project implementation.</li> <li>- Provide opportunities for outsiders to stay in the region.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Risk of conflict “crop-tree”	The conflict crop-tree is a very sound risk due to the profitability either from crops or trees for underground soil moisture and nutrients, and the trees on the canopy layer may also lead to shortage of light for crop.	MODE-RATE	<ul style="list-style-type: none"> <li>- Agroforestry tree species with ability to perform in the project area conditions may be the guiding approach and choice to address the conflict and the adoption of the system and practice.</li> <li>- To relieve the shortage of arable land and promote the sustainable development of natural resources, the intercropping systems, canopy structure, roots distribution of trees, the application of different agronomic measures and the role they play in the competition process would continue to be the hot spot for project research.</li> </ul>	<ul style="list-style-type: none"> <li>- The project should consider species with possibilities of being intercropped, and agronomic measures such as regular canopy pruning, root barriers, additional irrigation and biological fertilization also should be applied in the intercropping systems.</li> </ul>

Environmental and/or Social Risks	Scope / Rationale	Ranking	Project Plans to mitigate risks	Additional things to consider
Risk of water shortage in upstream and downstream	The use of water upstream for irrigation purposes might be a source of water shortage in downstream areas.	MODE-RATE	<ul style="list-style-type: none"> <li>- The integrated land and water resources management (ILWRM) is a sure instrumental in developing adaptive solutions to problems and can also enable stakeholders of upstream and downstream areas with various interests and needs to work together for the better utilization and management of land and water resources.</li> </ul>	<ul style="list-style-type: none"> <li>- For long term water use management, the establishment of an irrigation dam would be an influential remediation measure for irrigation purposes. Potential negative effects associated to this dam should be monitored regularly.</li> <li>- In addition, promote water use efficiency.</li> </ul>

Within the negative impacts presented in the previous table the following have a moderate likelihood to occur: “poverty and pressure on land”, “risk of shortage of firewood” and “risk of water shortage in upstream and downstream.

### 3.3.5. Monitoring

The monitoring plan is present in Table 42.

**Table 42 – Monitoring plan for potential negative impacts.**

Areas	Potential negative impacts	Mitigation measures	Indicators and frequency	Entities in charge
Improve land increase agroforestry, increase the access to improved seeds, and organic fertilizers, and diversify crops	<ul style="list-style-type: none"> <li>- Loss of habitats due to the extension of croplands</li> <li>- Change of soil characteristics due to fertilizers and resistant seeds</li> <li>- Contamination risks of soils and sub soils</li> <li>- Risk of increase of pest plant species</li> <li>- Shortage of water resources upstream due to increasingly intensive use downstream</li> <li>- Loss of water (due to poor irrigation systems) with impact on fish-farming and harvest fishing</li> <li>- Social conflicts on the management of water resources, related to the irrigation canals</li> </ul>	<ul style="list-style-type: none"> <li>- Application and monitoring of Districts Forest Management plans</li> <li>- Integrated management of water resources at all levels (local/community, regional)</li> <li>- Plant variety of trees species</li> <li>- Technical assistance by the local government entities for community guidance</li> </ul>	<ul style="list-style-type: none"> <li>- Number of awareness and communication actions on the DFMP each year</li> <li>- Number and types of beneficiaries of awareness raising actions (annual)</li> <li>- Execution rate (%) of activities included in the DFMP and planned under the Project (annual)</li> <li>- Number of tools on IWRM developed and applied at the levels of places (annual)</li> <li>- Average rate of compliance with IWRM provisions in the various territories (annual by sample)</li> <li>- Number of beneficiaries benefiting from guidance by Districts (semi-annual)</li> </ul>	<ul style="list-style-type: none"> <li>- Ministry of Environment</li> <li>- Ministry of Agriculture and Animal Resources</li> <li>- Districts</li> <li>- Rwanda Agriculture and Animal Resources Development Board</li> <li>- Local Conservation entities</li> <li>- Community Based Organizations (CBOs)</li> </ul>

Areas	Potential negative impacts	Mitigation measures	Indicators and frequency	Entities in charge
Apiculture	<ul style="list-style-type: none"> <li>- Abusive and immoderate practice of “modern” apiculture (e.g., frame hives) threatening the healthy colonies</li> </ul>	<ul style="list-style-type: none"> <li>- Preservation/ learning of the ecological and wild apiculture practice</li> </ul>	<ul style="list-style-type: none"> <li>- Number of people trained in ecological and wild apiculture (annual)</li> </ul>	<ul style="list-style-type: none"> <li>- Rwanda Agriculture and Animal Resources Development Board</li> <li>- Districts</li> <li>- Local Conservation entities</li> <li>- CBOs</li> </ul>
Drinking water	<ul style="list-style-type: none"> <li>- Water contamination</li> <li>- Pressure on water resources</li> <li>- Competition among users</li> </ul>	<ul style="list-style-type: none"> <li>- Protection of water sources</li> <li>- Compliance with technical specifications on the location of water sources</li> </ul>	<ul style="list-style-type: none"> <li>- Number of water sources with protection strips (annual)</li> <li>- Rate of complaints related to drinking water addressed (annual)</li> </ul>	<ul style="list-style-type: none"> <li>- Water and Sanitation Corporation (WASAC)</li> <li>- RWA</li> <li>- Districts</li> <li>- Local Conservation entities</li> <li>- CBOs</li> </ul>
Capacity-building	<ul style="list-style-type: none"> <li>- Planning, framing and regulations that are not compatible with local aspirations and contexts</li> <li>- Rural exodus motivated by the search for a socioeconomic environment that is more favourable to the application of received training</li> </ul>	<ul style="list-style-type: none"> <li>- Participatory preparation of reference and framework documents</li> <li>- Training modules adapted to local and project context</li> </ul>	<ul style="list-style-type: none"> <li>- Number of reference and framework documents developed (annual)</li> <li>- Number of training modules adapted to the local context developed (annual)</li> <li>- Number of beneficiaries of training modules (annual)</li> </ul>	<ul style="list-style-type: none"> <li>- RFA</li> <li>- REMA</li> <li>- Research institutions</li> <li>- Districts</li> <li>- Conservation Entities</li> <li>- CBOs</li> </ul>

Areas	Potential negative impacts	Mitigation measures	Indicators and frequency	Entities in charge
Cooking stoves and sustainable charcoal production	<ul style="list-style-type: none"> <li>- Pollution due to biomass combustion and waste</li> <li>- Disturbance of water resource distribution</li> <li>- Because of infrastructure: destruction of vegetation cover, loss of forest products (wood, non-timber forest products)</li> <li>- Loss of income for some households from the reduced trade in fuel wood and charcoal</li> </ul>	<ul style="list-style-type: none"> <li>- Development and application of the integrated land-use planning and management scheme (land-use, resource exploitation, revenue-activities, food security)</li> <li>- Reforestation in relevant areas</li> <li>- Provide technical data and information for the local production of improved cooking stoves.</li> <li>- Create fuelwood and charcoal distribution system and provide free improved cookstoves to impoverished households</li> </ul>	<ul style="list-style-type: none"> <li>- Number of integrated land-use planning, and management schemes developed and validated (annual)</li> <li>- Surface (ha) reforested (annual)</li> <li>- Number of social and economic studies related to the reduction of use of fuel wood (annual)</li> <li>- Average execution rate (%) of compensation measures recommended in studies (annual)</li> <li>- Improved cookstoves per household (%)</li> <li>- Improved cookstoves in poor households (number/ annual)</li> </ul>	<ul style="list-style-type: none"> <li>- Rwanda Forest Authority</li> <li>- Districts</li> <li>- Private developers</li> <li>- Development partners</li> <li>- CBOs</li> </ul>

Areas	Potential negative impacts	Mitigation measures	Indicators and frequency	Entities in charge
Restoration, reforestation, protection of natural habitats, development of low-emission agricultural techniques	<ul style="list-style-type: none"> <li>- Introduction of exotic species</li> <li>- Disturbance of forest ecosystems</li> <li>- Restriction of arable lands</li> <li>- Reduction of agricultural productions</li> <li>- Social conflicts</li> <li>- Relocation of households and goods</li> </ul>	<ul style="list-style-type: none"> <li>- Application of the DFMP</li> <li>- Technical assistance provided by Districts</li> <li>- Create local teams to provide immediate and sustained assistance.</li> <li>- Implementation and monitoring of the Environmental and Social Management Plan (ESMP), namely the resettlement plan</li> </ul>	<ul style="list-style-type: none"> <li>- Number of new tree species to be introduced and included in the DFMPs and planned under the project (annually)</li> <li>- Rate (%) of social conflicts resolved related to the application of the PAG (annual)</li> <li>- Restored surface (ha)/year / protected area</li> <li>- Planted trees in farms and on roads</li> <li>- Number of beneficiaries who have received technical assistance from Districts (annual)</li> <li>- Implementation rate (%) of the resettlement plan measures</li> </ul>	<ul style="list-style-type: none"> <li>- Rwanda Forest Authority</li> <li>- REMA</li> <li>- RAB</li> <li>- RAB</li> <li>- RDB</li> <li>- Districts</li> <li>- Local Conservation Organizations</li> <li>- CBOs</li> </ul>

### 3.3.6. Conclusion and recommendations

The following recommendations are formulated for the full integration of social and environmental standards:

- Tree nursery beds should be as near as possible to avoid long distances and time loss (fruits and agroforestry are the ones attracting farmers);
- As noted in the household energy report, households in the target area mostly rely on firewood for cooking and lighting. The project should not only promote cook efficient stoves and sustainable production of charcoal, but also alternative sources including gas and renewable energies;
- Farmers and other concerned local actors should be fully engaged in the project planning, implementation, monitoring, and evaluation;
- Training workshops should be conducted to enhance the technical capacity of farmers on sustainable land management, including sustainable forest management and climate smart agriculture. The implementation of training must ensure gender mainstreaming to reach all groups.
- Local cooperatives and agricultural associations should be prioritized in order to provide technical assistance to a larger number of agricultural households;
- Local human resources at district and cell levels should be increased, and with additional capacity building to enhance their technical capacity;
- Given high levels of poverty, local market development strategies should be promoted, including diversification, and considering the potential for payment for ecosystem services and distribution of carbon sequestration benefits.
- For long term water management, rainwater harvesting and storage infrastructure, including a community dam, would be important, working in parallel in increasing water use efficiency and on management mechanisms to prevent conflicts over use.

### **3.4. Vulnerability Assessment Report**

#### **3.4.1. Introduction**

This report consists of an update of the 2018 climate change vulnerability assessment carried out for the “Forest Landscape Restoration in Mayaga” project. The climate change vulnerability assessment characterizes the climate observed in the Mayaga region, assesses climate change impact, adaptive capacity, and vulnerability of the local communities, and identifies the ongoing and recommended strategies to address climate change vulnerability.

The present review reflects the most recent data on climate change projections and the progress made towards addressing climate change in the Africa region. Furthermore, the report is adjusted to the “Forest Landscape Restoration in Mayaga” project changes and takes into consideration the inputs from the field work carried out within the scope of the present baseline assessment review, which included interviews with key informants and focus group discussions.

The report is structured in six chapters. Chapter 3.4.2 characterizes Rwanda’s climate context with focus on climate change forecast. There is an attempt to detail this characterisation to the Mayaga region level. Chapter 3.4.3 identifies the impacts of climate change on the area in which is inserted the Mayaga region and assesses the vulnerability of the region to such impacts. Chapter 3.4.4 describes the interventions addressing climate change from both local and national institutions, including governmental policies, public and private projects and programmes that are active in the region. Based on the information reviewed in the later chapters, the report outlines the conclusions and recommendations on climate change vulnerability in Chapter 3.4.5.

#### **3.4.2. Climate change in Rwanda**

Climate in the country is commonly defined as tropical moderate for its proximity to the Ecuador being influenced by Rwanda’s hilly and variable topography. Climate variations across the territory lead to the definition of four climatic regions: eastern plains, central plateau, highlands, and regions around Lake Kivu (Republic of Rwanda, 2018).

The study area is mainly inserted in the transition between the central plateau and the eastern plains. The eastern plains register an annual rainfall of 700 mm to 1100 mm, which falls on 57 to 100 days, and a mean annual temperature oscillating between 20°C

and 22°C, while in the central plateau rainfall varies between the 1100 mm and 1300 mm, and is received in 90 to 150 days, being the mean temperature between 18°C and 20°C (Republic of Rwanda, 2018).

Rainfall patterns also lead to four main seasons. Long rainy (March-April-May) and short rainy (September-October-November) seasons alternate with long dry (June-July-August) and short dry (mid-December-January-February) seasons (Republic of Rwanda, 2018).

Rwanda's complex, variable and affected by strong seasonality climate makes the country even more vulnerable to climate change and related natural hazards. The most common natural hazards observed in the country are floods, landslides (given the country's mountainous profile) and droughts driven by El Niño – Oscillations events. With droughts affecting mostly the eastern region (Republic of Rwanda, 2018; BZ, 2018; Baastel, 2018d).

On the other hand, projections regarding climate change in Rwanda cannot be extremely accurate due to its climate variability and the existing gaps in long-term meteorological data. The present section outlines the main findings of the projections carried out within the scope of the “Climate Change Scenarios for the Congo Basin” project, funded by the German Technical Cooperation Agency (GIZ in tis German initials), which in turn is based on two different greenhouse gas emission scenarios from the 4<sup>th</sup> and 5<sup>th</sup> Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC), and also the recent trends and estimations assessed in the Third National Communication under the United Nations Framework Convention on Climate Change (UNFCCC), issued by the Republic of Rwanda in 2018.

The climate trends observed in the Third National Communication under the UNFCCC indicate that annual rainfalls in the country seem to have suffer high fluctuations between 1961 to 2016 with a decrease in precipitation levels in January, February, May and June, and the remaining months registering a general increase. Besides the variations observed in the rainfall patterns, there is a clear progressing increasing in temperature for the period of 1961-2016. The observed climate trends reveal that the highest increase reached the 2.5°C in the south-west and eastern regions of Rwanda (Republic of Rwanda, 2018).

In the “Climate Change Scenarios for the Congo Basin” projections, significant increases are expected both for the low emission scenario and high emission scenario. In the low

emission scenario, for the period 2036-2065, annual mean temperature might increase from 1.4°C to 2.1°C, and for the period 2071-2100, an increase of 1.5°C to 2.7°C is expected. While in the high emission scenario the temperature can increase up to 2.7°C already during the period of 2036-2065 and even reach an increase of 5.1°C in the period of 2071-2100. Key findings indicate not only an increase in mean temperatures, but also of extremes. The number of cold days and nights are expected to be reduced and the number of hot days and nights are projected to increase (Baastel, 2018d).

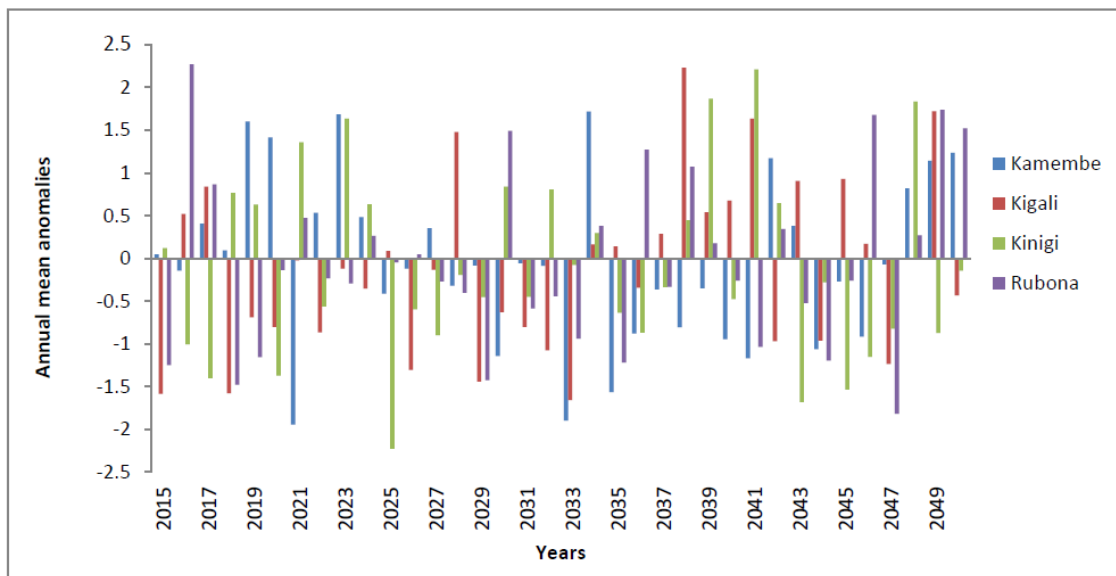
The results from the scenarios projections carried out within the scope of the Third National Communication, in turn, allow for a regional perspective as the baseline data is developed upon four selected weather stations (Gisenyi, Kamembe, Kigali and Ruhengeri) which provide differentiated results according to the region represented by the weather station. Thus, the projections, elaborated for the period 2017-2050, also indicate that the annual mean temperature will likely increase, however the northern-highlands region will remain an exception with a decrease in temperature in all seasons, but the long dry season. Additionally, the report refers that the expected increase in annual mean temperatures varying between 0.003°C to 0.009°C, per year, for the period 2017-2050 is lower than the increase of 0.0068°C to 0.041°C, per year, observed in the period of 1991-2016. As a consequence, the rate of evapotranspiration might decrease leading to less rainfall, especially in the central plateau and in the south-eastern lowlands that naturally already receive less amounts of precipitation.

Annual rainfall projections are complex as well. The Third National Communication under the UNFCCC refers that some studies suggest a general decrease in precipitation while others predict an increase in rainfall specifically during the short dry season. Either way, the overall tendency would be for a decrease in mean rainfall, with the exception of the north-western highlands.

Even considering a slight change on the annual total precipitation amounts, the rainfall patterns will likely suffer other relevant changes. For instance, intensity of heavy rainfall events will probably increase in the Congo basin while dry spells during the raining seasons will be more common (CSC, 2013).

The occurrence of more extreme weather events (flooding and drought events) might also be predicted based on the fact that a number of positive and negative anomalies are projected for the period of 2015-2050 (Republic of Rwanda, 2018). Figure 12 represents the variations predicted for rainfall anomalies in four weather stations:

Kamembe, Kigali, Kinigi and Rubona. Kigali and Rubona are the stations closest to the Mayaga region.



Source: (Republic of Rwanda, 2018).

**Figure 12 - Variations of annual mean standardized rainfall anomalies for Kamembe, Kigali, Kinigi and Rubona weather stations (2015-2050).**

In fact, rainfall trends' analysis has already shown an increase of the occurrence of extreme rain events, associated with shorter but more intense rainy seasons, while the eastern regions have experienced serious rainfall deficits in the last decades. Thus, frequent rainfall deficits are expected in parts of the eastern province and southern province. In the Mayaga region, frequent rainfall deficits are predicted in the Nyanza and Gisagara Districts (BZ, 2018).

In 2006, the former Ministry of Land, Environment, Forestry, Water and Mines (MINIRENA) analysed climate change risks. It concluded that "prolonged seasonal drought, dry spells in rainy seasons, and recurrent droughts for three or more years are among the most pressing problems. At the same time, the country has experienced major floods in a number of consecutive years (2006-2009) (...). Droughts and floods are region-specific problems, with droughts occurring mainly in the east of the country and floods in the western/central north and south." (Baastel, 2018d).

### 3.4.3. Impacts of climate change and vulnerability assessment

The Project Identification Form (PIF) of the “Forest Landscape Restoration in the Mayaga Region” project mentions that the past decade experienced increased climate risks, such as the increased occurrence of extreme drought and floods and incidence of soil erosion and landslides, lowering of lake and river water levels, as well as loss of biodiversity, decrease in agricultural productivity, worsening food security and malnutrition, spreading of diseases, and human population migration. Prolonged cyclical droughts are particularly frequent in the east and southeast, especially in Mayaga and Umutara areas. In addition, as most agriculture in Mayaga, and the country in general, is rain fed, and there is predominance of subsistence agriculture, people rely on rains to survive.

Specific potential impacts in agriculture due to rainfall patterns change include late harvests, delay of sowing in next season, seasonal crop failures and low yields. Existing studies show a clear relation between yield fluctuations and annual precipitation, in particular with yields of maize, rice and wheat, but no specific correlation with the number of rainy days and temperature was found, at least at the country level, thus a more localized study could present different results. Stronger rainfall intensity, expected for the northwest highlands and south-western regions leads to soil loss, nutrient leaching and consequently impacts on agriculture productivity. Plus, violent events tend to destroy cultivated crops and facilities, especially on vulnerable areas such as steep slopes and valleys (Republic of Rwanda, 2018).

The expected decrease in mean rainfall and number of rainy days, in particular in the southern lowlands and central plateau regions, where it lies the Mayaga landscape, and the consequent decrease on water storage, will not only affect crop-growing, but also biomass supply and, consequently, affect not only the agriculture sector but the biomass energy sector as well. Moreover, the rainfall quantity, that is the amount received in a certain period of time, can affect the soil content moisture and, hence, the feedstock quality which then impacts the efficiency of the energy generation plants (Republic of Rwanda, 2018).

There is also the possibility of the existing vegetation species to be affected by competing species that tend to spread in high CO<sub>2</sub> concentration environments, and that usually are less dense, thus reducing the fuel wood supply per unit area of land. Extreme events, such as flood and landslides, also contribute for land degradation with possibly loss of feedstock (Republic of Rwanda, 2018).

Additional impacts include an increase need to convert existing swamps for agricultural purpose that will eventually have implications for overall water balance, which has particular relevance for the Mayaga region. Moreover, the intensification of the runoff during extreme heavy rain events can cause sedimentation of pounds and lakes (Republic of Rwanda, 2018).

Likewise, impacts on the forestry sector due to decrease in mean rainfall and number of rainy days will include water stress of tree species, namely in the eastern and southern areas, which tends to lead to trees' productivity decrease or even death. Moreover, droughts might generate instability along populations leading to a higher demand for forests products, hence resulting in deforestation and degradation. While an increase in intense rainfall could lead to improved forest productivity, if followed by extreme weather events (e.g., storms), forest resources in fragile areas such as steep slopes and valleys are to be affected (Republic of Rwanda, 2018).

In addition, infrastructures might also be impacted by climate change. The country's steep, hilly topography makes it particularly susceptible to landslides, which together with flooding and storms cause damage to houses, mines, industrial sites, and major infrastructure including pipelines, power lines, roads, and dams. Damages not only have a direct cost in repairs and reconstruction, but also a knock-on effect on the economy as a whole, particularly in critical services such as power and transport (Byamukama, Carey, Cole, Dyszynski, & Warnest, 2011).

Rwanda's National Strategy for Climate Change and Low Carbon Development (2011), resumes the following main impacts of climate change on the country's economy:

- **Agriculture:** Rwanda's economy is largely dependent on rainfed agriculture, thus increases in temperature and changes to rainfall patterns, resulting in floods and droughts, can significantly reduce crop yields, negatively impacting livelihoods, food security and export earnings. Crops may be further negatively affected by new parasites and pests which thrive in the new climate. Food insecurity due to climate change might not only occur in Rwanda, but in the whole region and may result in increased migration and urbanisation.
- **Water and energy:** Climate change could affect water security, and as a result, increase levels of poverty and force subsistence farmers into informal urban settlements. While energy security may be also at risk as

hydropower in Rwanda contributes with 50% of electricity, making energy generation vulnerable to variation in rainfall and evaporation.

- Tourism: This sector, which is one of Rwanda's largest earners of foreign exchange, is dependent on the survival of gorillas in the Volcanoes National Park, and the preservation of the Nyungwe and Gishwati forests and Akagera National Park. These biodiversity hotspots are vulnerable to change in temperature and rainfall once it can reduce the viability of their habitat and lead to spreading of diseases.
- Health: The health of farm animals and humans is also at risk, particularly amongst those living below the poverty line, and as temperatures rises, diseases could spread to new areas, particularly to higher altitudes.

In the 2018 baseline assessment carried out for the *Forest Landscape Restoration in the Mayaga Region Project*, the participants of the focus group discussions conducted in eight communities highlighted the following main impacts of climate change in the Mayaga region:

- Decrease of agriculture production due to water scarcity or increase of crop pests (which results in encroachment on forests). Both crops and pastures are affected by scarcity and heavy rains.
- Increased number of cases of malaria, and more generally increase of human and livestock pests and diseases.
- Water sources affected.
- Extreme events (in particular heavy rainfall) result in the destruction of houses, poverty, and shortage of food.
- Increased soil erosion.
- Increased number of wildfires.

Some of the above-mentioned issues were also referred in the public consultations carried out in the present 2020 assignment. In particular, soil erosion, low crop productivity and prolonged droughts are pointed as current issues facing the agriculture and forest sector. Focus groups in the Gisagara, Nyanza and Ruhango districts indicate that one of the reasons causing a decrease in production, namely fruit trees, agroforestry trees for firewood and fodder for livestock to be climate change.

Rwanda's economic characteristics combined with its current level of development and the country's variable climate and mountainous landscape, makes it particularly vulnerable to climate change. Acknowledging that, Rwanda Environment Management

Authority (REMA) produced in 2015 a study establishing a Baseline Climate Change Vulnerability Index for Rwanda. In 2018, REMA's national level vulnerability assessment was updated using a broad range of indicators selected during the preparation of the first assessment.

The “Assessment of Climate Change Vulnerability in Rwanda – 2018” provides a comprehensive understanding regarding the climate change vulnerability of the four provinces, the City of Kigali and 30 Districts based on a vulnerability index. The conceptual assumption is that vulnerability is a function of the impact and the adaptive capacity, where the impact is a combination of exposure and sensitivity. The respective assessment and index were calculated based on data collected through a survey addressed to a large sample of households from all the 30 districts of Rwanda, with an average of 80 households surveyed in each District.

The results available only allow to assess climate change vulnerability at district level, as there is not information regarding households from all sectors covered by the Mayaga region. Nevertheless, the results include seven of the sixteen sectors that compose the Mayaga region project area (Gikonko, Sabe, Mugina, Nyamiyaga, Kibirizi, Kinazi and Mbuye), and at least one from each District. Therefore, the conclusions made at District level might be extrapolated for the Mayaga region, to some extent.

Besides reviewing the data collected in the 2015 assessment, the Assessment of Climate Change Vulnerability in Rwanda of 2018 presents the changes that have taken place since 2015. Thirty-seven (37) indicators were analysed to determine the direction of change between the baseline data (2015) and the current updated data (2018). The results indicate that 17 indicators show a reduction in vulnerability, while other 11 indicators show increased vulnerability, five indicators show no change and four provide new data or do not allow for a comparative analysis.

Indicators of household vulnerability to climate change include, among many others: for exposure - perceived changes in meteorological features (temperature, warm spells, rainfall etc) and change in local forest and woodlot size; for sensitivity - diversification of agriculture production and impacts of climate change affecting households' livelihoods; for adaptive capacity - change in farmers' knowledge of climate resilient farming methods and participation in building adaptive capacity.

According to the results of the Southern Province climate change vulnerability assessment, Gisagara and Nyanza districts are the most exposed to climate change.

Gisagara mostly for its exposure to changes in the river water level and for the physical vulnerability of the infrastructures located in the hillsides, while Nyanza District for its perceived variability to temperature and warm spells. Whereas the Huye Districts has the highest sensitivity value, mostly due to indicators related to the households' lack of health insurance, food insecurity cases, severe weather hazards and physical vulnerability of local infrastructure.

Gisagara District has the highest overall value for impact, followed closely by Huye District, and Nyanza District. Whereas Nyamagabe and Muhanga have the lowest impact values. Comparing to other districts, Southern Province has three districts scoring *high* impact and the remaining five districts scoring *medium* impact. Gisagara and Nyanza districts are classified as being subject to a *high-level* impact (with a score of 0.43 and 0.415 respectively), and the Ruhango and Kamonyi districts are classified with *medium* impact (with 0.4 and 0.398 respectively).

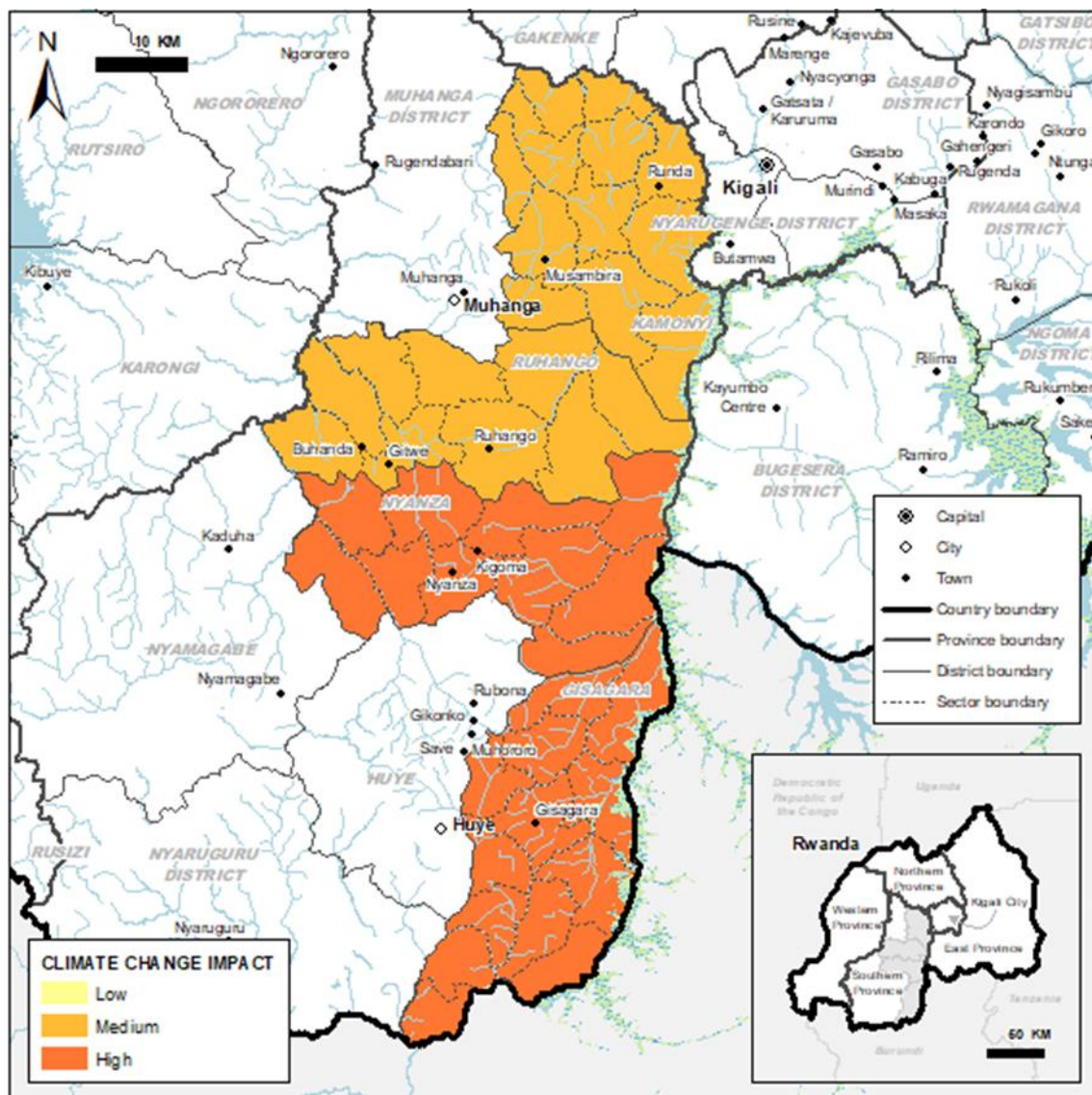
For the four target districts, the exposure indicators levels with higher values are regarding perceived changes in temperature, proportion of households' members with malaria, heatwaves and perceived changes in rainfall, rainstorm intensity, floods, and droughts. On the other hand, sensitivity indicators values are especially high resulting in high impact with regard to the age dependency ratio and the perceived impact of climate change affecting household livelihoods (calculated based on the perceived impact of temperature and rainfall in the household livelihoods).

In Gisagara, the values of exposure indicators are also high for perceived changes in river water levels. Comparing to the neighboring districts, Gisagara is also particularly both exposed and susceptible to the physical vulnerability of local infrastructure.

Ruhango exposure indicators also have high levels with regard to river water levels when compared to other districts. While the sensitivity indicator with the higher value is the impact of climate change affecting household livelihoods. The high values for physical vulnerability of local infrastructure and household experience of severe weather hazards are also highlighted.

For Nyanza, the underlined exposure indicators values are perceived variability in temperature, namely comparing to the neighbouring districts, and perceived variability in warm spells, which is in accordance with previously assessments. In addition, the sensitivity indicators regarding age dependency ratio and the impact climate change has in household livelihoods are those with worst results. Despite not having a very high

value, the social safety net effectiveness stands out for not being as good as in neighbouring districts. In the Kamonyi district, besides the proportion of households with malaria and temperature variability, the perceived change in rainfall, rainstorm intensity, floods and droughts has also a relevant weight for the district vulnerability to climate change. The sensitivity indicators with high values are the age dependency ratio, the perceived impact of climate change affecting household livelihoods and the proportion of households experiencing loss due to weather hazards.



**Figure 13 - Climate change estimated impact in the four target districts.**

With regard to the district adaptive capacity, the report indicates the Huye District as having the lowest adaptive capacity and the Muhanga District with the highest capacity. Regarding the districts in the Mayaga region project, Ruhango District is the one with

The results of the adaptive capacity indicators are particularly high, meaning low adaptive capacity, regarding the level of education attained by women, the change in manure and fertilizer use by households and the proportion of households with access to land. When comparing the level of adaptive capacity between districts, other indicators can be highlighted as having potential to be improved.

In Gisagara, the low values concerning change in farmer's knowledge of climate change resilient farming methods is the main factor contributing for a decrease in adaptive capacity, followed by change in manure and fertilizer use and women education level. The results are even more alarming when compared to other districts of the Southern Province.

Ruhango adaptive capacity indicators contributing for the district vulnerability are not only the low proportion of households with access to land, but also the change in occupation among households. On the other hand, Ruhango has the best results of the southern province regarding the proportion of households with access to and use of irrigation.

Concerning the Nyanza district's adaptive capacity, special attention should be given to the change in farmers' knowledge of climate change resilient farming methods, as it is the highest value registered among the district's adaptive capacity indicators. Furthermore, the social capacity of the district is also much lower than the other three districts of the Mayaga region.

The adaptive capacity in Kamonyi is especially low regarding the proportion of households with access to land. These results are in line with the fact that, in 2012, Kamonyi was the most populous district and the one with highest population density. Nevertheless, the worst result was concerning the change in manure and fertilizer use by households, namely use of organic manure. Both indicators have the higher values of the four districts.

As a result of climate change impact and adaptive capacity, the report concludes that regarding the four districts under the scope, Gisagara and Ruhango districts are clearly the most vulnerable to climate change with values close to the Huye District, the most vulnerable district in all Southern Province. In fact, these three districts are among the most vulnerable districts in the country. Particularly regarding the Mayaga region, it is possible to identify the sectors that are most prone to suffer from climate change impacts, as it observed in Figure 15.

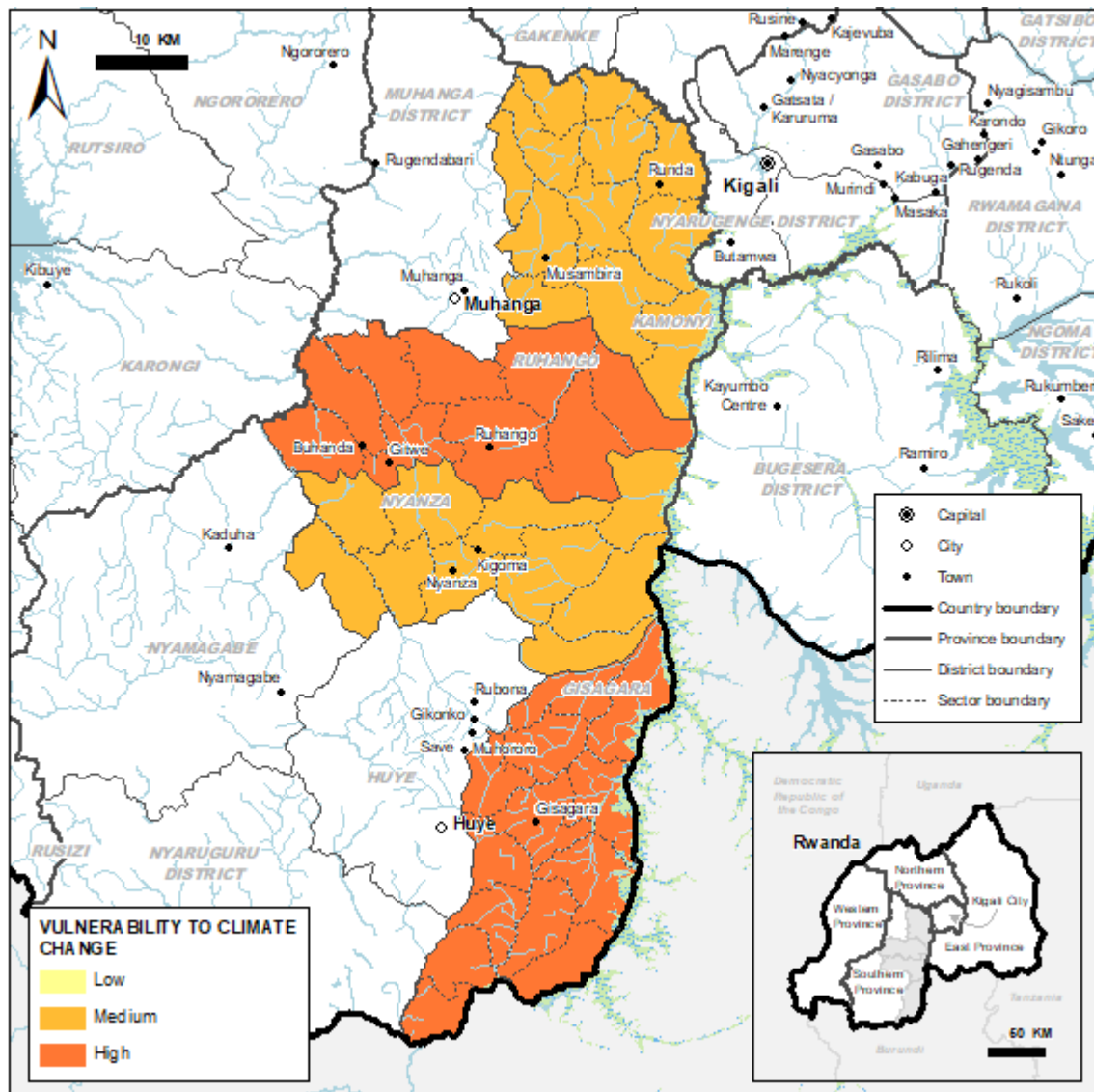


Figure 15 - Vulnerability to climate change in the four target districts.

The perceived resilience to climate change at community level was also addressed in the previous 2018 baseline assessment. During focus group discussions, the communities tried to identify the main factors of resilience explaining why some households are less vulnerable than others. The resilience factors identified were (Baastel, 2018d):

- Use of improved / short growth cycle seeds enables better crop production for those households who can get them.
- Diversification of production in low lying areas when land is available, or by producing new crops, fruit trees, eucalyptus, and livestock. It is

considered that those households who own livestock or forest plots are generally more resilient than others.

- Resilience is impacted by the capacity to change crops (for example from cassava, which is really affected, to maize). Households who demonstrate flexibility in the type of crops they plan demonstrate better resilience.
- Access to external sources of income as households where part of the family can work for others are more resilient than those relying only on agriculture. Temporary migration for work is also a frequent adaptation option.
- Availability of land as more land means more production, and the possibility to save part of the harvest. Sometimes it also means diversification of geographical areas. Land ownership, size and location of land are key resilience factors referred by these communities, where some people do not have access to big areas of land.
- Good health is also an important resilience factor. For instance, the physical ability to get food or wood from relatively distant places, and the ability to work for others effectively, are key to households' wealthiness and ability to cope with external challenges.
- Finally, some communities mentioned that "exposure" is also key inasmuch as those households who live close to the swamp or depend highly on water for livelihoods (e.g., rice producers) are more exposed and less resilient.

Overall, communities consider that vulnerability at the household and community levels has increased in the last 10 years, as they are not able to cope with the impacts of climate change, while on the other hand population pressure on natural resources is increasing. Enhance the above resilience factors is therefore considered essential to improve livelihoods in the Mayaga region (Baastel, 2018d).

According to the focus group discussions, a resilient household is one that demonstrates a certain level of comfort and wealthiness in all situations. Those households have all or some of the below characteristics (Baastel, 2018d):

- The household has access to a significant piece of land, well situated (i.e., away from flood prone areas, and too steep and landslide prone slopes) and diversified;
- The household owns cattle and other animals;

- The household owns a forest plantation;
- Some members of the household work outside agriculture, and some have migrated to cities or even abroad;
- The household demonstrates good technical knowledge and capacity for agricultural production. It grows a variety of crops, including fruit trees, and has benefitted from some kind of training and support for implementing new production techniques, using improved seeds, etc.
- People in the household are in good health, with no major disabilities preventing them from working hard.

Therefore, supporting households in the Mayaga region to reach such a situation of resilience requires specific activities on access to land, agriculture diversification (diversity of crops, including animals in the systems and forest plots/trees through agroforestry), technical support (enhanced extension services, farmer field schools), and health. Resilience is multi-dimensional and requires interventions on various variables, as illustrated by the local population themselves (Baastel, 2018d).

Whereas the “Assessment of Climate Change Vulnerability in Rwanda – 2018” highlights five sectors as being in need for special attention in strategic planning based on climate change scenarios: health, water, agriculture, forestry, and energy. The report also recommends the implementation of a cooperative multi-sector approach to reduce vulnerability.

#### **3.4.4. Ongoing interventions**

##### **National guidelines**

At the national level, several policies and strategies were put in place since 2005, including invest in hydropower stations, promotion of new renewable energy, control of erosion on hillsides around lake Burera and Ruhondo, implementation of IWRM, introduction of early warning systems, introduction of wood varieties resistant to environmental conditions and dissemination of firewood alternatives (Republic of Rwanda, 2018).

The new National Policy for Environment and Climate Change outlines an implementation plan to be mainstreamed through ministerial and DDSs, SSPs, annual Imihigo targets and actions plans. Some of the policy actions defined are to increase

Rwanda's resilience to climate change interventions and include information systems for regular updates of climate-change related data, implementation of incentives for the private sector and research institutions to develop affordable and efficient adaptation and mitigation technologies, as well as mainstreaming green, ecological and climate resilient practices and interventions in all development sectors and districts, including in their plans, budgets, functions.

The Third National Contribution under the UNFCCC report also proposes a series of possible adaption strategies for the different sectors to address climate change. Some of the adaptation strategies propose by the report include:

- Breed new climate smart and nutrient efficient varieties using molecular markers and varieties that are more resistant to pests and diseases;
- Plan for crop change considering the chancing temperature and rainfall decline;
- Creating windbreaks using agro-forestry;
- Attracting the private sector for seed multiplication, dissemination of fertilizers and training services;
- Development of agro-forestry for sustainable agriculture and landscape restoration to reduce the pressure on deforestation and forest degradation, caused by climate change, while also increasing agricultural productivity of farms.
- Afforestation of remaining free and designated areas through improved germplasm and effective planting and post-tending technical practices to counteract the likely pressure forestry sector will suffer from climate change events.
- Plant forest mixed species to increase ecosystems' resilience.
- Implement adequate forest management practices with focus on degraded forest resources and carbon sequestration, as well as on increasing biomass supply without concerting additional land.
- Ensure an efficient use of wood and biomass energy by improving the wood value chain management and efficiency, including avoiding wastages during wood conversion which is essential to meet the demand without creating unnecessary pressure on forest resources. Improving the wood conversion process should also contribute for the reduction of GHG emissions.
- Revise the value of wood products to make such products more profitable.

- Promote public-private partnerships in forest management to ensure the sustainable management of all public forests, namely by establishing multi-year contracts with forests operators that could plant and maintain plantations until they reach a commercial value.

### **Interventions from local governments**

At the district level, the key development tools providing guidance on local intervention are the Districts Development Plans (DDPs) and, most recently, District Development Strategies (DDSs) They identify the main priorities for district development over certain time periods, in line with national priorities, and list the main interventions (investments, capacity building, technical support to farmers, etc) to achieve the fixed objectives. Implementation is regularly monitored and reported to the central government.

Development plans and strategies all include elements of resilience for local population, in line with the resilience factors identified in section 3.4.3. It is also possible to identify interventions that have been taking place in district with the potential to address specifically the indicators of the 2018 Vulnerability Assessment with less positive results. On this basis, districts in Rwanda play an active development role, and although difficulties in implementation and financing of activities exist, there is a real mobilisation of local actors (Baastel, 2018d).

The Gisagara DDS mainstreams climate change resilience mainly in two areas: Environmental & Natural Resources and Agriculture. Measures defined for the first sector include increasing the area covered by forestry and agroforestry by 13,430 ha, carrying out Environmental Impact Assessment for all projects and requiring rainwater harvesting systems to new buildings. While the measures targeting the agricultural sector include control soil erosion through the construction of more than 1,650 ha of radical and progressive terraces, implement irrigation practices on 375 ha and expanding the use of organic manure through increasing livestock breed in animal sheds.

As referred in section 3.4.3, Gisagara is mostly exposed to changes in temperature and rainfall patterns, heatwaves, and malaria, as well as changes in river water levels and affected by the physical vulnerability of the infrastructures located in the hillsides.

One recent intervention to reduce exposure to climate change and consequently climate change vulnerability is the Akanyaru Watershed Protection Project. The project was

launched in 2014 and was planned to be concluded 2019, thus its results might not yet be observed in the 2018 assessment. The project aimed to enhance the Akanyaru Watershed, controlling soil erosion and landslides in the area, through the construction of more than 364 ha of radical terraces, 1,945 progressive terraces across eight Gisagara sectors, the rehabilitation of the Akanyaru River buffer zone by planting bamboo trees and *Pennisetum* and the construction of two tanks in the near Nyaruteja market to harvest rainwater.

To reduce the physical vulnerability of infrastructures located in hillsides, another indicator with worrying results, the DDS defines as main strategy the rehabilitation of ravines (including the rehabilitation near the Nyaruteja market) and the creation of new ravines with the establishment of infrastructures. The District plan also includes the development of hillside irrigation and marshland irrigation infrastructure in a total of 1,125 ha.

On the other hand, with regard to the levels of adaptive capacity assessed in 2018, the lack of change in farmer's knowledge of climate change resilient farming methods and the women education level are the two main indicators contributing for a decrease in adaptive capacity when comparing to other districts. In this regard, Gisagara DDS plans to implement a massive vocational training target to unskilled women and has defined different outputs that might contribute for increasing knowledge in resilient farming methods, such as use of quality seeds and training on extension services, as well as measures in the scope of agroforestry and agriculture referred previously.

Ruhango District is particularly exposed to changes in river water levels and the sensitivity indicators with highest values include impact of climate change affecting household livelihoods, physical vulnerability of local infrastructure and household experience of severe weather hazards. While the main adaptive capacity indicators contributing for the district vulnerability are the low proportion of households with access to land and the change in occupation among households.

Taking this into consideration, the interventions planned in the DDS of Ruhango activities that contribute for decreasing the district's vulnerability to climate change include the minimization of local infrastructure physical vulnerability through infrastructure planning strategies, such as the development of six Integrated Development Programme Model Villages, proper run-off design, creation of green spaces and climate proofing on major roads through tree planting. Ruhango DDS also plans the construction of different roads and bridges, thus improving local infrastructures accessibility.

One strategy that might reduce sensitivity to climate change impact planned in Ruhango DDS is the implementation of the District Disaster Management Plan. Ruhango District also is to refocus on VUP Classic Public Works to areas of the district at most risk of seasonal and climate-related shocks. While strategies to increase adaptive capacity, namely concerning the indicators with worst results, include strengthen land administration and management to ensure optimal allocation and use of land.

Ruhango DDS also mentions different interventions that are in line with the outcomes foreseen for the “Forest Landscape Restoration Project in the Mayaga region”. Some examples include the construction of post-harvest infrastructures, marshland irrigation on 167 ha, increase use of compost manure/organic fertilizers at 75% to increase soil nutrient levels and planting agroforestry trees (covering 16,794 ha).

Nyanza DDS intends to increase climate change resilience in agriculture, promoting irrigation and agricultural mechanization methods and the construction of valley dams. Such interventions have the potential to increase the district adaptive capacity concerning the change in farmers’ knowledge of climate change resilient farming methods, which according to the 2018 climate change vulnerability assessment scored high values, meaning low adaptive capacity. On the other hand, the implementation of these supporting farmers methods might ease the impact of the exposure to temperature change and heat waves in agriculture and households’ livelihoods in general.

The district has also planned a more effective social protection response to shocks and crisis by implementing a Disaster Management Plan and by ensuring an improvement of the community health insurance aiming at 100% covering. These objectives might be able to improve the social safety net effectiveness (sensitivity indicator) and the social capacity which, according to the 2018 assessment, is much lower than in the other three districts in the region.

Furthermore, the Nyanza DDS integrates climate change adaptation across several sectors which are highly affected by climate change, and in turn, contribute for the impact climate change has in the households’ livelihoods. For instance, to control soil erosion, 150 ha of radical terraces will be constructed, and 429 ha of existing productive radical terraces will be enriched. Moreover, 4,000 ha will be covered by agroforestry planted trees and 500 ha covered by forestry planted trees. Nyanza DDS also considers the rehabilitation of its watersheds, namely the Mwogo and Akanyaru swamps (1,300 ha), the upper Nyabarongo catchment (2,400 ha) and Akanyaru wetland (3,528 ha).

Moreover, around 300 households will be supported to use cooking gas while other 300 households will be supported to use biogas.

Finally, Kamonyi district has also different planned and ongoing strategies that address the main concerns on climate change vulnerability. In Kamonyi DDS there are specific measures for transports, agriculture, forestry, and social protection that might reduce exposure to rainfall, floods and droughts impacts.

Some examples of key interventions in agriculture within this context include the creation of 80 ha of radical terraces with agroforestry trees, the creation of 600 ha and rehabilitation of 7,200 ha of progressive terraces, and the intensification of fruits plantations along marshlands and hillsides terraces. While in the forestry sector, it is predicted the plantation of 1,100 ha of forestry and 5,600 ha of agroforestry and the rehabilitation of 250 ha of forestry. Other examples of intervention targeting climate change impacts include the construction /rehabilitation of 750 biogas, supply briquettes to 600 households and gas to 30,000 households.

Particularly targeting the results of the 2018 vulnerability assessment indicators, the district intends to construct 200 houses for poor families currently living in high-risk zones which has the potential to minimize the number of households experiencing loss due to weather hazards (one sensitivity indicator with high values in Kamonyi). Plus, also to reduce the proportion of households affected by weather hazards, the Kamonyi DDS sets a target of having 100% of vulnerable men and female headed households suffering from areas at risk of seasonal climate change supported under VUP (Vision 2020 Umurenge Programme) classic public works.

Concerning the district adaptive capacity, one of the indicators with a higher value, thus indicating less adaptive capacity is the change in manure and fertilizer use by households. One intervention addressing this matter is the increase of productivity by using improved seeds and mineral fertilizers and the use of organic manure to 30% of total fertilizer.

In addition, Table 43 provides selected extracts from the DDSs of the four districts with relevance for improving climate change resilience in more detail. Although non-exhaustive, it provides a general picture of local development priorities, including those above-mentioned, and the local governments' involvement in district development towards climate change resilience which is impressive and promising within Africa's context.

Furthermore, interventions at the district level concerning climate change mitigation also include capacity building initiatives. District planners and Environment District officers have received training on mainstreaming environment and climate change into District Performance Contracts and District Development Plans (DDPs). Local environment NGOs were also provided with skills to plan their activities taking into consideration the climate change issues raised in the national blueprints, namely Vision 2020 and the Economic Development and Poverty Reduction Strategy (EDPRS) II (Republic of Rwanda, 2018).

**Table 43 – Extracts from DDPs.**

District	Outcomes and outputs of DDS
<b>Priority area: Modernize and increase productivity of agriculture and livestock</b>	
Gisagara	<ul style="list-style-type: none"> <li>• Outcome 11: Increase resilient agricultural production and productivity.</li> <li>• Outputs: Production and productivity of crop under land use consolidation increased. Agriculture extension services strengthened through <i>Twigire Muhinzi</i> (solution to ensure access to advisory services). Effective and efficient irrigation developed. Increased resilient animal production and productivity. Insurance for Agriculture and livestock projects increased. Food security for nutrition increased.</li> </ul>
Kamonyi	<ul style="list-style-type: none"> <li>• Outcome: Increased agricultural production and productivity.</li> <li>• Outputs: Surface of land consolidation increased; Productivity of selected crops increased; Land covered by progressive and radical terraces to ensure optimal use increased.</li> <li>• Outcome: Increased traditional and non-traditional export crops.</li> <li>• Outcome: Increased financing and infrastructure for agriculture.</li> <li>• Outcome: Agriculture production value chain improved.</li> <li>• Outcome: Increased climate resilience for agriculture.</li> <li>• Outputs: Sustainable Irrigation and mechanization infrastructure developed; Agricultural research and development established.</li> <li>• Outcome: Improved livestock.</li> <li>• Outputs: Livestock inseminated and vaccinated against diseases.</li> </ul>
Nyanza	<ul style="list-style-type: none"> <li>• Outcome 1: Ha under cultivation increased.</li> <li>• Outcome 2: Increased agricultural production and productivity.</li> <li>• Outputs: Productivity of key crops per hectare increased. Promote diseases control using integrated crop management. Production of improved seeds by farmers. Land area covered by terraces increased and optimal used.</li> <li>• Outcome 3: Increased climate resilience for agriculture. Outputs: Surface of land irrigated, and agriculture mechanization promoted; Construction of 3 dams.</li> </ul>

District	Outcomes and outputs of DDS
	<ul style="list-style-type: none"> <li>• Outcome 4: Increased export crops.</li> <li>• Outcome 5: Increased financing and infrastructure for agriculture.</li> <li>• Outcome 6: Improved livestock sector. Outputs: Local breed cows improved; Animal diseases prevented and controlled; Increased number of livestock vaccinated; Small livestock developed.</li> </ul>
Ruhango	<ul style="list-style-type: none"> <li>• Outcome 10: Increased agricultural production and productivity.</li> <li>• Outcome 11: Increased agriculture for traditional and non-traditional crops for export.</li> <li>• Outcome 12: Increased financing and infrastructure for agriculture.</li> <li>• Outcome 13: Increased livestock production.</li> </ul>
<b>Priority area: Sustainable Management of Natural Resources and Environment to Transition Rwanda towards a Carbon Neutral Economy/ Environment sector</b>	
Gisagara	<ul style="list-style-type: none"> <li>• Outcome 16: Increased sustainability and profitability of forestry management.</li> <li>• Outputs: Forest cover productivity increased and maintained. District forest sustainably exploited and managed.</li> <li>• Outcome 17: Increased efficient land use management.</li> <li>• Outcome 18: Enhanced environment and climate change resilience control and awareness. Outputs: Environmental committees and clubs created or enforced and trained on environment protection and sustainability. Awareness on environment protection and climate change resilience increased. Interventions to mitigate/adapt climate change issues increased.</li> <li>• Outcome 20: Enhance friendly environmental and climate resilient use of mining and quarries.</li> </ul>
Kamonyi	<ul style="list-style-type: none"> <li>• Outcome: Increased sustainability and profitability of forestry management. Outputs: Forest coverage increased and maintained; Sustainable Water resource Management established.</li> <li>• Outcome: Disaster risk reduction and management integrated.</li> <li>• Outputs: Disaster management plan implemented; Male and female headed families living in high-risk zones relocated;</li> <li>• Outcome: Increased innovations and sustainability across Home Grown Solutions</li> </ul>
Nyanza	<ul style="list-style-type: none"> <li>• Outcome 1: Increased sustainability and profitability of forest management.</li> <li>• Outputs: Increasing the surface covered by forest; Integrated water resource management.</li> <li>• Outcome 3: Accelerated growth in green innovation. Outputs: Households using firewood as source of energy reduced (among others).</li> </ul>
Ruhango	<ul style="list-style-type: none"> <li>• Outcome 8: Minerals, oils and gas sectors protected.</li> <li>• Outcome 9: Increased sustainability and profitability of forest management.</li> </ul>

District	Outcomes and outputs of DDS
<b>Priority area: Enhancing graduation from extreme Poverty and promoting resilience</b>	
Kamonyi	<ul style="list-style-type: none"> <li>Outcome: Increased graduation from extreme poverty among male and female</li> </ul>
Nyanza	<ul style="list-style-type: none"> <li>Outcome: More effective social protection response to shocks and crisis. Outputs: Disaster management plan implemented; relocation of households living in high-risk zones.</li> </ul>
Ruhango	<ul style="list-style-type: none"> <li>Outcome 2: Reduced poverty among Rwandans. Output 2: Management of One Cow per Poor Family Program and other social programs run at the village level and support poor households to acquire small livestock improved.</li> </ul>

### Projects and programmes active in the region

The region has benefitted of very little support from other projects and programmes in the past few years. The only recent project in the project intervention area is Lake Victoria Management Project (LVMP II), which invested in the protection of Nyabarongo River Catchment in the last 2 years (2016-2017) (Baastel, 2018d).

Focus group carried out recently within the scope of the baseline assessment review to seven different communities located in the Mayaga region (Nyamiyaga, Mugina, Cyeru, Nyarugenge, Kibirizi/Muyira, Cyiri and Musha) also refer that no other project or program, concerning agriculture, forest or energy sector has been implemented.

There are, however, other initiatives which do not qualify to an entitlement of project but are worth mentioning, namely New Forest Company supporting nurseries preparation and tree planting in Gisagara and Nyanza. This is rather important as population and District officials mentioned that for the last 5 years, they only received between RWF 20-30 Million (USD 23-35 million) annually from Government for nurseries, tree planting, forest regeneration and forestry inventory. Although supported by many international organizations and donors, Rwanda's initiatives promoting forest restoration (Rwanda Forest and Landscape Restoration (RFLR), Forest Sector Strategic Plan 2017-2021 (FSSP)) do not seem to be sufficient as compared to the huge needs of the region.

### 3.4.5. Conclusion and recommendations

The Southern Province has been classified as the most vulnerable to climate change in Rwanda (Republic of Rwanda, 2019). The climate change impacts, to which the districts of the Southern Province are particularly exposed to, are prolonged droughts and rainfall variations which affect the agriculture and forestry sectors, both highly dependent on rainfed, by causing a decrease on productivity and, consequently, impact food security and biomass supply.

Districts are urged to make or renew their commitments in addressing the climate change impacts that especially hitting their territory. For instance, Gisagara District might be particularly affected by changes in the river water level and by instability on the hillsides where infrastructures are located, while the Nyanza District is the most exposed to temperature variations and warm spells. Whereas the Ruhango District vulnerability is very much associated with its lack of adaptive capacity, namely with regard to their extent of social capital, that means, the existing social networks.

The forest restoration plans to be developed within the scope of the FLR in the Mayaga region project should consider the results from the 2018 Assessment of Climate Change Vulnerability in Rwanda obtain for each district. These results allow for a target specified, and therefore, more efficient, response to reduce vulnerability to climate change in the region.

Decreasing vulnerability to climate change in the Mayaga region can be achieved through direct and indirect means. Direct means include for example interventions to secure access to land and to agriculture/ livestock inputs; indirect interventions relate to responding to the people's basic needs in terms of water, sanitation, and health facilities for example.

In line with the main resilience factors expressed by local communities, the 2018 Baseline Assessment Report identifies some possible avenues of intervention for resilience enhancement for the project (Baastel, 2018d):

- Access to land: Considering that some people do not have land and most people have small areas of land, alternative livelihood options should be promoted/ developed. Rwanda's population density is very high and there is hardly any additional land available for those people. However, where land is available, access to land would contribute to the resilience of the concerned households as long as it does not affect the functionality of ecosystems and key biodiversity

elements. Terracing steep slopes, rehabilitating old terraces, convert marshland into well delineated crop land, where encroachment has already occurred and does not result in further loss of key biodiversity elements and hampering of ecosystem functioning, are some of the possible interventions to be considered.

- **Diversification:** Diversification is as an important resilience factor, both diversification of income source and diversification of agriculture and forestry products. Income from non-agricultural activities is a usual strategy, especially for men, to increase household income sources while reducing risk from relying on agricultural production only, which, in turn, are subject to climate variability and possible production losses. On the other hand, diversification of agricultural and forestry production can help produce more value for each acre of land. Distribution or promotion of cattle can help local populations in the Mayaga region to cope with bad yields due to climate change. The promotion of more integrated agricultural systems, where crops, trees (agroforestry), and animals interact and are combined, would increase resilience as such interactions tend to enhance yields and quality of products, but also as those systems provide complementary income sources that can overcome accidents or weak yields for one of the products. Small-scale, mostly manual, farming as is the case in Rwanda can be very productive when the principles of agroecology are applied, making the most of each square meter of land and sunlight.
- **Securing agricultural productions:** Agricultural techniques and inputs should focus on securing production, in particular from climate variability. Crops can become more resistant to droughts by applying moisture conservation techniques (e.g., mulching) and small-scale irrigation. Protection from heavy rains with adapted practices (no bare land), erosion control techniques (terraces, agroforestry, hedgerows, etc.) and drainage infrastructures. Hedgerows and similar adapted techniques can be employed for protection against strong winds. Improved, short-cycle seeds are also interesting to be considered as a means to avoid losses from dry spells. Crop rotation, use of different crops and a large range of varieties, are also important to good and regular agricultural production and disease control. Training in improved agroecological production techniques can enhance yields and secure high-volume harvests. Finally, livestock farming also constitutes an interesting income source when crops are destroyed, or yields are too low and contributes for a balanced ecosystem.

- Ensuring good health: Health is mentioned by communities as an important resilience factor. Indeed, workforce is what many people have to offer to get an income, so it is crucial to be able to work physically to survive. Moreover, health impacts life quality and education. Essential aspects to ensure people's health are good nutrition, hygiene, access to water, sanitation, health facilities and insurance systems. Improvement of Rwanda's health system in the last 20 years, including better-equipped health facilities and the *Mutuelle de Santé*, is in this sense a strong climate change resilience factor.

Such interventions require proper planning and management, as well as effective stakeholder engagement. Moreover, the needs for investments are huge, requiring secured finance sources, and there is also a strong need for building local capacities, in particular regarding improved agricultural practices. Experience in other countries shows that well trained and equipped agriculture extension services are essential for farmers to adopt improved soil and farm management practices in the long term (Baastel, 2018d).

Furthermore, when populations are living under a survival mode, changing practices, and learning new approaches might be a barrier. An agro-pastoralist/ farmer field school (AP/FFS) approach may be a good option for integrating climate resilience into agricultural and pastoral production, since the AP/FFS approach uses farmer groups to deliver advisory services in a more interactive, participatory, and democratic manner than the previous often top-down extension systems. AP/FFS enables sharing experience between farmers and to demonstrate the value of some crops/techniques by showing existing plots that farmer can see. However, to be effective, AP/FFS should follow international best practices and work along specific methodologies, implemented by experienced professionals. Methods developed by FAO and GIZ are globally recognised for such purpose. Indeed, these are already being successfully implemented in Rwanda and throughout Africa (Baastel, 2018d).

Specifically concerning the forestry sector, four major interactions forest have with climate change, identified by FAO, namely the contribution to one-sixth of global carbon emission caused by deforestation and forest degradation, the forest ecosystem sensibility to changing climate, the alternative to fossil fuels offered by sustainable forest management, and the capacity of forests to absorb up to one-tenth of global carbon emissions estimated for the first half of the century the climate change. Considering the previous mentioned interactions, the climate change mitigation strategies should be

focus on increasing carbon storage in harvested wood products, product substitution and producing biomass for bioenergy (Republic of Rwanda, 2018).

Regarding ensuring biomass availability in the face of climate change, selecting more robust crops, with biological tolerance to heat and water stress is one possible solution. Another solution is the use of adequate and efficient irrigation systems that can counteract drought impacts. Other cross-sectorial solutions that also benefit the biomass sector resilience are the implementation of early warning systems for seasonal rainfall and temperatures anomalies, the existence of emergency harvesting for an imminent extreme event and the provision of crop insurance systems (Republic of Rwanda, 2018).

Moreover, and as planned for the FLR in the Mayaga region project, strengthening the use of improved stoves and biomass alternatives such as the LPG and biogas, would reduce the pressure on biomass. An assessment of sectoral opportunities considered in the Mayaga region afforestation project suggests the implementation of a sustainable charcoal value chain, which is also recommended as mitigation technology in the Nationally Appropriate Mitigation Actions (NAMAs) for Rwanda developed in 2015 (Republic of Rwanda, 2018)

Finally, an additional suggestion is to strengthen the institutional capacity of the Department of Environment and Climate Change of the Ministry of Environment, the Ministry of Emergency Management, in particularly the Disaster Prevention and Mitigation Unit, and Rwanda Meteorology Agency. The main objective is to improve and disseminate information throughout the different sectors involved on how to make decisions in addressing climate change in a concerted effort.

Moreover, introducing climate change vulnerability and adaptation considerations to the criteria used for selecting and prioritizing projects and their respective financing will be essential. Additionally, it is recommended for the project's budget to assign one specific percentage of the budget for carrying out specific measures regarding climate change adaptation and prevention, for instance, building resilient infrastructures, energy efficient solutions, compensation measures to be implemented in other sectors, such as the forestry sector for restoration and afforestation practices interventions.



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### 3.5. Legal Policy and Institutional Report

#### 3.5.1. Introduction

The “*Forest Landscape Restoration in the Mayaga region project*” is supported by a strong legal, policy and institutional framework. On the other hand, the project is upscaling national initiatives and strategies planned to encourage sustainable natural resources management. Hence, the project’s results are influenced by the adequacy of the framework in force, while also having an impact on the ongoing actions, particular regarding forest management. The effective implementation of the project is intrinsically linked to the legal, policy and institutional framework.

Rwanda is continuously making progress towards sustainable natural resources management with regard to the development of national policy, target sector strategic plans and specific related strategies. This chapter reflects the progress made since the 2018 baseline reports developed within the scope of the “*Forest Landscape Restoration in the Mayaga region project*”.

The following sections identify the legal instruments, policies, and strategic plans with relevance for FLR, particularly in the Mayaga region, together with their applicability for the project. Overall, the legal instruments are related to the main national blueprints, environment, and climate change in particular, forestry, biodiversity, land management, as well as to governance, urbanization, agriculture, energy, and mining sectors which are the most influence or influenced by forest management practices.

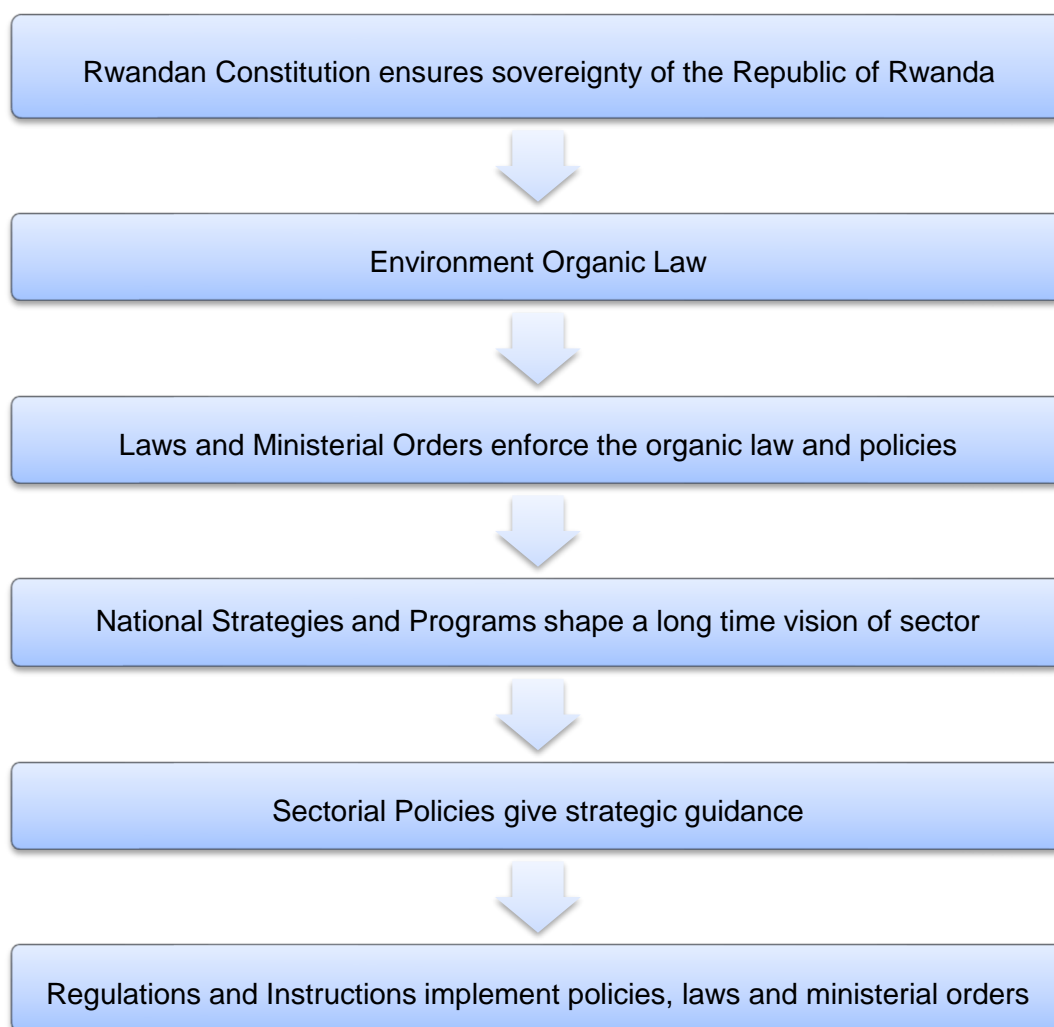
Moreover, an analysis of the previous identified legal and policy gaps will be carried out to comprehend if these have been already addressed and, if necessary, define which additional efforts need to be made. The institutional capacity to support FLR, in particular, and SFM, in general, will also be reviewed.

Overall, the present chapter will provide updated information considering the country’s last two years progress on the legal, policy and institutional setting. The assessment carried out in the next sections includes different sources of legal instruments including the environment organic law, national policies providing general strategic guidance, laws and ministerial orders enforcing the organic law and national policies, and finally national strategies and programs for the sectors mentioned above.

### 3.5.2. Legal and policy framework

Rwanda governance is built on three political powers: the legislature, the executive, and the judiciary. These three powers are independent and separate from each other, but complementary.

The regulatory framework, in turn, comprises laws, policies, strategies, ministerial orders, regulations and instructions. Figure 16 shows the hierarchy of legal instruments.



**Figure 16 – Hierarchy of legal instruments.**

The Constitution is the Supreme law in Rwanda. A new Constitution was adopted on the 26<sup>th</sup> May 2003, which was last reviewed in 2015. Being the Supreme law, every law or custom must comply with the Constitution.

The Organic Law and policies overrule and provide strategic guidance on the main sectors. Specific Laws and Ministerial Orders are published to enforce the Organic Law and Policies while National Strategic Plans and Programs can be developed to design long-term visions considering a specific sector or goal. The policies, laws and ministerial orders are implemented through regulatory instruments.

This section summarizes the policies, strategies and plans or programs, applied at the national and sectorial levels, with most relevance for forest and land management, forest ecosystem restoration and climate change. The legal and policy framework reviewed is presented in Table 44.

**Table 44 - Legal and policy framework most relevant for the Forest Landscape Restoration in the Mayaga region project.**

Area	Instrument
Cross-sectorial	Vision 2050 <sup>1)</sup>
	National Strategy for Transformation (NST) <sup>1)</sup>
Environment and Climate Change	Law n°48/2018 of 13/08/2018 on environment <sup>1)</sup>
	Environmental regulations and guidelines (e.g., Ministerial order no 001/2019 of 15/04/2019 – Requirements, procedure and list of projects for Environmental Impact Assessment <sup>1)</sup> )
	National Environment and Climate Change Policy 2019 <sup>1)</sup>
	Rwanda's Green Growth and Climate Resilience Strategy 2011-2050
	Strategic Plan for the Environment and Natural Resources Sector 2018-2024
	Updated Nationally Determined Contribution 2020
Forests	Law n°47bis/2013 of 28/06/2013 - Determining the management and utilisation of forests in Rwanda
	National Forestry Policy 2018
	Forest Sector Strategic Plan 2018 – 2022
	District Forest Management Plan
	National Tree Reproductive Materials Strategy 2018 – 2024 <sup>2)</sup>
	Agroforestry Strategy 2018-2027 <sup>2)</sup>
Biodiversity	Law N° 70/2013 of 02/09/2013 on biodiversity
	Biodiversity Policy 2011
	National Biodiversity Strategy and Action Plan (NBSAP) 2016

Area	Instrument
Land	Law N° 03/2013/OL of 16/06/2013 determining the use and management of land in Rwanda.
	National Land Policy 2019 <sup>1)</sup>
	National Land Use and Development Master Plan 2020-2050
Other relevant sectors	Energy Policy 2015
	Energy Sector Strategic Plan 2018/19 – 2023/24 <sup>2)</sup>
	Strategic Programme for Climate Resilience 2017 <sup>2)</sup>
	Strategic Plan for Agriculture Transformation 2018 - 2024 <sup>2)</sup>
	National Decentralization Policy Revised 2012
	National Housing Policy and National Urbanization Policy 2015
	Mining and Minerals Policy 2017

Notes: 1) Recently updated/ reviewed; 2) Not considered in the last assessment.

### 3.5.2.1. Cross-sectorial strategies

#### Vision 2050

Vision 2050 began to take shape recently in December 2019 with the publication of a draft version, to later replace Vision 2020. Much like Vision 2020, the new Vision 2050 acts as a critical blueprint to guide all stakeholders in Rwanda's development. Rwanda's Vision 2050 discloses the long-term strategic direction for “the Rwanda we want” by setting out the pillars that support this ambition. Moreover, Vision 2050 reflects the changing development context as the country enters in new phase of societal transformation (Republic of Rwanda, 2019).

Natural resources management, considered one of Vision 2020 cross cutting issues, is now taken into consideration under the Vision 2050's pillar “Urbanization and agglomeration”, while climate change resilience is considered under the pillar “agriculture wealth creation”. The ambition is that by 2050 sustainable energy generation and use will be well established which includes the identification of new sources of energy. Urbanization will be planned under an integrated approach that considers spatial, economic, social, and environmental dimensions. Whereas farmers will be provided with tools to minimize the losses from weather and climate change impacts. Spatial location and preservation of agricultural land will be ensured by the National Land Use Plan.

The implementation of Vision 2050 will be done mainly through the first National Strategy Transformation (NST1) a medium-term development strategy that links the Vision 2020 and Vision 2050. NST1, in turn, unfolds into Sector Strategic Plans and District Development Strategies.

All main global and regional development agendas were taken into consideration during the elaboration of Vision 2050, including: The Sustainable Development Goals (SDGs), the Africa Union Agenda 2063, the East African Community (EAC) Vision 2050, and the National Determined Contributions on Paris Declaration on Climate Change, among other instruments. Therefore, it is assumed that these policies main objectives and principles are reflected in Vision 2050.

### **National Strategy for Transformation (NST1) 2017-2024**

The National Strategy for Transformation of 2017-2024 is the main instrument for the implementation of Vision 2050 and its associated 2035 targets, which are aligned with the President's mandate (7 years). Overall, the NST1 provides the platform and pillars to stimulate Rwanda's transformation towards its ambition.

Rwanda recognizes the challenges and opportunities to be addressed in the NST1. Among the challenges identified are the incapability of achieving the targeted economic growth due to exports objectives and the rates established for school completion and transition. As opportunities, the NST1 highlights the support provided by important transformational factors, such as the country's visionary leadership, Home-Grown Solutions, security, stability, law, and order, as well as the zero tolerance to corruption. Other opportunities acknowledged are the country's young demographics, the existing potential for shifting the current workforce from agriculture to industrial sectors, the membership to regional economic blocks, and the potential to develop knowledge-based sectors, namely ICT, as well as the mining, oil, and gas industry.

Taking into consideration the progress achieved throughout Vision 2020 and foreseeing the achievement of Vision 2050, the NST1 defines three main pillars:

8. Economic transformation.
9. Social transformation.
10. Transformational governance.

The economic transformation pillar, in particular, defines one priority area with great relevance for the *Forest Landscape Restoration in the Mayaga Region project* which is priority area 7 – Sustainable Management of Natural Resources and Environment to Transition Rwanda towards Green Economy. Priority area 7 comprises key strategic interventions, which include:

- Continuing to strengthen forest management, namely by working closely with the private sector to ensure a sustainable exploitation, for instance by encourage private owners to work in cooperatives for market-oriented production.
- Increase forest cover to 30% by 2024 through forest landscape restoration. The restoration process is to be carried out in line with the National and District Forest Management Plans and acknowledging the plantation of tree species for their commercial value.
- Reduce the number of households depending on firewood as the source of energy for cooking from 79.9% (2016/17) to 42% by 2024, through the use of alternative sources such as cooking gas and biogas.
- Assist land administration and management to ensure optimal allocation and use of land. This includes the consolidation and harmonisation of land use master plans at both national and districts level with the support of a Land Administration Information System (LAIS).

The other two NST1 pillars also define specific priority areas. These strategic areas do not directly concern the objectives of the *Forest Landscape Restoration in the Mayaga Region project*. Despite that, some of the practices and guidelines defined are in line with the project's goals. For instance, the Social Transformation Pillar pretends to ensure a stable and secure society with quality standards of living, thus converging with the project's aim of improving the livelihoods' resilience.

In addition to the strategic interventions under the three established pillars, the NST1 prioritizes specific cross-cutting areas. Every cross-cutting area is to be embedded within the Sector Strategic Plans and District Development Strategies. One of the defined cross-cutting areas is Environment and Climate Change whose main focus will be to enhance cross sectoral coordination towards a “smooth implementation of the environmental policies and regulations” with emphasis for the agriculture, urbanization, infrastructure, and land use management sectors.

### 3.5.2.2. Environment and Climate Change

#### Law on environment (Law n°48/2018 of 13/08/2018)

Law n°48/2018 of 13/08/2018 updates organic law n° 04/2005 of 08/04/2005 on environment by determining the modalities for protecting, conserving, and promoting the environment. It defines the fundamental principles guiding environmental conservation, using recent terminology, and looks over the main concepts that need to be established for ensuring a quality environment for Rwanda, following a similar structure to the revised law.

The obligations of the State, decentralised institutions and local communities were reviewed and encompass obligations with regard to environmental conservation, including the financing of environmental conservation activities. Moreover, the new law explores with more extent the Prohibited Acts and Penalties and criminal investigation.

Considering the scope of the *Forest Landscape Restoration in the Mayaga Region project*, the following obligations are highlighted:

- Every socio-economic sector must mainstream environment and climate change in the development and implementation of its policies, strategies, plans and programs.
- Only the State has the supreme power for the management of all land situated on the national territory.
- The State has the obligation to protect the biodiversity and must identify the areas to be protected for conservation or rehabilitation of ecosystems, forests, woodlands, species of biodiversity and protected zones, monuments, historical sites, and landscapes.
- The State has the obligation to promote effective energy use.
- The State is responsible for defining financing mechanisms developed to support initiatives of the Government/ administrative entities/ national and international NGOs that have the purpose of protecting the environment and building climate resilience.
- The state has the obligation to facilitate initiatives aiming at protecting environment, including the implementation of low carbon technologies, in accordance with relevant laws.

- Decentralised entities are responsible for, among others, afforestation, protection, and proper management of forests, as well as protection and proper management of reserved areas.

## **National Environment and Climate Change Policy 2019**

The National Environment and Climate Change Policy 2019 provides strategic guidance for addressing environmental management and climate change adaptation and mitigation related emerging issues, which include high population density, pollution, land degradation, fossil-fuel dependency, irrational exploitation of natural resources, among any others. The policy is line with the other main global and national blueprints, namely Vision 2050 and the NST1, as well as the regional development strategies.

The new policy reflects the changes and reforms occurred in the sector throughout the last 15 years, namely the new institutional set up (such as the new law on environment and the establishment of REMA, FONERWA, RFA, RLMUA and Meteo Rwanda). On the other hand, the revised policy is framed within the context of the current international and regional development strategies on the matter.

Moreover, the 2003 Environment Policy did not contemplate climate change as a distinctive concern. The revised policy also takes into consideration other missing topics such as: protocols from Regional Economic Communities (RECs), norms and standards on environmental and social safeguards, circular economy, integration of Payment of Ecosystem Services and Natural Capital Accounting, mechanisms to guide and promote innovation in environment and climate change impact management, as well and pollution control and waste management.

Additionally, the new policy provides appropriate and effective responses to some sectoral activities that were lacking in the former environmental policy while, at the same time, avoids duplication of specific topics that have been catered in proper policy (e.g., biodiversity policy). The 2019 policy also intends to provide a sounded framework to support a much-needed public and private financing of environment and climate actions.

The policy is line with other sectoral policies that include, but not are not limited to, forestry policy, biodiversity policy, agriculture policy, land policy and energy policy. Environment and climate change issues have also been incorporated during the

elaboration of sectoral and districts medium-term strategies to be in practise through the period of 2017-2024, as cross-cutting areas.

The policy main goal is for “Rwanda to be a nation that has a clean and healthy environment resilient to climate variability and change that supports a high quality of life for its society”. The following objectives were defined to achieve the established goal:

1. Greening economic transformation.
2. Enhancing functional natural ecosystems and managing biosafety.
3. Strengthening meteorological and early warning services.
4. Promoting climate change adaptation, mitigation, and response.
5. Improving environmental well-being for Rwandans.
6. Strengthening environment and climate change governance.
7. Promoting green foreign and domestic direct investment and other capital inflows.

To meet the objectives defined, 22 policy statements and 127 policy actions have been defined. It is recognized that policy goals can only be achieved with clear institutional arrangements in place.

The policy objective 2 has particular relevance for the forest landscape restoration project. For instance, its statement 1 “conserve, preserve, and restore ecosystems and enhance their ecological functioning” clearly advocates for the development of programs for the conservation of natural heritage and the employment of all appropriate actions to protect and preserve fragile ecosystems. Forests are indicated as one of the most critical ecosystems to be addressed. The preparation of restoration development plans is referred as well.

Other policy actions in line with the objectives and scope of the forest landscape restoration project include:

- Strictly regulate transboundary movement of genetically modified organisms and products, and at the same time, encourage the generation of improved crop varieties (in policy objective 1).
- Promote sustainable farming practices in accordance with the local agricultural practices, able to not be disruptive and to consider economic, social, cultural and gender dimensions (in policy objective 1).

- Mainstream green, ecological and climate resilient practises and interventions in all development sectors and districts including in their plans, budgets, functions, and actions (in policy objective 4).
- Promote resource recovery and reuse in all sectors (in police objective 4).
- Mainstream the sustainable use and conservation of critical ecosystems in the daily operations of productive sectors including agriculture and energy (in policy objective 6).
- Develop projects and partnership to build human capacity in dealing with the environment and climate sector ongoing challenges (in policy objective 6).
- Enhance environment, weather and climate information use and climate change awareness and education among Rwandan society (in policy objective 6).
- Establish a statutory national coordination framework for managing critical ecosystems that are facing serious threats by economic activities (in policy 6).

An implementation plan was designed to execute the policy actions defined. It clearly assigns roles and responsibilities to specific institutions for each of such actions. The policy will be implemented through ministerial and DDs, SSPs, annual *Imihigo* target and actions plans, including those of development partners. Moreover, the 2019 Environment and Climate Change policy will be supported by existing coordination mechanisms.

### **Green Growth and Climate Resilience Strategy - National Strategy for Climate Change and Low Carbon Development (2011)**

The National Strategy for Climate Change and Low Carbon Development, usually referred as Green Growth and Climate Resilience Strategy (GGCRS), published in 2011, was already developed with the purpose of providing a strategic framework towards Vision 2050 ambition of making Rwanda a climate-resilient and low-carbon economy. Under this premise, the national strategy provides guiding principles, strategic objectives, programmes of action and the enabling pillars, as well as a road map for implementing the defined measures and strategies.

To build a low-carbon economy, Rwanda has to invest in economic development and reduction of GHG emission at the same time. One potential pathway sated in the GGCRS

2011-2050, focuses on the energy resource mix, namely in the exploitation of the alternative existing energy sources (e.g., geothermal, hydro, and solar energy or Lake Kivu methane exploitation). In addition, it refers that to ensure a low carbon development it will always be necessary to improve transport efficiency.

Forests, parks, and agroforestry can also contribute to a low carbon development by acting as carbon sinks, as referred in the GGCRS 2011-2050. Preserving and increasing the area covered by these ecosystems would compensate the emissions associated with economic development, namely from the industry and transport sectors growth. Furthermore, forests, parks and agroforestry provide ecosystem services that stimulate economic development, for instance in the energy, tourism, and food sectors.

Concerning the guidelines provided by the GGCRS 2011-2050 for climate resilience, it is relevant to highlight the need to integrate land use planning with agricultural adaption to climate change and the importance of disaster management and vulnerability mapping. Moreover, the national strategy states that forests and natural parks must be protected to preserve Rwanda's biodiversity and ecosystem services. Knowledge on climate data and on climate resilience practices is also pointed out as one of the main pathways to be followed towards green growth and climate resilience.

Accordingly, agriculture, land and forestry are some of the sectors target in the programmes of action defined under the GGCRS 2011-2050. The programmes of action with more relevance for the *Forest Landscape Restoration in the Mayaga Region project* are the following:

- Sustainable intensification of small-scale farming;
- Agricultural diversity for local and export markets;
- Sustainable Land Use Management and Planning;
- Promotion of ecotourism, conservation, and payment for ecosystem services;
- Sustainable forestry, agroforestry, and biomass energy.

The implementation of the programmes of action is to be supported by five enabling pillars: institutional arrangements; finance; capacity building and knowledge management; technology, innovation, and infrastructure; integrated planning and data management.

Institutional arrangements include the targeted ministries and governmental authorities and agencies under the ministries' administration. Additionally, a Technical Co-ordinating Committee was created to ease the coordination and implementation of the determined strategic national objectives across sectors, thus ensuring compatible climate resilient and low-carbon development. The institutional arrangements also embody the National Fund for Climate and the Environment – FONERWA – and foresee the creation of a Centre for Climate Knowledge for Development.

Finally, the national strategy defines “big wins” which are procedures that if implemented will contribute significantly for the mitigation, adaption and for the low carbon economic development. One of these big wins is agroforestry for providing wood for fuel, increasing food security and carbon sequestration, while avoiding deforestation and enhancing soil stability and resistance to erosion at the same time.

### **Strategic Plan for the Environment and Natural Resources (ENR) Sector 2018-2024**

The overall objective of the Strategic Plan for the Environment and Natural Resources (ENR) Sector 2018-2024 is “optimize and scale-up sustainable and climate resilient management of natural capital resources to anchor and accelerate achievement of Rwandan prosperity”. It covers six sectors: forestry, water, land, meteorology, environmental management, and mining.

For all the six above referred sectors, the Strategic Plan for the ENR Sector covers the key related identified challenges. The challenges addressed with regard to the forestry sector include unproductive forest management practices (which is intensified by illegal tree cutting, uneven distribution of forest resources, limited space, and low productivity of plantations), predominance of monoculture and poor agroforestry practices. High levels of land degradation leading to non-optimal utilization of resources are also considered.

Accordingly, one of the specific objectives defined in the strategic plan is to establish and enforce national quality standards for Sustainable Forest Management (SFM) & Agroforestry Materials, as well as management techniques to improve productivity. This objective lead, in turn, to outcome 1 - sustainable and productive forest and agroforestry management.

Outcome 1 comprehends the optimization of the services provided by agroforestry and forest plantations through the establishment of quality standards for tree seeds and management techniques, based on expert guidance about appropriate site-species matching and seed sourcing. The compliance standards will be applied by private and community-based models and by the extension of technical capacity. Implementation of optimal and high-productive agroforestry models will be scale-up in partnership with the Ministry of Agriculture and Animal Resources and farmers. Plus, efforts should be made to reduce biomass demand, namely by promoting the use of alternative and/or improved technologies.

Also worth mentioning is outcome 5, consisting of enhancing environmental management and resilient to climate change. Among others, this outcome includes as an output the improvement of environmental education, awareness, and mainstreaming, strengthen pollution control and reduction of vulnerability to climate change. Furthermore, the ENR SSP addresses, to some extent, the cross-cutting areas prioritized under the NST1 (in which climate change and capacity development are included).

### **Updated Nationally Determined Contribution 2020**

Under the country's commitment to the Paris Agreement, Rwanda must provide its Nationally Determined Contribution (NDC) with the aim to contribute for limiting the average global temperature. This document must outline the main strategies to reach the defined target. For such purpose, Rwanda's NDC is developed on a data-driven analysis of the main contributors to the country's greenhouse gas emissions which was last assessed in the Third National Communication of 2018.

Following that, in 2020, the Government of Rwanda published the update of the first Nationally Determined Contribution for the period to 2030 taking into consideration the new policies and national plans and their respective implementation. The updated NDC intends to support coordinated responses for both government agencies and international organizations, as well as NGOs, community-based organisations, and the civil society, in general, to foster and monitor climate action.

Rwanda's contribution to climate change through the emission of greenhouse gas is relatively low, but the impact generated from deforestation, agriculture, land use and the expected growth in energy use and economic development are considered significant

for mitigation and adaptation actions to be defined. As a result, in 2011 the country adopted the Green Growth and Climate Resilience Strategy (GGCRS) in which such mitigation and adaptation measures are defined. The actions set out in the GGCRS provide the basis for the development of the NDC.

According to the updated NDC, the country's total emissions, excluding forestry, were estimated at 5.33 million tCO<sub>2</sub> with the agriculture sector accounting for the largest share of the total (2.94 million tCO<sub>2</sub>, 55% of total), followed by energy (1.68 million tCO<sub>2</sub>, 31% of total) and waste (0.64 million tCO<sub>2</sub>, 12% of total). Under a business-as-usual projection, Rwanda's total emissions are forecast to more than double over the period 2015-2030, reaching 12.1 million tCO<sub>2</sub> in 2030. However, such emissions have the potential to be reduced up to 4.6 million tCO<sub>2</sub> through unconditional contribution, based on domestically supported measures and policies, and conditional contribution, with international support and funding, which contribute for a higher decrease.

Regarding adaptation contribution, the updated NDC underlines the 24 adaptation measures proposed in Rwanda's agenda, covering different sectors, namely water, agriculture, land and forestry, human settlement, health, transport, mining, but also other cross sectorial measures. Among others, the interventions selected include developing agroforestry and sustainable agriculture, promote afforestation/ reforestation of designated areas, improving forest management of degraded forest resources, and developing sustainable land use management practices.

The update report also provides a specific "measuring, reporting and verification" framework to ensure the successful implementation of Rwanda's NDC. Furthermore, the financial and technology means, as well as the capacity building actions required for the implementation of the mitigation and adaptation measures are estimated.

### **3.5.2.3. Forests**

#### **Law n°47bis/2013 of 28/06/2013**

Law n°47bis/2013 of 28/06/2013 determines the overall management and utilisation of forests in Rwanda. It is applied to all types of forests, all tree species, all persons who possess, process, and utilize forest products, as well as all issues related to sustainable forest management.

With the purpose of determining the management and utilisation of forests in Rwanda, the Law n°47bis/2013 defines:

- Forests categories;
- The development of a 10-year forest management plan, and the respective State, District, and private forests;
- Planting, conservation and protection of forests practices, objectives, and responsibilities (afforestation, including agroforestry practices; role of population, collaboration of institutions and responsibilities of local authorities regarding forests protection; forest harvesting);
- Requirements of forest management (inventory of forests; management of protected State forests to be under special law; State production forests to be managed under the forest plan; guidelines for harvesting in private forests);
- Forestry research;
- Licenses appliance;
- Judicial police and administrative sanctions.

### **National Forestry Policy 2018**

The 2018 National Forestry Policy reflects the strategy for forest resources use and management considering the changing local and global environment, as well as the government's ambitions for the sector. It intends to be the basis for the reliable use of domestic and outsourced technologies in the forestry sector and to reinforce the role of private sector in forest management.

The revised National Forestry Policy is in line with the national development framework, namely the Vision 2020, the National Strategy for Transformation, the GGCRS, and the Forest Landscape Restoration initiative. Plus, it considers the programs in force at the international programs, such as the Sustainable Development Agenda and the United Nations Framework Convention on Climate Change (UNFCCC), which includes the Reducing Emissions from Deforestation and Degradation (REDD+) initiative and the Bonn Challenge.

As an overall goal, the forestry policy aims at making the forestry sector one of the pillars for sustainable development and climate change adaptation to improve the livelihoods

of present and future generations. To contribute for such goal, it defines the medium and long-term strategies regarding national forests resources management throughout the following policy statements:

1. Institutional capacity – Enhance the capacity of forests institutions and actors to achieve the requirements of Sustainable Forest Management (SFM);
2. Sustainable Forest Management – Ensure SFM through the definition and implementation of forest management plans at all levels;
3. Private Sector Participation – Encourage private sector to increase investment in forestry sector;
4. Woody Biomass Energy – Develop and implement appropriate regulatory instruments to ensure sustainable and efficient biomass supply;
5. Forest Ecosystem Conservation – Enhance biodiversity and ecosystems services and values in accordance with the national and international agenda;
6. Participatory Forest Management – Promote active participation of stakeholders in SFM to ensure ownership and proper benefit sharing;
7. Agroforestry and Trees Outside Forest Development – Enhance the adoption of these techniques to improve forest resources and agriculture productivity.

The document contextualizes the linkages of Rwanda's forest policy to other national policies and challenges and opportunities faced by the sector. The challenges identified include excessive and illegal cutting of forests, uneven distribution of forests resources, low productivity and genetic quality of forest resources, weak involvement of private sector, predominance of monoculture, poor agroforestry practices, lack of land for reforestation and afforestation and limited technical capacity. Whereas the existing opportunities encompass the following favourable setting:

- High level of political keenness translated into the establishment of institutions with the mission of developing the forest sector;
- Policies and strategies that prioritize green growth development, biodiversity, climate change and afforestation fostering landscape restoration approaches;
- Compliance with regional and international conventions and agreements that might lead to climate finance and funding of green bonds for private participation in forest related sectors;
- Environmental protection being perceived as a priority in national and economic sectors policies to a low carbon development;

- Forestry being one key intervention among different sectorial policies, such as environment, water resources, biodiversity, food security, energy, and land management;
- Made in Rwanda program encourages the private sector to explore forest value addition, non-timber forest products and forest landscape restoration;
- Increased awareness on ecosystems services;
- High linkages in integrated programs from different sectors.

### **Forest Sector Strategic Plan 2018 - 2022**

The government's directions towards the achievement of the policy statements defined in the National Forestry Policy are translated into specific outcomes and respective outputs defined in the Forest Sector Strategic Plan of 2018 - 2022. For each of the defined outcomes and outputs, the strategic plan defines the lead agency responsible for achieving such goals, thus assigning responsibilities to each entity. Consequently, reaching the outcomes defined also depends on other sectorial strategic policies and strategic plans.

Both the Forest Sector Strategic Plan 2018-2022 and the 2018 National Forest Policy long-term vision of productive but environmentally friendly forests and agroforestry plantations call for the development of quality tree species adapted to the conditions imposed by the management practices promoted. For such, the forest sector needs to be supported by a national strategy responsible for the establishment of a sustainable supply chain of tree reproductive materials capable of generating trees adapted to the different reforestation, agroforestry, and restoration sites and with potential to produce goods and services.

### **District Forest Management Plan**

As the districts are considered the management implementation units for all government plans, the National Forestry Policy is implemented at a decentralised level mainly through the District Forest Management Plan (DFMP). Overall, the DFMPs translate the policy into actions to address the critical issues of forest management in the district context.

The District Forest Management Plan is design based on the forest resources updated status which has to be assessed in the contexts of the plan's development. Upon the assessment results, general and specific objectives for these resources are established. The management plan intends to be an efficient tool for ensuring the public forest resources sustainable management. For such purpose, and considering the different uses, services provided and conservation status, different units might be created to which different interventions are assigned.

### **National Tree Reproductive Materials Strategy 2018-2024**

In line with the Forest Sector Strategic Plan, a National Tree Reproductive Materials Strategy was developed with the purpose of creating enabling conditions for the development of seeds, seedling or other vegetative materials and container stocks aiming at the creation of forest and agroforestry plantations that provide improved economic and ecological services. To do so, a strategic framework with specific objectives was defined.

Within this scope, a tree seed centre is in place in the country since the 70's and has had successful results and relevant recognition since the middle 80's. Indeed, demand for tree seeds has been continuously increasing due to the rising afforestation targets set for the country and due the tree planting investment, which has resulted in higher responsibility for the tree seed centre. Currently the tree seed centre's management falls under the Rwanda Forestry Authority.

As reflected in the National Tree Reproductive Materials Strategy, there is an urgent need to improve the management of current tree stands (e.g., with adequate forestry practices, awareness campaigns for the communities, etc.). Plus, the interest of the private sector is still low with no accredited tree seed producers or collectors (that are following well-established standards) working for the tree seed centre. Therefore, as referred in this strategy, there is a strong need to implement a tree reproductive materials supply chain with the increasing participation of the private sector.

## **Agroforestry Strategy 2018-2027**

The National Agroforestry Strategy (2018-2027), supported by the Food and Agriculture Organization of the United Nations (FAO), creates a roadmap for increasing the adoption of agroforestry practices in Rwanda's landscapes and watersheds. In this roadmap, the aspects identified as most relevant for the agroforestry practices to be successfully implemented are leadership, coordinated action for technology development and integration, application and decision support tools, technology transfer to target managers and technical assistance to farmers, although it is recognized that some farmers already have a relevant knowledge regarding agroforestry best practices, but these are not yet properly applied.

Considering that, the agroforestry strategy identifies needs and priority actions for all agro-ecological zones and land use systems. Priority actions are formulated in six interconnected thematic areas that include: creating Policy and Institutional Framework for Agroforestry; innovative Research and Knowledge for Agroforestry Development; strengthening Communication and Extension for Agroforestry Adoption and Scaling-Up; promotion of priority Agroforestry Practices; marketing of Agroforestry Products and Development of their Value Chains; and empowering Women and Youth through Agroforestry Development (FAO, 2020).

### **3.5.2.4. Biodiversity**

#### **Law N°71/2013 of 02/09/2013 on biodiversity**

The Law N°71/2013 of 02/09/2013 is the legal instrument governing biodiversity in Rwanda. Its main purpose is to determine how management and conservation of biological diversity will be handled in the country. Overall, the law stipulates biodiversity planning and monitoring (including national strategies and bioregional plans), identifies the ecosystems endangered and invasive species, the conditions for bioprospecting, access, and benefit sharing, as well as permits and administrative sanctions.

The following procedures and orders defined by the law on biodiversity are highlighted:

- Definition of national biodiversity strategies, including their content and procedures for revision;

- Definition of bioregions and the respective management plan which should be related to the management of an ecosystem, indigenous species or alien and migratory species;
- Determination of monitoring mechanisms;
- Promotion of research mainly focused on the conservation status of different biodiversity components;
- Identification of ecosystems and species that are critically endangered, endangered, vulnerable or with other high conservation value, as well as the activities prohibited with regard to those ecosystems and species;
- List of invasive species, activities including such invasive species and obligation to control them;
- Bioprospecting and export of biological resources and administrative sanctions for infractions.

### **Rwanda Biodiversity Policy 2011**

In 2011, the Government of Rwanda published the Rwanda Biodiversity Policy with the purpose of providing a “an overarching framework for the conservation, sustainable utilization, access to biodiversity resources and fair and equitable sharing of benefits derived from the resources”. The Biodiversity Policy articulates the conservation goals defined as key pillars of the main national development strategies in force at the time (Vision 2020 and the Economic Development and Poverty Reduction Strategy), and reflects Rwanda’s international obligations such as those imposed by the ratification of the Convention on Biological Diversity.

The objectives of the policy were to:

1. Provide a comprehensive and cohesive policy framework that will strengthen the Government’s ability to conserve and protect Rwanda’s resources;
2. Provide a legal and institutional framework for biodiversity conservation and management throughout the country;
3. Promote partnerships, incentives and benefit sharing to enhance biodiversity conservation and management;
4. Promote generation and management of knowledge in conservation, including traditional knowledge and its application in biodiversity conservation;
5. Provide a framework for access genetic resources and sharing benefit concerning those resources;
6. Promote positive actions towards biodiversity conservation and management.

The Biodiversity Policy elaboration was based on an analysis carried out on the country's state of biodiversity. This assessment identified the main drivers of biodiversity loss and the current challenges concerning the socio-economic context and the policy framework in place in the country.

Concrete strategies and activities are defined to achieve each of the policy objectives. These actions address, among others, the incorporation of biodiversity conservation into land-use plans as a specific land use; the conservation of keystone and indicator species, as well as endangered and threatened species; the efficient management of protected areas, including increasing the area under the protected areas system; the rehabilitation of degraded ecosystems; *ex-situ* conservation; conservation of agrobiodiversity; control of alien and invasive species and genetically modified organisms; and the integration of biodiversity concerns in national and regional initiatives.

Particularly regarding the rehabilitation of degraded ecosystems, according to Rwanda Biodiversity Policy, the Government, in collaboration with interested and affected parties, shall: prioritise the rehabilitation of degraded ecosystems with a program to restore those of national importance; develop strategies, plans and measures for the identification, restoration, recovery and conservation of populations of threatened species; address the issues of genetic contamination and loss of variability.

## **National Biodiversity Strategy and Action Plan 2016**

The 2016 revised National Biodiversity Strategy and Action Plan (NBSAP) defines five objectives and 19 national targets to stop biodiversity loss and increase the economic benefits provided by biodiversity and ecosystem services. The NBSAP is developed on the values of biodiversity and ecosystem services, on the causes and consequences of biodiversity loss, on the country's policy, legal and institutional framework and, finally, on the lessons learned from the previous NBSAP.

The updated strategy has a long-term vision aligned with the Convention on Biological Diversity Strategic Plan to 2020 which 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”. Accordingly, the

objectives defined, and respective targets are in line with the Convention on Biological Diversity Strategic Goals and also the Aichi Biodiversity Targets.

In the defined targets were included ambitious results concerning ecosystems conservation and reduction of the known degradation. Particularly regarding the scope of the FLR in the Mayaga region project, target number 14 aims at enhancing ecosystems resilience and contribution to carbon stocks through an increase of forest cover up to 30% by 2020. This was to be done by the promotion of afforestation and restoration programs, enforcement of policy and law in forestry sector, and forest sustainable management in particular, as well as strengthening institutional capacity for technology transfer regarding forestry management.

Furthermore, the NBSAP foresees the incorporation of the defined activities into other sector's plans and strategies as it is the case of the Green Growth and Climate Resilience Strategy, the Strategic Plan for Transformation of Agriculture, and the integration of biodiversity in the Environmental Impact Assessment procedures regulation.

#### **3.5.2.5. Land management**

##### **Law N° 03/2013/OL of 16/06/2013**

Law N° 03/2013/OL of 16/06/2013 repeals the Organic Law n° 08/2005 of 14/07/2005, and sets new modalities for land allocating, acquisition, transfer, and management in Rwanda. Overall, this law defines:

- The principles applicable to the rights recognized over land in the national territory of Rwanda. Land is a common heritage of all the people of Rwanda.
- The state as having the supreme power over the management of all lands in Rwanda in the interest of all.
- Equal rights to men and women.
- Freehold land rights for residential, industrial, commercial, cultural, and scientific services.
- The different categories of land: urban, rural, individual, public, and state land. Public land is controlled by national or district institutions

- Procedures and obligation within land allocation, acquisition, and lease. For instance, swamp land cannot be allocated to individuals, but it may be lent through agreement.
- Land registration as being obligatory for all landowners.
- That land can be transferred through succession, gift, inheritance, rent, sale, sub-lease, or exchange, but the transfer requires prior consent by all registered right holders
- Land registration, issuance of titles and land management shall be carried out by a competent national institution.
- Specifications on land management, e.g., land for Special Economic Zones.
- That for purposes of optimization of productivity an Order of the Minister in charge of Agriculture and Animal Resources shall set up procedures and modalities of land use consolidation.
- Crimes against proper land management and use shall be punished in accordance with the Penal Code
- When State land in the private domain or that of other State institutions is degraded, is about to be degraded or is unexploited, it shall be temporarily allocated to an interested person, who has demonstrated the willingness and capability to make it productive, for a period not exceeding five years.
- The Minister (responsible for lands) can order the repossession of land that has remained undeveloped or unused for a period of three years.

### **National Land Policy 2019**

The National Land Policy 2019 corresponds to the revised land policy developed based on the outcomes from the 2004 land policy, thus giving continuity to the actions which are still in progress and, at the same time, providing the missing framework for the emerging issues in efficient land management, as the previous policy was mainly focus on land administration instead of use management. It also reflects the country's long-term transformational development planning ambitions (NST-1 and Vision 2050) and the new global and national commitments.

The 2019 National Land Policy is built upon three main pillars:

1. Land use, surveying, and mapping – proposes a shift from district boundary-based planning to planning based on sectorial and land suitability, which should

- include the development of Sector Use Master Plan for each sector linked to land management (under the considerations of the National Land Use and Development Master Plan).
2. Land use management – provides guidance on how to use and manage land efficiently across sectors in accordance with the respective master plans, focusing on how to support strategic investments towards efficient use.
  3. Land administration – strengthening the current land administration system through the effective administration of land fees and property taxes, the minimization of land conflicts and the enforcement of land sub-sector coordination and dynamic.

Land is a core component linked to other sectorial national policies, as well. The forest policy and strategy aim at contributing for the sustainable land use management through a forest cover of 30% and 10.25% composed of natural forest ecosystem managed as protected area, which should be achieved through landscape restoration approaches mainly on degraded land. The national land policy in force recommends agroforestry to be part of the agricultural landscape on the hill since it contributes to soil protection.

The land policy mission is “to ensure a mid and long-term efficient land use planning, management and administration in Rwanda” aiming at the overall objective of enforcing land administration and management towards an optimal allocation and use of land. For such purpose, the policy defines six specific objectives. These objectives consider an effective and efficient land use and management across the concerned sectors, including forestry, and an efficient cross-sectorial land utilization.

### **National Land Use and Development Master Plan 2020-2050 (2020)**

Upon the evaluation of the National Land Use and Development Master Plan (NLUDMP) of 2011, it became clear that the previous one was not aligned with the new Vision 2050, NST-1, the new land law, the green growth policies, and the other related development guidelines and, thus, needed to be reviewed.

The NLUDMP for 2020-2050 assess all land-users, through the consideration of 13 prime land consumers: 1) Prime Agricultural Lands; 2) Secondary Agriculture Lands; 3) Conditional Agriculture in Wetlands; 4) Grassland for Livestock; 5) Natural Forest; 6)

Forest Plantations; 7) Wooded Savannah; 8) Shrubland; 9) Urban Settlements; 10) Rural Settlements; 11) Industry; 12) Roads; 13) Airfields.

The master plan analyses the current land cover, the long-term needs, and the area to be allocated for each land-use during the period of 2035 to 2050. With regards to environment and natural resources, the NLUMDP suggests the reservation of 1,389 km<sup>2</sup> of natural forests and 3,873 km<sup>2</sup> of forests plantations, as well as 1,554 km<sup>2</sup> of high slopes to be planted, among other considerations of land allocation. Additional measures also include ensuring that there are no new plantations of forest in agriculture lands, except agroforestry, and ensuring the promotion of green energy in order to avoid deforestation. However, it is proposed a reduction of the area set for conservation from 47% to 37% in order to satisfy the population growth needs of built up and agriculture areas.

#### **3.5.2.6. Other relevant sectors**

##### **Energy Policy 2015**

The importance of the energy sector for forests is mostly related to the country's dependency of biomass for energy production. According to the Energy Strategic Plan 2017-2024, biomass accounts for 85% of all energy consumed, with a very significant part being consumed for cooking, with wood being used mainly by rural households, as urban households use charcoal.

Indeed, the Energy Policy (2015) reviews the most significant issues regarding the energy sub-sectors which are Electricity, Petroleum and Biomass. The issues referred in relation to the biomass sector are the “inefficient production and use of wood-fuels resulting in the depletion of forest resources, which, in turn, has an adverse environmental impact in terms of accelerating climate change, threatening biodiversity and increasing erosion. It also has an adverse impact on the health of wood-fuels users, especially in rural households.”

The policy main goal is to ensure that all residents and industries can access energy products and services and that these are sufficient, reliable, affordable, and sustainable. To achieve this main goal, the policy defines specific goals, some of which contribute simultaneously, for national development. The following key statements are highlighted:

- Implementation of an integrated approach to energy planning as part of a broad national planning framework, in which the linkages between different energy sub-sectors and the economy are considered as a whole.
- Foster energy efficiency and conservation by ensuring the best use of the existing as well as future energy supplies, while minimizing adverse environmental consequences of energy use.
- Generation of energy supplies through efficient technologies and allocation of appropriate economic incentives for prudent use of energy resources while satisfying the energy needs;
- Promotion of alternative energy sources such briquettes, kerosene (using efficient and safe pressure stoves and lights), LPG and solar power. Rwanda has the potential to develop other alternative energy sources such as geothermal, methane and wind energy that will be research.
- Promotion of biofuels, namely ethanol and biodiesel.
- Consideration of the environmental dimension as there are close interactions between almost all forms of energy use and the environment. Rwanda is committed to implement environmentally friendly energy technologies.
- Focus on energy efficiency, namely through more efficient conversion technologies and improved domestic stoves. Research on this field is to be supported.

Efforts for funding low-carbon energy solutions, such as renewable power generation projects and improved cook stoves, include the registration of projects and activities of the UN Clean Development Mechanism and Nationally Appropriate Mitigation Actions under the United Nations Framework on Climate Change, as well as voluntary carbon market channels. These include:

- Developing a Sustainable Charcoal Value Chain in Rwanda, namely producing more biomass through better management of plantations and removal of restrictions on cutting and transport of wood and charcoal, as well as saving biomass using more efficient charcoal production and improved stoves.
- Improvement of energy efficiency in the tea and coffee sectors in Rwanda namely by in shifting from biomass to renewable energy in some components of the production process.

## Energy Sector Strategic Plan 2018/19 – 2023/24

Concerning particularly the biomass energy subsector, the National Forest Inventory concluded in 2015, refers the country has 8,9 million m<sup>3</sup> of forest resources for energy wood use, with the majority being trees outside forests on agroforestry (including agriculture) areas. Additional, biomass resources available include residues from harvesting and residues from agriculture.

As stated previously, biomass accounts for 85% of the energy consumed in Rwanda, with households using 91%. Rural households use biomass mostly as firewood for cooking and heating, while urban households use charcoal. The use of firewood is associated with being a resource available for free, whilst charcoal is preferred for being easily transported and stored. With increasing urbanisation its expected for the charcoal consumption to increase as well. Industries, on the other hand, use biomass essentially in tea productions and small-scale brick making.

Reducing the reliance on firewood and, consequently, improve health, economic development and contribute for the protection of forests resources is a priority of the Government reinforce in the Energy Sector Strategic Plan (ESSP) 2018/19 – 2023/24. LPG and biogas are two alternative energy sources suggested. Incentives to low LPG prices are being implemented as well as subsidies to use biogas digesters, although this requires the users to have access to domestic animals and it remains a limited technology as not always answers the demand for fuel.

Another strategy is the implementation of improved cooking technologies, namely improved stoves. Such goal is specifically translated into the following ESSP high-level target objective: “halve number of HH using traditional cooking technologies to achieve sustainable balance between supply and demand of biomass through promotion of most energy efficient technologies.” This target concerns the sector priority of improving people’s health and simultaneously protect forest resources. To achieve the target the ESSP defines the following principles:

- Carry out more studies on the biomass supply and demand to improve forecasting, impact assessment and cost/benefit analysis of proposed interventions.
- Implement a multi-strategy approach with supply-side improvements and demand-side improvements.

- Improve institutional context considering that biomass is wide-range sector, the roles and responsibilities of the different actors involved need to be clarified and optimise while coordination between them must be foster through data sharing and regular meetings/ workshops.
- Focus on behavioural change, namely through awareness campaigns and specifically design programmes and interventions so that target groups are able to implement new technologies/ products.
- Work on market development by engaging the private sector and providing an appropriate enabling environment for them to invest and also by minimizing identified barriers and bottlenecks.
- Targeted use of Government resources to de-risk investments, subsidise low-income households, promote further finance of the private sector and create the required infrastructure of support.
- Promote diversification of fuels used for cooking and combine it with the use efficient stoves.
- Expand the supply chain by developing import routes, building storage and processing points across the country, and linking them to households.
- Implement a holistic approach and clearly defined initiatives, i.e., ensure that the initiatives defined are complementary and directly contribute to the objectives.

Evidently, the ESSP is linked to National Strategy for Transformation and mainstreamed to cross-cutting areas, including environment and climate change.

### **Strategic Programme for Climate Resilience (2017)**

The Strategic Programme for Climate Resilience (2017), which is in line with the major national blueprints in force in the country, defines three key building blocks: 1) Technical Capacity Building and Strengthening Institutional Coordination; 2) Integrated Land Use Planning and Spatial Planning; 3) Climate Services and Disaster Risk Reduction/ Management.

These are breakdown into four programmes:

- Agriculture Driven Prosperity.
- Water Security for All – Strengthening Resilience in The Water Sector.

- Climate Resilient Human Settlements.
- Stable and Sustainable Landscapes.

Within the project of FLR in the Mayaga region the following components are highlighted: Programme 1, Component 2 – Climate Smart Agriculture and Forestry; Programme 4, Component 3 – Landscape Conservation in the Context of Fuelwood Production and Collection. Particularly in the Component 2B – Climate Smart Agroforestry, it is emphasised that restoring and improving forest cover will contribute for the mitigation of the GHG emissions and increase carbon sequestration and storage. It refers that enhance site-user-species combine with a diversified base of forestry and agroforestry species, a high-quality germplasm and a strong application of best practices will provide greater climate change resilience.

### **Strategic Plan for Agriculture Transformation 2018 – 2024**

The Strategic Plan for Agriculture Transformation 2018 – 2024 corresponds to the fourth phase (PSTA 4) of the implementation plan of the National Agricultural Policy (NAP) and represents the agriculture sector's strategic plan under the National Strategy for Transformation. Overall, the plan defines the priority investments in the sector and the respective required costs for the period 2018 – 2024.

PSTA 4 aims at the “transformation of Rwanda agriculture from a subsistence sector to a knowledge-based value creating sector, that contributes to national economy and ensures food and nutrition security in a sustainable and resilient manner”. The strategic plan has a particular focus on private investment, with the government becoming a market enabler rather than a market actor. To address Rwanda's limited space for agriculture the focus will be also on increase productivity and profits per hectare.

The Plan recognises the increasing impact climate change has on agricultural performance, considering that the agricultural profile (small-scale, subsistence, rain-fed farming and use of traditional technologies) makes the sector extremely exposed to climate variability. Therefore, increasing resilience to climate change is one of the four strategic impact areas defined. The success of this strategic area will be measured by the indicator “Share of agriculture land under Sustainable Land Management practices.”

## **National Decentralisation Policy Revised 2012**

The institutional scheme in place in Rwanda will be considered in the FLR in the Mayaga Region project at different levels. For instance, the elaboration of forest restoration plans will have institutional and legislative frameworks to guide the defined actions. Therefore, it is relevant to bear in mind the National Decentralisation Policy (2011) revised in 2012.

National Decentralisation Policy defines the decentralised administrative structures and organs, whose implementation is to involve the communities and local stakeholders, thus empowering them to participate in the social and economic reform. Under this premise, the policy defines the following strategic objectives:

- Enable and reactivate the participation of local people in initiating, making, implementing, and monitoring the decision and plans that concern them by transferring power, authority, and resources from the central to the local government and lower levels.
- Strengthen accountability and transparency by making local leaders directly accountable to the communities they serve.
- Improve public administration's awareness and responsiveness to local environment by ensuring services are provided and by allowing local leadership to create organization structures and capacities focused on local environment and needs.
- Develop the local level capacity regarding sustainable economic planning and management aiming at an adequate planning, mobilization, and implementation of social, political, and economic development heading for poverty alleviation.
- Enhance effectiveness and efficiency in the planning, monitoring, and delivery of services by withdrawing such responsibility from the central government officials who are distanced from where services are physically delivered.

## **National Housing Policy and National Urbanization Policy 2015**

The National Housing Policy and the National Urbanization Policy was developed in 2015 by the Ministry of Infrastructure. While the housing policy aims at enabling every Rwandan to have access to adequate housing in sustainably planned neighbourhoods,

the urbanization policy sets a framework for all players, including private sector and civil society, to support provisions of quality of life and conditions for economic growth in compliance with principles, strategies and actions set by the Government of Rwanda.

In addition, there is the urbanization and rural settlement sector strategic plan 2012/2013 - 2017/2018 to implement the urbanization policy through the improvement of the access to basic infrastructure and the enforcement of the housing policy by addressing the housing needs. According to this strategy, the annual growth rate of urban population in Rwanda is 4.5%, which far exceeds the worldwide average of 1.8%.

### **Mining and Minerals Policy 2017**

Following the dissolution of the Rwanda Natural Resources Authority in March 2017 and the creation of three specific institutions for mines, land use, forests and water, the mining and geology policy changed its naming to become “Rwanda Mining and Minerals Policy”. In May 2018, this new policy, with the goal to further strengthen mining governance, was in its final approval after the public consultation of late 2017.

The new policy main objective is “to ensure Rwanda’s mining sector operations are managed efficiently in an economically, socially and environmentally sustainable framework within the internationally accepted standards of occupational health, mine safety and environmental protection.” The policy will be enforced through laws, ministerial orders regulations and instructions. The most relevant references are:

- Law No 58/2018 of 13/08/2018 on Mining and Quarry Operations;
- Law No 55/2013 of 02/08/2013 on Mineral Tax;
- Ministerial Order No 013/MOJ/2019 of 16/07/2019 Determining requirements for granting authorisation to import, manufacture, transport, trade in and use dynamites in mining and quarry operations;
- Prime Minister’s Order n° 079/03 of 26/07/2019 Determining the structure and functioning of the committee in charge of assessment of applications for licences and disputes related to mining and quarry operations.

In 2012, REMA developed guidelines for Environmental Impact Assessment (EIA) for Mining Projects in Rwanda. Proposed mitigation measures and environmental management practices include: i) mitigation of land subsidence, ii) mitigating ecosystem degradation through re-vegetation, prevention of open pits and late pits, and iii) mitigating

runoff/storm water, sedimentation, and erosion. In collaboration with District Natural Resources officers, REMA conducts environmental inspections to mining sites in order to verify the compliance with proposed mitigation measures over issuance of EIA certificates.

### **3.5.3. Institutional setting**

Forest landscape restoration and sustainable forest management, in general, requires the involvement and coordination of a number of state and non-state institutions. This institutional setting is compiled in the present section. It distinguishes central level and local level entities.

#### **3.5.3.1. Core state institutions**

The present section summarizes the core institutions involved in forest landscape restoration and sustainable forest management. Figure 17 identifies those institutions involved and their overall interaction.

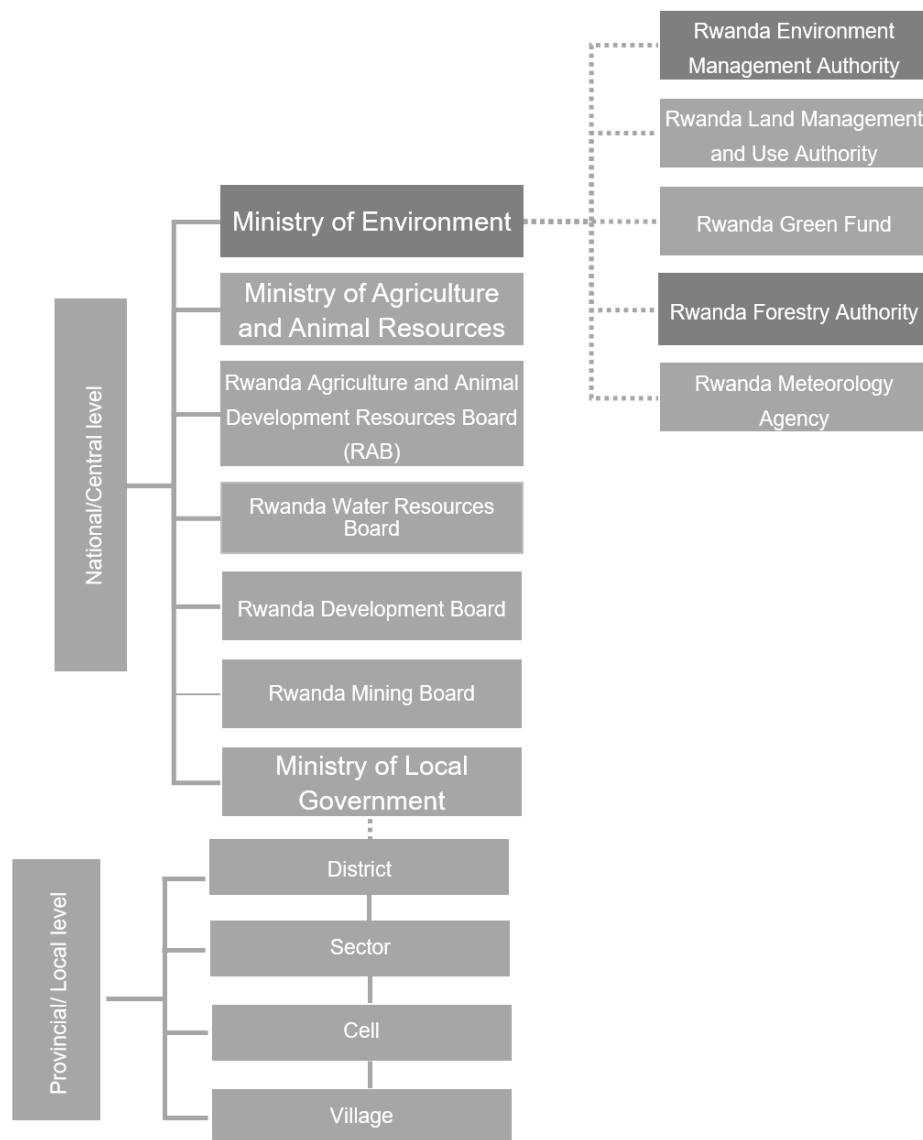
### **Ministry of Environment**

The overall mission is to ensure the conservation, protection, and development of the environment, as well as to foster green and climate resilient economic growth (Ministry of Environment, 2020a). According to Prime Minister's Order N° 131/03 Of 23/12/2017, the Ministry has the following responsibilities:

- Develop and disclose the policies, plans and programs regarding the environment and climate change, namely, develop strategies to engage the private sector in investing on environment and climate change related activities, develop laws and regulations for environment protection and conservation of natural ecosystems, develop both institutional and individual capacity concerning environment and climate change.
- Monitor and evaluate the implementation and dissemination of the environment and climate change policies, programs, and strategies throughout all sectors.

- Oversee and evaluate the Ministry affiliated institutions, including by guiding the implementation of the specific plans whose implementation is of theirs and local government's responsibility.
- Mobilise the resources required for the improvement, protection, and conservation of the environment and for climate change adaptation and mitigation.

Currently, the Ministry of Environment is composed of the following affiliated institutions.



**Figure 17 – Main state institutional setting for Forest Landscape Restoration (FLR)/ Sustainable Forest Management (SFM).**

### **Rwanda Environment Management Authority (REMA)**

Established by Law n°63/2013 of 27/08/2013, REMA shall have legal personality, administrative and financial autonomy to be the authority in charge of overseeing environment-related issues, ensuring these are integrated in all national development programmes. Accordingly, it has the mission to promote environmental protection and sustainable management of natural resources through decentralized structures and seek national position on global environmental issues looking after Rwanda's well-being. Its responsibilities include the implementation of measures to tackle climate change impacts, participate on the elaboration of actions to mitigate environmental degradation and propose remediation strategies.

### **Rwanda Land Management and Use Authority (RLMUA)**

Previously under the extinct Ministry of Land and Forestry, RLMUA is now affiliated with the Ministry of Environment. The authority is established in Law n° 05/2017 of 03/02/2017 as a public institution with legal personality having administrative and financial autonomy. Its main missions include overseeing all land-related issues, supervise all land-related issues, being the State representative for supervision and monitoring land management and use; foster research on land; prepare and disseminate land management master plans; establish updated topographic information and set up the principles and guidelines for land use, among others.

### **Rwanda Green Fund (FONERWA)**

FONERWA is Rwanda's national fund for addressing the environment and climate change, by providing technical and financial support to the best public and private projects that are aligned with the country's green growth and climate resilience strategy. Law n° 39/2017 of 16/08/2017 establishes FONERWA as a specialised organ with legal personality and autonomy.

The fund has four investment priorities. Priority one is "Conservation and Sustainable Management of Natural Resources" which includes sustainable forest management and

promotion of biodiversity. Priority two is “Research & Development and Technology Transfer and Implementation” in which is included applied and adaptive research on agro-forestry. Priority three “Environment and Climate Change Mainstreaming” namely sector specific adaptation and/or mitigation. Finally, priority four is concerning “Environmental Impact Assessment Monitoring & Enforcement”. Concerning the activities developed under these priorities, FONERWA’s responsibilities include the mobilisation and management of financial resources, collection of funds from public and private entities, coordinate and ensure finance partnerships agreements and collaborate with national and international institutions with the same mission.

### **Rwanda Forestry Authority (RFA)**

The national authority responsible for forest sector development and management is the Rwanda Forest Authority (RFA), which was established in 2018 when the former Ministry of Lands and Forestry was eliminated, and all forest related matters were transferred to the Ministry of Environment. It replaces its predecessor, the Rwanda Water and Authority (RWFA), which was established in 2016. The RFA is subdivided into units: Forest Management Unit, Non-Timber Forest Products and Agro-Forestry Unit, Forest Business Support Unit and Forest Planting Materials Unit.

The Tree Seed Centre (TSC) presently falls under the management of RFA. The TSC is responsible for managing and establishing tree seed sources, organizing, and following up tree seed collections, processing and controlling seed quality (i.e., handling, testing, storing, delivering, and selling seeds), before dispatch to end users, and it is officially recognized as the only supplier of tree seeds in the country. TSC has some basic infrastructures, materials, and equipment but they are not sufficient for the centre to achieve fully its mandate.

At the local level, the Forestry Department is represented by only one District Forestry and natural resources Officer (DFO) who caters for the entire forestry activities of the District- forestry planning and management, including agricultural extension work. DFOs work under the supervision of the District’s Directors of Agriculture and Natural Resources in collaboration with District Agriculture Officers. However, administratively, DFOs’ position falls under the Ministry of Local Government (MINALOC). At the Sector level, in most cases, there is only one extension officer in charge of agriculture and

natural resources management who is mostly agriculture-oriented and covering two sectors.

The RFA is also responsible for the development of the District Forest Management Plans (DFMPs), but their implementation is of the DFOs responsibility. As above-mentioned, according to the law and institutional arrangements, DFOs are accountable to the mayors and MINALOC and therefore have no ownership of DFMPs, meaning they have no mandate in this particular case. Therefore, it is necessary to ensure a strong coordination between the DFOs and the RFA central department to avoid an inadequate management and control of forests in the country, and to make sure DFMPs strategies are being implemented.

### **Rwanda Meteorology Agency (Meteo Rwanda)**

According to Law N°54bis/2011 of 14/12/2011, the mission of Rwanda Meteorology Agency shall consist in implementing the Government policy regarding meteorology, through the use of modern study, research, and coordination methods. The main responsibility is to provide accurate and timely weather and climate information services and products for the general welfare of Rwanda and for socio-economic development.

### **Rwanda Water Resources Board (RWA)**

Rwanda Water Resources Board has the following assignments: to implement national policies, laws and strategies related to water resources; to advise the Government on matters related to water resources; to establish strategies aimed at knowledge based on research on water resources knowledge, forecasting on water availability, quality and demand; to establish strategies related to the protection of catchments and coordinate the implementation of erosion control plans; to establish floods management strategies; to establish water storage infrastructure; to establish water resources allocation plans; to establish water resources quality and quantity preservation strategies; to control and enforce water resources use efficiency; to examine the preparation of roads, bridges, dams and settlements designs in order to ensure flood mitigation and water storage standards; to monitor the implementation of flood mitigation measures and water storage during the implementation of roads, bridges and settlements' plans; and to cooperate and collaborate with other regional and international institutions with a similar mission.

## **Ministry of Agricultural and Animal Resources**

The overall mission is to set up, elaborate and manage adequate programs to modernize agriculture and livestock thus contributing for food security and national economic development. According to Prime Minister's Order N° 40/03 Of 27/02/2015, the Ministry has the following responsibilities:

- Develop, oversee, and disseminate the policies, strategies and programs regarding the agriculture and livestock sector.
- Draft laws and issue regulations on the agriculture and livestock sector.
- Increase human resources and institutional capacity in the agriculture and livestock sector.
- Monitor and assess the implementation of the sector related policies, strategies and programs.
- Mobilize the required resources for developing the agriculture and livestock sector.

Under the mission assigned to the Ministry, and according to the National Forestry Policy of 2018, the Ministry of Agricultural and Animal Resources ought to develop and implement agroforestry strategies within the context of its agriculture intensification programme. Moreover, the Forest Sector Strategic Plan of 2018-2022 assigns specific activities to the Ministry for the institution to participate and collaborate with other entities as the agencies responsible for the implementation of such initiatives. These activities include empowering the tree seed center, enhance forest research, integrate specific measures to protect tree species into the agroforestry practices, as well as all activities defined for the outcome of increasing the land area under agroforestry.

## **Rwanda Agriculture and Animal Resources Development Board (RAB)**

According to Law n°14/2017 of 14/04/2017, the Rwanda Agriculture and Animal Resources Development Board (RAB) is an administrative and financial autonomous board with legal personality. The RAB was established to develop agriculture and animal resources research and then agriculture and animal resources extension in order to increase agriculture and animal resources productivity.

The RAB mission includes, in particular, carrying out research on forestry and agroforestry species (for each country region) as well as on climate change, its

respective impact on the sector, and measures to mitigate such impact. The establishment of a gene bank for storing and conserving plant and animal genetic resources and the development of quality seeds is also part of the board's mission. Surely, the RAB is also responsible for developing policy and strategies regarding the agriculture and animal resources and for the implementation of all related legal and political instruments.

### **Rwanda Development Board**

Law n°46/2013 of 16/06/2013 establishes Rwanda Development Board (RDB) with having legal personality, administrative and financial autonomy, and the overall mission of accelerating Rwanda's economic development by enabling the growth of the private sector. The RDB reports to the Office of the President, being managed by a Board of Directors composed of global entrepreneurs and experts. RDB is focused on six key services: i) Investment Promotion, ii) Export & Special Economic Zones Development, iii) Investment Deals Negotiation, iv) Tourism and Conservation, v) Skills Development and vi) One Stop Center services (business and investment registration, visa facilitation, EIA, tax incentives management, etc.).

The relevance of the RDB for sustainable forest management is mostly linked to the RDB's role in managing the forest under National Parks. Indeed, one of RDB's main mission is "to participate in initiating and implementing policies and strategies in matters relating to tourism and conservation of national parks and other protected areas in matters relating to tourism and advise the Government on the promotion of the tourism sector" as stated in Law n°46/2013 of 16/06/2013.

### **Rwanda Mining Board**

Rwanda Mining Board has the following main missions: to implement national policies, laws and strategies related to mines, petroleum and gas; to advise the Government on issues related to mines, petroleum and gas; to monitor and coordinate the implementation of strategies related to mines, petroleum and gas; to conduct research in geology, mining, petroleum and gas and disseminate research findings; to carry out mineral, petroleum and gas resources exploration operations in the country; to provide advice on the establishment of standards and regulations in Mining, Petroleum and Gas;

to supervise and monitor public or private entities conducting mining, trade and value addition of minerals operations; to assist the Government in valuing mining and quarry concessions; to cooperate and collaborate with other regional and international institutions carrying out similar mission.

## **Ministry of Local Government**

The Ministry of Local Government is responsible for the coordination of territorial administration programs of high quality and ensuring good governance thus supporting economic, social, and political development throughout the nation. Specifically, the Prime Minister Order n° 238/03 of 08/12/2016, assigns to the Ministry the following responsibilities:

- Develop, disseminate, and implement of policies, strategies and sector programs of good governance, territorial administration, social affairs, and group settlement sites aiming at a sustainable community development.
- Develop of a legal framework for good governance, territorial administration, settlement, and social-economic development.
- Improve institutional and human resources capacities.
- Monitor and evaluate the implementation of the national policies, strategies and programs concerning the sectors and sub-sectors under their area of governance.
- Supervise the institutions under the Ministry's mandate, including monitoring their functioning and providing policy guidance and the legal framework required for their specific programs.
- Promote effective intergovernmental relationships.
- Mobilise resources for the Ministry's activities, including the establishment of partnerships between local governments, local stakeholders, national and international entities.

As published in the Law n° 87/2013 of 11/09/2013 determining the organisation and functioning of decentralised administrative entities, the Ministry in charge of local government supervises these decentralised administrative entities, which in turn are governed by their respective Councils. The decentralised administrative entities referred comprise the City of Kigali, the Districts, the sectors, the Cells, and the Villages.

Accordingly, the structures that constitute Rwanda's two layers of government, central and local, are complementary.

Rwanda is divided into four Provinces (Northern Province, Southern Province, Eastern Province and Western Province) and the City of Kigali which is further divided into 30 Districts. These Districts are subdivided into 416 Sectors which, in turn, are further divided into 2,148 Cells then, lastly, are divided into 14,837 villages.

## **District**

The Districts are autonomous (legally and financially) administrative entities with legal personality that represent the basis for community development (i.e., Districts are basic political-administrative units of the country). The daily tasks are managed by the Executive Committee which should be headed by a Mayor and two Vice-Mayors.

The District's responsibilities include implementing the policies adopted by the Government and development programmes; ensuring the infrastructure maintenance; promoting the collaboration between other Districts, cities, and organs; secure the District's safety and prosperity; and coordinating the Sectors activities planning. The Districts targeted by the "Forest Landscape Restoration in the Mayaga region project" are: Gisagara District, Nyanza District, Ruhango District and Kamonyi District.

## **Sector**

Territorial administrative entity with no legal personality that is responsible for implementing the development programs, service delivery and for fostering good governance and social welfare (Republic of Rwanda, 2020). Therefore, the sector's responsibilities include, but are not limited, to the following: develop the sector development plan; ensure public assets are properly managed; coordinate the activities envisaged in specific government programs targeting their area; supervise the cells functioning; ensure population safety and security; mobilize the resources required for their activities.

## Cell

The cells are also administrative units with no legal personality that are mainly in charge of data collection and raising awareness among the population regarding sustainable development activities (Law n° 87/2013 of 11/09/2013). Cells handle both political and technical matters at a lowest level than the sectors but reporting to these. Decisions on the Cell's responsibilities are taken by the Cell Council which is constituted by councillors elected by the populations in the villages comprised by the Cell. In addition, the Cell should have representatives of specific stakeholder groups such as the Coordinators of the national women and youth councils, nursery, and primary schools as well as representatives of the private sector. Table 45 presents the sectors and cells targeted by the "Forest Landscape Restoration in the Mayaga region project", in each of the four districts under analysis.

**Table 45 - Project implementation administrative units.**

District	Sector	Cells
Gisagara	Ndora	Cyamukuza, Mukande
	Musha	Kigarama, Kimana
	Gikonko	Gisagara Mbogo, Gikonko, Cyili
	Mamba	Ramba, Mamba, Muyaga
	Save	Munazi, Zivu
	Gishubi	Nyiranzi, Gabiro, Nyakibungo, Nyabitare
Kamonyi	Nyamiyaga	Kidahwe, Kabashumba, Bibungo, Ngoma, Mukinga
	Mugina	Nteko, Mbatu, Mugina, Jenda, Kabugondo
	Rugalika	Sheli, Kigese, Bihembe, Nyarubuye
	Nyarubaka	Kambyeyi, Kigusa, Ruyanza, Gitare
Nyanza	Ntyazo	Katarara, Bugali, Kagunga, Cyotamakara
	Kibilizi	Mututu, Cyeru, Mbuye, Rwotso
	Muyira	Gati, Nyamyaga, Nyundo, Mugina, Nyamure
	Busoro	Shyira, Kimirama, Gitovu, Masangano, Munyinya, Rukingiro
	Kigoma	Mulinja, Gahombo, Butansinda, Gasoro, Butara
	Busasamana	Kibinja, Kavumu, Gahondo
Ruhango	Ruhango	T ambuye, Gikoma, Munini, Buhoro
	Kinazi	Rutabo, Kinazi, Burima, Gisali, Rubona
	Ntongwe	Kayenzi, Nyakabungo, Kebero, Nyarurama, Gako, Nyagisozi, Kareba
	Mbuye	Kabuga, Mbuye, Mwendo, Nyakarekane, Gisanga, Cyanza

Source: Provided directly by manging staff team.

## **Village**

Basic unit for mobilisation and interaction with the population (Law n° 87/2013 of 11/09/2013). Villages are the smallest politico-administrative units being the ones that interact more directly with the population. Villages are responsible for: solving conflicts; disseminate governmental information through the communities; gather data on programs' implementation to submit to the Cell; and gather information regarding people's problems, priorities and needs. Villages do not handle technical issues.

### **3.5.3.2. Other relevant institutions**

#### **Ministry of Finance and Economic Planning (MINECOFIN)**

The MINECOFIN main mission is “to raise sustainable growth, economic opportunities, and living standards of all Rwandans”. The ministry's main responsibility of planning national economic development, as well as their role in mobilizing internal and external resources and in ensuring a stable, efficient, and accessible financial market for the country, provides the MINECOFIN with a structural function throughout all sectorial programmes and strategies (MINECOFIN, 2020).

#### **Ministry of Trade and Industry (MINICOM)**

With the objective to ensure a rapid but sustainable economic growth, the MINICOM works to promote a competitive private sector integrated into regional and global markets. Its general mission is to “lead the development of internal and external trade, competitive companies and cooperatives on the market and the promotion of investment and consumer rights”. Among other specific responsibilities, the Ministry supports strategic industries and services aiming at high added value and competitive products and services. Moreover, MINICOM is the main responsible for the regulation of the trade and industry sector. Additional responsibilities include developing institutional and human resources capacities in the industrial and commercial sector and conducting bilateral and multilateral trade negotiations **Fonte especificada inválida..**

The MINICOM has three affiliated agencies: National Industrial Research and Development Agency (NIRDA), Rwanda Standard Board (RSB) and Rwanda Cooperative Agency (RCA).

### **National Industrial Research and Development Agency (NIRDA)**

NIRDA constitutes the governmental institution to foster industrial and technological development in Rwanda, as established in Law N° 51/2013 of 28/06/2013. It has been mandated with a mission “to enable a generation of industrial innovators to become competitive through technology monitoring, acquisition, development and transfer & applied research.” Therefore, NIRDA’s responsibilities include the implementation of the national industrial development policy as well as the related patent inventions and traditional knowledge, promote the exchange of research products, provide training on industrial research products, establishes partnerships within the sector context, advice the Government on such matters, among many others (NIRDA, 2020).

### **National Institute of Statistics of Rwanda (NISR)**

The National Institute of Statistics of Rwanda is an independent institution of the Ministry of Finance and Economic Planning with legal personality and autonomy, established by Law to produces mandatory statistics, including sectorial-specific surveys. The NISR’s work is particularly relevant to evaluate the implementation of development programs and strategies, namely in the elaboration of indicators and for monitoring the respective results of such programs/ strategies. Relevant data provided by the NISR includes socio-economic information (e.g., Population and Housing Census, Household Living Surveys) and data on environment (e.g., water, forest cover [namely through its world view images]) and sectorial (e.g., agriculture, energy) characterisation.

### **New Forests Company**

The New Forests Company, founded in 2004, is a private company with the aim to create sustainable timber resource in East Africa, a region facing rapid deforestation. In 2011, the New Forests Company signed a 49-year concession lease over Rwanda plantation. Harvesting in the country started three years later. Currently, the company has already established in Rwanda charcoal production facilities, a pole treatment plan, and sawmills.

Audited annually to comply with the Forest Stewardship Council (FSC) certification, the company has received in 2018 the first FSC certification in Rwanda for the Nyungwe Buffer Zone Concession area. This certification indicates that NFR is managing the forest

resources of the area in a manner that complies with international, national, and local laws while maintaining community relations and worker's rights and in order to limit environmental impacts, thus generating multiple benefits for forest resources.

### **One Acre Fund**

One Acre Fund is a non-profit social organization that “supplies smallholder farmers with the financing and training they need to build permanent pathways to prosperity”. In Rwanda, one of the countries in which Once Acre Fund is present, the farmers have been provided with fertilizer on credit and frequent training over two growing seasons, mainly in maize, climbing beans, bush beans, potatoes, and rice crops.

On the other hand, the enterprise has offered a range of additional add-on products such that includes trees seeds and cookstoves, and has an active agroforestry program in place. Only in 2019, 383 thousand farmers have benefit from One Acre Fund work. An average improvement of 7% in Rwanda's agro-biodiversity is estimated, which is likely due to multiple years of tree offerings within the One Acre Fund program.

### **Agricultural cooperatives**

In the past 20 years, the number of agricultural cooperatives and their relevance in Rwanda's context has increased significantly. The cooperatives are formed when farmers organise themselves around agricultural production-related activities. Through these cooperatives access to markets, including to credit facilities, might be eased.

Cooperatives constitute significant investors in agriculture, both by providing labour and microfinance credits and therefore they should take part of the larger private investments in FLR. In the Mayaga region there is a significant number of cooperatives which might bring a great input to the FLR project.

### 3.5.4. Gap analysis

Within the context of the implementation of the FLR in the Mayaga Region project, institutional and legal arrangements gaps have been previously identified as one of the main barriers to the project's implementation. In the bottom line is missing a knowledge-based and integrated framework with a clear definition of: FLR concept and practices; baseline updated data on forest resources; and the linkages between the target sectors policies, plans and programs, to ensure a coordinated and efficient response.

FLR and SFM concepts and practices are not clearly defined in any of the sectorial policies or programs. There is a definition of SFM in the National Forest Policy (2018), but it is not detailed, which might generate further misunderstanding in the implementation of the concept. Therefore, publishing a formal document specifically concerning forest restoration procedures and practices, with a clearly defined concept, would provide a common framework for every ministry, district, and agency to develop FLR upon, thus easing the process and contributing for a coordinated response (Basteel, 2018e; REMA, 2020).

There is, however, a guideline on FLR published in 2014 by the Government of Rwanda and prepared by IUCN and the World Resources Institute (WRI) entitled "Forest Landscape Restoration Assessment for Rwanda". This report covers FLR main concepts and principles, carries out an analysis of enabling conditions (policies, finance, and institutions) and provides a number of concrete actions to achieve Rwanda's restoration potential. The key findings of this assessment provide important background information to fill the gap previously mentioned, although an update should be made, for instance with regard to the enabling conditions.

Gaps in the existing legislation and policy framework also include ineffective execution of fines and penalties to environmental pollution and degradation actions, which not only results in loss of revenues, but most important does not hinder the continuous degradation of ecosystems (Basteel, 2018e). The Law on Environment (Law N° 48/2018 of 13/08/2018) sets the prohibited acts, including those with the potential to contribute for forest degradation, as well as the fines to be administered in case of crime. However, control and supervision needed to identify the occurrence of such activities tends to be weak. Increasing the human and capital resources capacity to undertake surveillance, control and execute environmental penalties should be taken into consideration. The lack of consideration of all types of Rwanda's natural ecosystems under the country's

protected areas regulation makes it difficult to safeguard the landscape's ecological services as well (Basteel, 2018e).

Updated data on forests resources status and on the implementation of their respective management plans is essential for the development of both proper forest restoration implementation and monitoring programs capable of addressing the areas in need and the most prominent issues. In this matter, it was previously highlighted the lack of a recent comprehensive baseline assessment which limits the implementation of sustainable forest management related initiatives, such as the Forest Monitoring and Evaluation System. One of the causes identified for the inexistence of this baseline information is the insufficient financial and technical support provided to the district officers for them to carrying out data collection (Basteel, 2018e; REMA, 2020).

Recognizing the need of evaluating the forestry resources cover and productivity, the Ministry of Environment promoted an up-to-date forest cover assessment that can reflect the already on-going efforts to achieve Vision 2020 forest cover goals and, at the same time, can be used as a decision-making tool in the elaboration and, posterior monitoring, of forest management plans (Ministry of Environment, 2020b). Therefore, the knowledge gaps above-mentioned are currently mostly regarding the need of defining national indicators, targets, means and sources of verification (upon the baseline provided by such reports) and with the weak involvement of all the interested parties. Notwithstanding recording data on FLR is still observed as a challenge for local authorities, as reported in the key informants' interviews carried out. Local communities also highlighted the need to involve them and local authorities in the FLR.

Finally, cross-sectorial integration at policy level and coordination between plans and strategies have been considered poor in the previous assessments. On one hand, there is a definition, and further implementation, of contradictory policy actions, namely between the agriculture and forestry sector. On the other hand, the fact that master plans, strategies and policies are not released in a timely manner, and the inexistence of proper communication and collaboration among the involved agencies, leads to a superimposition of inconsistent recommendations and actions assigned to the same area. Moreover, the Project Preparation Grant (GEF) highlights that institutional mandates, roles and responsibilities and the respective coordination are not clear, namely with regard to the new institutional re-organization (REMA, 2020).

Yet, recent policy reforms have been attempting to address the referred challenges. For instance, the new National Environment and Climate Change Policy 2019 takes into

consideration the linkages with the national and global development agenda and defines the necessary institutional arrangements, assigning roles and responsibilities to all involved institutions. The Forest Sector Strategic Plan 2018-2022 recommends the establishment of a permanent forest management expert to be in charge for overseeing the implementation of District Forest Management Plans and the coordination between the activities conducted in every District. It also assigns lead agencies to each activity.

On the other hand, lack of coordination between national level and local level institutions has also been reported. Essentially, there is a link missing between the District Forest Officers and the ministry in charge for forest management, as the District Forest Officers do not report to these. Without such communication, Districts can prioritise their development agenda over forest resources preservation intentions (REMA, 2020; Basteel, 2018e).

Besides the gap in the development of knowledge and shared FLR objectives/ actions, the mechanism for an inclusive participatory definition of such goals is also referred as inadequate. For instance, landowners are often not adequately consulted in the decision-making process. Plus, although it was established, in each district, a Joint Action Development Forum (JADFs), composed of representatives of the public sector, private sector and civil society, to facilitate public participation in the decentralized and participatory governance and improve service provision process, the JADFs do not have enough financial and technical resources to bring stakeholders in the envisaged inclusive, participatory process (REMA, 2020).

### **3.5.5. Conclusion and recommendations**

Considering the significant number of sectorial policies and strategic plans, the effort to harmonise the defined principles and actions in the recent documents, addressing the integration of forest landscape restoration related policies should be ensured by the Ministry of Environment (MoE) and, when applicable, through the responsible authorities namely REMA and RFA, without adding additional bureaucracy to the process. Coordination and communication between ministries and agencies needs to be guaranteed as well.

The collaboration between the MoE and Ministry of Agriculture and Animal Resources (MINAGRI) on forest management related issues is particular essential as currently such matters are shared mainly between these two entities. On the other hand, restructuring

the current institutional arrangement so that forest management is only under one ministry, might pose additional constraints, thus securing an effective coordination between institution might constitute the best option. Within this context, the forest research which is currently under the Rwanda Agriculture and Animal Resources Board, is one of the main topics to be effectively coordinated between the MoE and the MINAGRI.

The establishment of a Forest Management Expert team in each district to be responsible for the implementation of District Forest Management Plans, as recommended by the Forest Sector Strategic Plan 2018-2022, can also contribute to ensure integration of sectorial policies and strategies. The team should work on the coordination and coherence of the activities developed under forest management, including forest landscape restoration, and the related sectorial policies to be implemented at the local level. Nevertheless, the Government should maintain its effort in aligning the existing policies and strategies as they are revised.

Aiding the establishment of the Forest Management Expert team will be necessary to ensure their sustainability. Likewise, proper administrative and financial support to the JADF is necessary for the organisation to be able to carry out efficient stakeholder engagement, thus ensuring an inclusive and shared participation.

Another suggestion, that has also been raised during public consultations, is to develop a formal, and mostly technical, document that resumes how the existing policies, strategies and plans are applied to forest landscape restoration into a unique procedure. This document should clarify the FLR concept, the linkages with existing policies and strategies, the procedures to implement landscape restoration and guidelines for the assignment of how roles and responsibilities. The existing “Forest Landscape Restoration Assessment for Rwanda” published in 2014 by the Government of Rwanda and prepared by IUCN and the WRI for the then Ministry of Natural Resources, provides a useful basis for the document development, namely regarding FLR concepts and the country’s restoration needs, and the most adequate intervention practices considering Rwanda’s context.

Regarding the identified gaps in regulations, the recommendation of ensuring that all types of Rwanda’s forested ecosystems are safeguarded under the network of protected areas, is maintained. It is also of importance that environmental fines and penalties should be harmonized and mainly that the existing regulations and laws are enforced, especially concerning forest degradation practices.

Finally, the need to provide sufficient and updated baseline information and respective indicators, targets, and means of action has seen some improvement regarding the revised data on forest cover. However, the monitoring and evaluation of progress towards FLR/SFM is still in need for an effective forest management and evaluation system, namely the definition of national proper indicators, target, means and sources of verification.



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## 3.6. Local Market Development Report

### 3.6.1. Introduction

The international community is trying to address the deforestation and forest degradation that have taken place for decades globally. In 2011 the Government of Germany and the International Union for the Conservation of Nature (IUCN) launched the Bonn Challenge. This seeks to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. The Bonn Challenge was endorsed and extended by the New York Declaration on Forest at the 2014 United Nations Climate Summit, and is aligned to other international commitments on climate change and biodiversity, notably the Aichi target under the Convention on Biological Diversity calling for the restoration of 15% of degraded ecosystems by 2020, and the United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD+) discussions under the United Nations Framework Convention on Climate Change calling for countries to slow, halt and reverse the loss and degradation of forests.

Concerned with deforestation and forest degradation in its land, the Government of Rwanda (GoR) has joined the international community's efforts on forestry. In 2011, it committed to restore two million ha of forests by 2020. To do so, the Rwandan Government has recognized the importance of engaging the private sector in forestry development. Different versions of the National Forest Policy have highlighted this. The 2017 National Forest Policy not only points out that the management of public forests will be privatized on a competitive basis, but also mentions that the private sector will be a key player in the transformation of timber and other forest products. Indeed, the policy estimates that the exploitation for public forest will generate more than RWF 700 million annually while the exploitation of private forests is expected to generate up to USD 3 billion.

The GoR has rightly promoted the private sector. This has the power to save forests and water and generate enormous social, economic, and ecological benefits. Its ability to mobilize financial, technical, and social resources can make a difference. Moreover, as a substantial consumer of ecosystems services such as water, energy and wood, the private sector's business model and operation systems have a huge influence on ecosystems, for good or bad.

### **3.6.2. Private sector in Mayaga region**

Land in Rwanda is used for farming and/or livestock development. The growing population combined with strong reliance on agriculture make land one of the scarce resources in Rwanda. The majority of Rwandan households cultivate at least one parcel of land, and most of them are directly reliant on agriculture as their main or only source of income, especially in rural areas (94% in 2016/17). The average area cultivated per rural household is only 0.6 ha. About 80% of crop growers have ownership rights over their land and can use it as a guarantee for a loan. It was realized that among households that accessed a loan from a formal source of credit, 47% used land as collateral to obtain the loan (NISR, 2018a).

This baseline study analyses the current involvement of the private sector in the following FLR value chains: i) tree nursing, planting, and monitoring; ii) timber for energy; iii) timber for construction and electric transmission poles; iv) non-timber forest products; v) agriculture production; and vi) construction and valorization of terraces.

#### **Tree nursing and planting**

The districts of Gisagara, Nyanza, Ruhango and Kamonyi are promoting FLR, as in the rest of the country, by awarding the procurement of goods and services through mainly open and competitive bidding processes with some little variations depending on the districts, following the Law of Public Procurement (Law N°62/2018 OF 25/08/2018), and under the supervision of the Rwanda Public Procurement Authority (RPPA). All legally recognized and eligible enterprises depending on the nature of work and services to be provided as per terms of references are allowed to submit their bids. In addition, an electronic bidding system has been launched through the e-procurement system in order to increase the level of transparency in awarding contracts.

Elsewhere, some non-governmental organisations, such as TUBURA (ONE ACRE FUND), involved in the promotion of FLR use other alternatives by providing nursery trees. It is worth noting that the type and size of the tenders for tree nursery preparation, tend to discourage the competition for Mayaga-based private companies as their experience, technical references and financial capacity does not meet the minimum requirements. As a result of this, in most cases, the winning bidder on tree nursing and planting comes from outside Mayaga region. Nevertheless, in most cases, the successful

bidder sub-contracts local community-based tree nursery associations engaging them in the whole process.

### **3.6.3. Barriers for private sector engagement**

Several barriers explain the limited participation of the private sector in FLR in Mayaga. These include i) limited availability of land; ii) considerable land degradation; iii) presence of pests and invasive species; iv) limited stakeholder specialization and collaboration; v) limited market incentives; vi) limited access to financial services; and vii) limited knowledge on FLR and business opportunities related to it.

#### **Limited land availability in Amayaga region**

A majority (68 percent) of households had inherited land, while 46 percent had purchased it (NISR, 2018a). Given population growth, most households in the country own tiny and scattered plots of land. As noted in the report, this is also the case in Mayaga. Indeed, FGDs showed concerns regarding the capacity to let younger generations significant pieces of land. From an economic perspective, these tiny pieces of land inhibit key economic mechanisms, such as economies of scale, making them hardly profitable. Land fragmentation also makes it difficult to build relatively big production areas, through purchase or renting, as it requires negotiating with a large number of owners, which implies high transaction costs. These two elements clearly discourage private sector investment.

#### **Considerable land degradation**

Land degradation is an outstanding barrier for the private sector, as it increases investment costs and reduces the likelihood of significant returns on investment (returns are likely to be small, and even the likelihood of this is limited), particularly in the short term, as land restoration takes time (returns are likely to be higher in the medium and long-term) (data collected through interviews and focus groups in 2020, see section 3.1.2).

### **Presence of pests and invasive species**

Crops, and trees in Mayaga are highly affected by pests, which have increased and are projected to increase as a result of climate change. In particular, pests are destroying seedlings before reaching their maturity stage. In addition, *Lantana camara*, an invasive species, is affecting significantly natural forests in Mayaga. Pests and invasive species increase investment costs and reduce the likelihood of significant returns on investment (returns are likely to be small, and even the likelihood of this is limited) in the short term (data collected through interviews and focus groups in 2020, see section 3.1.2).

### **Limited stakeholder specialization and collaboration**

The stakeholder analysis found that a large number of stakeholders is active in FLR related activities in Mayaga, from the government at the national and decentralized levels to development partners, multilateral and bilateral, via international and national NGOs. However, many of these stakeholders carry out similar activities, without strong specialization. Furthermore, coordination and collaboration are scarce, with potential synergies hardly being exploited. These two factors (limited specialization and collaboration) compromise the establishment of long and strong value chains and their connection to other value chains, reducing the potential for local market development and, thus, for private sector investment.

### **Limited access to finance**

Access to financial services is also limited for companies in the target districts, in spite of the efforts of the GoR to overcome this barrier. In 2011, the Development Bank of Rwanda established the Business Development Fund (BDF) with the objective of assisting SMEs to access finance, particularly those without sufficient collateral to obtain credit from traditional financial institutions at reasonable rates. BDF's role was to promote alternative financing avenues at reasonable costs to help small businesses access credit by providing credit guarantees, quasi-equity support to start-ups, managing matching grants, SACCO refinancing, and business development advisory services. BDF manages a fund worth RWF11 billion.

However, so far, SMEs in the target districts have barely benefited from it. Limited access to financial services and market incentives hinders households and private companies from making investments that can prove highly profitable.

### **3.6.4. Opportunities for advancing the local economy**

#### **3.6.4.1. Kamonyi District**

There is availability of suitable land for agribusiness activities, like growing passion fruits, pineapple, coffee growing to enable agriculture export, beans growing and cattle keeping. In addition, there are mineral deposits and quarries for mining development (coltan, cassiterite, clay, stones, and sand). Mining is a strong opportunity for Kamonyi District since it provides diversified source of revenues and can create job opportunities to the population.

Its proximity to Kigali City opens a wide market of agricultural production from Kamonyi. The skilled labour force can easily work in Kigali while travelling back to Kamonyi every day (DDS, 2018).

#### **3.6.4.2. Ruhango District**

The Rural region commonly known as “*Amayaga*” is good for cassava, rice, beans, and coffee cultivation and is made up of *Kinazi*, *Ntogwe*, *Mbuye*, part of both *Byimana* and Ruhango sectors. This region has potential for agriculture transformation which is considered as an important driver for Ruhango economic transformation and agribusiness (Ruhango DDS, 2018).

#### **3.6.4.3. Nyanza District**

Nyanza District potentialities mostly focus on culture tourism and milk industry. A strategic position and comparative advantage in milk processing and tourism based on culture allow for the development of several high-value products and potentialities in Nyanza. The District’s favourable climate, location and historical background has brought a relatively sizeable tourist industry to Nyanza. Nonetheless, maize, cassava,

and horticulture production dominate agriculture sector particularly in Amayaga region (Nyanza District Development Strategy, 2018).

#### **3.6.4.4. Gisagara District**

Among the economic potentialities of Gisagara District is a fertile soil suitable for many crops: the district has a good type of soil for growing different crops such as maize, rice, beans, coffee, banana, and different fruits like, avocado and pineapples. This is important for increasing agriculture production for food security, soil conservation and availing raw materials for agro-processing industries and hence sustainably increase jobs in all FLR interventions (Gisagara District Development Strategy, 2018).

#### **3.6.4.5. Specific opportunities**

Furthermore, this report identifies several opportunities for advancing the local economy in Mayaga. These can be organized in three main categories, namely i) primary goods; ii) transformed and manufactured goods; and iii) services.

#### **A) Primary goods**

As a largely rural region, Mayaga has great potential in the production of primary goods, such as fruits, crops, timber, non-timber forest products and others, such as sand and limestone.

#### **Fruits**

Most of the households in Mayaga have tiny pieces of land, which they use to cultivate crops for subsistence. In this sense, most of them do not have free land available for trees that are not compatible with crops. In this framework, agroforestry is a good option. Fruit trees with high potential in the area include mangoes, papaya, oranges, avocados, guava, and passion fruit (data collected through interviews and focus groups in 2020, see section 3.11.3).

## **Crops**

In Mayaga there is potential for cash crops such as coffee, banana, and macadamia. In addition, there is potential for horticulture, including strawberries and cherries (data collected through interviews and focus groups in 2020, see section 3.11.3).

## **Timber**

Most of the households in Mayaga will continue to rely on firewood, and eventually charcoal, in the short and medium-term. In this sense, there is huge necessity to go for Green energy.

## **Non-timber forest products**

Some beekeeping initiatives are already active in Mayaga. There is significant room for scaling them up. Moreover, indigenous species (that can be restored along with the restoration of forests) can be useful for traditional medicine.

## **B) Transformed and manufactured goods**

Mayaga has potential for transforming the primary goods mentioned above in different manufactured products. The following is given as example:

### **Wine**

Given its climatic conditions, Mayaga is ideally suited for the production of dry wine. Further investigation on topography and soil analysis is needed regarding where this could be introduced. A new factory of sorghum beer called “IKIGAGE” is now operational in Kamonyi District to serve the southern province.

## **C) Services**

Significant opportunities can be identified for three type of services: i) those directly related to putting in place FLR; ii) those related to commercializing the services secured by FLR; iii) those related to local economic development more broadly.

## **Services related to putting in place FLR**

Production of fruits, crops and, to a lesser extent, timber, requires a range of services. These include:

### Improvement of land

Increased production of fruits, crops and timber requires soil with nutrients and water, and free of invasive species. In addition, there is a market potential for building green houses for horticulture (data collected through interviews and focus groups in 2020, see section 3.11.3).

### Provision of seeds and seedlings

Afforestation, reforestation, and intensive agriculture require an adequate provision of seeds and seedlings. The District Forest Management Plans of the four target districts include ambitious afforestation and reforestation efforts. In addition to the initiatives mentioned in the DFMP, a considerable effort will be carried out in the country through the Umuganda, that is, community work, particularly in the context of Rwanda's National Forest Planting Day and Season. The District Development Strategies of these districts also plan intensive agriculture. In this sense, there are great opportunities in the development of nurseries supplying high quality or improved seeds and seedlings on different species of trees, including fruit trees and native species, and crops. According to the FG questions on seedlings, the local farmers are suggesting having the nursery beds prepared locally (data collected through interviews and focus groups in 2020, see section 3.11.3).

### Planting

Related to the previous point, there is significant potential for the private sector on planting trees. This requires a lot of manpower and private companies that can coordinate teams, mobilize the necessary machinery and technology, and bring technical expertise.

### Forest and farm inputs

The adequate growth of trees and crops requires inputs such as fertilizers and pesticides, for instance against ants, which are already affecting Mayaga and which could become more harmful with climate change. The expansion of forests and farms and the improved

management will require the increased provision of these inputs, generating a market opportunity. In Mayaga, hot pepper (cayenne or red chili) liquid and canola oil have demonstrated to be an efficient homemade pesticide for protecting fruit trees against insects and bugs. Vegetable or canola oil suffocates small insects, insect larvae and eggs, thus preventing infestation; insects and bugs do not like either the spicy taste or feeling of hot peppers. While research on more modern techniques should also be encouraged, women associations could supply part of the demand for organic pesticides.

#### Technical support

Natural forests and plantations and farms require adequate management. There is a huge market potential for technical support. As noted in the forestry report, the government plans to increase the number of concessions on public (state and district) forests. There is also considerable market potential in supporting private forest owners to manage their forests. On agriculture, as noted in the climate vulnerability report, there is potential for training and assistance on climate smart agriculture.

#### Off-farm technologies

The services opportunities mentioned above are directly related to forests and farms. In addition to these, there are market opportunities on off-farm services indirectly related to FLR. In particular, given climate change projections on less reliable rainfall, there are opportunities on domestic water harvesting technologies. Similarly, given the need to reduce dependence on firewood, there are opportunities on renewable energy, for instance solar.

### **3.6.5. Conclusion and recommendations**

The following recommendations indicate how the project can contribute to overcome the barriers presented in the previous section:

1. Promote land consolidation programmes in order to have pieces of land that allow some economies of scale. Given that land fragmentation results in high transaction costs, district governments should lead some negotiations and provide incentives for farmers to associate directly and private companies to negotiate with them.

2. Provide climate information, both long-term and, more importantly, short, and medium term, so that economic players can make informed decisions, reducing uncertainty. In parallel, raise awareness and provide training and technical assistance on climate resilient practices, including climate smart agriculture and climate resilient seeds.
3. Carry out land improvement techniques to restore land. Additional terraces mainly progressive terraces should be built. Additional infiltration channels should also be constructed, while irrigation schemes should be significantly expanded. Existing infrastructure in bad conditions should be rehabilitated in the framework of the project.
4. Research on organic and non-organic pesticides should be promoted. At the same time, community associations, namely women and youth associations, working on traditional organic pesticides should be supported.
5. Campaigns should be organized to cut and extract the roots *Lantana camara*. Activities should start in and around the natural forest of *Kibirizi*, *Muyira* and extended later to other areas across Mayaga. As noted in section 4, the collected material could be used as a raw material for charcoal production by processing it through mechanical crushers and injectors to produce classic, high calorific green charcoal briquette.
6. Strengthen existing coordination mechanisms, further involving the private sector. Specific recommendations on this are provided in the stakeholder's report. In any case, from a local market development perspective, it would be important to promote public private partnerships.
7. Promote strategic specialization. Developing a local economic development plan further identifying areas of specialization could help if followed by a realistic implementation plan. In any case, this report has identified some critical areas of specialization, namely:

- a. Primary products: some fruits (i.e., mangoes, papaya, oranges, avocados, guava, strawberries, cherries and passion fruit), some cash crops (i.e., coffee, banana, and macadamia); some vegetables; honey; mining products for Kigali;
  - b. Transformed goods: construction material, furniture, and poles for electric power transmission; briquette from Lantana Camara; juice, wine, handicrafts and efficient cookstoves.
  - c. Services: FLR related activities: land improvement, production of seeds and seedlings, planting, production of forest and farm inputs, natural resource management and domestic water harvesting and renewable energy; ecosystem services, including eco-tourism and agro-tourism.
8. In order to exploit opportunities in these areas, training should be provided (climate smart agriculture; forest management).
  9. Importantly, learning by doing should be promoted. To that end, it would be important to adjust the tendering process to ensure that companies from Mayaga are actually involved in FLR-related activities. This could involve establishing a minimum of fund allocation for local companies, or requiring bidders to create consortia with local companies, including their participation as one of the criteria in the selection of bidders.
  10. Promote the access to financial services, with locally adequate institutions and products. More concessional mechanisms such as grants, seed resources and long-term loans with very subsidized interest rates would also help. To that end, it would be important to link with the BDF, and ensure it reaches the four target districts. Increased access to financial resources would boost investment and increase resilience to shocks in a climate change context.
  11. Promote the access of businesses in the abovementioned sectors to transportation, marketing, commercialization, and administrative and legal support. This could be facilitated by the creation of a regional centre for local economic development that links businesses with companies providing this type of services.

12. Support overall development strategies, such as the financial inclusion of households. Even if there are opportunities in rural areas, urban areas should be considered as centres of growth that can provide important opportunities in sectors like retail and leisure. Planned settlements also contribute to make local economies more dynamic.

### **3.7. Sustainable Land Management & Sustainable Forest Management Practices Report**

#### **3.7.1. Introduction**

This study seeks to assess the current levels of adoption of Sustainable Forest Management (SFM), Sustainable Landscape Management (SLM) and biodiversity friendly agriculture practices in Mayaga region of Rwanda, in general, and in the districts of Gisagara, Nyanza, Ruhango and Kamonyi, in particular. It also seeks to assess the capacity of extension services as well as review adoption of technologies for SFM and SLM. Besides the report identifies strengths, weaknesses, challenges, and opportunities for improvement. In addition, this study examines the enabling conditions and best practices – globally, regional and in-country – for incentivising uptake of SFM, SLM and biodiversity friendly practices in agriculture. Finally, the report draws lessons to inform selection of project activities. The report is based on desk review, interviews in Kigali and with district staff and focus group discussions (FGD) with communities in the target districts. Desk review comprised all relevant documents about SFM, SLM and biodiversity agriculture practices. The literature reviewed included the SLM & SFM policy, District Development Strategies (DDS), District Forest Management Plans (DFMP), national extension services models and many other unpublished materials relevant to the study. Individual interviews with national level authorities at ministry level and district authorities and FGDs with communities' women and men as well as youth were conducted. Implementers of similar projects, such as International Union for Conservation of Nature and Natural Resources (IUCN), were also consulted.

Rwandan soils are naturally fragile, deriving from physico-chemical alteration of basic schistose, gneissic, quartzite, volcanic rocks. The national economy is largely based on rain-fed agriculture with small, semi-subsistence, and increasingly fragmented farms (small scale agriculture). The intensive farming practices on steep slopes across the country have exerted high pressure on land resources resulting into soil loss and declining soil fertility.

Erosion remains the major contributor to the degradation of the global soil resource and in Rwanda in particular. A recent study on soil losses from 2005 to 2015 (a period for which most of sustainable development were integrated into national development programs) recorded a total nationwide soil loss of approximately 110 and 89 million tons (Nambajimana et al., 2020), which is extremely alarming. In the districts crossed by the Mayaga region, soil losses were rated in the following order: Nyanza ( $19.1 \text{ t ha}^{-1} \text{ y}^{-1}$ ),

Gisagara ( $18.1 \text{ t ha}^{-1} \text{ y}^{-1}$ ), Kamonyi ( $18.6\% \text{ t ha}^{-1} \text{ y}^{-1}$ ), Ruhango ( $17.67\% \text{ t ha}^{-1} \text{ y}^{-1}$ ), with a declining trend from 2000 to 2015 due to the implementation of national policies and strategies at district level (Nambajimana et al., 2020), with special focus on radical terracing.

According to MINAGRI reports, in 2020, radical and progressive terraces cover 127,340 ha and 958,77 ha respectively (MINAGRI, 2020). This is also confirmed by the EICV5 data which report that erosion control practices formally practiced across Rwanda, resulted in 78.1% of agricultural land protected from erosion. Although the soil erosion trends declining from 2000 to 2015, losses were still high.

Clearance of natural vegetations including forests especially on steep topography, can lead to increased risk of soil erosion. In fact, Rwanda was recently ranked among top two erosion prone countries together with Haiti. In addition, Rwanda also faces other natural calamities such as landslides, that exacerbates the levels of soil erosion (Nsengiyumva et al., 2019).

Sustainable land management bottlenecks have been listed as in the following order: i) plot level: declining fertility, ii) farm level: lack of awareness of benefits of SLM and practices hence low adoption, iii) community level; lack of collective action and iv) district level: inhibiting access and control factors as well as policy dynamics (Tukahirwa et al., 2013).

Land use/land cover change is and will remain a global challenge since, according to projections, it has been estimated that 109 hectares of natural ecosystems could be replaced by agriculture related activities by 2050 and other mainly anthropic disturbance activities (Tilman et al., 2000). Soil erosion rates are reported to vary depending on land use/land cover (LULC) type. Based on LULC maps, Rwandan soils were grouped into erosion-prone (forestland, grassland and cropland) and non-prone areas (wetland, water bodies and built-up). The erosion prone-areas were estimated to be 86.5% of the total land, the remaining consisting of non-erodible lands (Nambajimana et al., 2020).

In the Mayaga region, forest degradation has taken three pathways: quantitative loss, qualitative loss and fragmentation caused largely by encroachment for agriculture and overharvesting of forest products. Land degradation is widespread, with 22% of land in Mayaga being affected by flooding, landslides or destructive rains that wash away the soil (Nyamihana, 2018).

To address the forest degradation referred causes and taking into consideration the Mayaga region profile (a low altitude, dry and hot savannah region that harbours 0.14% of native forests and 10% of man-made plantations of Rwanda's total forested area), SLM practices such as agroforestry and terracing have been identified as suitable for the area. Preferred tree species include *Eucalyptus*, *Greveria*, *Caryandra*, *Licena* and fruit trees such as avocado, mango, orange, lemon and papaya. While *Eucalyptus* is the dominant species, fruit trees are used for agroforestry.

### 3.7.2. Rwanda's regulatory framework

The Government of Rwanda has embarked on a low carbon development, environmental conserving path that works to address renewable energy access and use, natural resource use efficiency and climate resilience. A number of policies and other strategic documents which guide the management, development and use of natural resources has been promulgated and align with the national strategy for transformation (NST1: 2021-2024), but with a much strategic vision of achieving a middle (2035) and high (2050) income country by 2050.

At policy level, the revised National Land Policy (2019) is the guiding policy with matters related to efficient land management for sustainable development. This policy is a continuation of the 2004 policy which dealt with matters related to land tenure and administration but left behind issues related to land efficient land management for sustainable development. Under this policy, strategic documents were also drafted such as the Forest Sector Strategy (2018-2014), which gives directions on how to achieve the medium to long-term policy actions presented in the 2018 National Forest Policy (NFP) for the development and management of forest sector.

The National Land Policy is strengthened by the National Environment and Climate Change Policy (2019) provides strategic direction and responses to the emerging issues and critical challenges in environmental management and climate change adaptation and mitigation such as land degradation, fossil-fuel dependency, high-carbon transport systems, irrational exploitation of natural ecosystems among others. All these strategies are in line with the much long term and integrative plan, the National Land Use and Development (2020-2050) which marks the achievement of the high-income economy.

A regulatory framework has been put in place for a proper implementation of guidelines provided by the above-mentioned policies, including the following laws and orders:

- Law No. 24/2012 of 15/06/2012 relating to the planning of land use and development in Rwanda;
- Law No.70/2013 OF 02/09/2013 governing biodiversity in Rwanda.
- Law N°43/2013 of 16/06/2013 governing land in Rwanda;
- Law N°10/2012 of 02/05/2012 governing urban planning and building in Rwanda;
- Law N°20/2011 of 21/06/2011 governing human habitation;
- Law N°32/2015 of 11/04/2015 relating to expropriation in the public interest;
- Law N°87/2013 of 11/09/2013 determining the organization and functioning of decentralized administrative entities;
- Ministerial Order N°14/11.30 of 21/12/2010 determining the models of land consolidation;
- Ministerial Order N° 04/Cab.M/015 of 18/05/2015 determining urban planning and building regulations;
- Ministerial Instructions relating to the implementation of the National Grouped Settlement Program in Rural Areas (27 May 2009)

Moreover, the country has created a strong institutional framework for environmental management. Several ministries are involved, including the Ministry of Environment, the Ministry of Infrastructure, the Ministry of Local Governments and the Ministry of Agriculture and Animal Resources; national agencies, such as the Rwanda Environment Management Authority, the Rwanda Forest Authority, and the recently created Rwanda Water Resources Board; decentralized bodies; and non-governmental organizations. Additionally, the Government has established institutional frameworks to spearhead resource mobilization from diverse sources for environmental management (including the National Fund for Environment [FONERWA]).

Table 46 is a summary of stakeholders for each intervention of the sustainable land and forest management.

**Table 46 – Stakeholder intervention in Sustainable Land and Forest Management.**

Intervention	Stakeholder
Community-based ecotourism	MINICOM, RDB, MINAGRI, MINALOC, MINECOFIN, MININFRA, MINEMA, MoE, MINEDUC, NGOs and civil society including women's groups, youth groups.

Intervention	Stakeholder
Afforestation/ Reforestation & Improved Forest Management	MINICOM, RDB, MoE, MINAGRI, MININFRA, RFA, FONERWA, MIGEPROF, MINEMA, MINALOC, MINEDUC, MoH (Ministry of Health), RAB, UR, NGOs and civil society including women/ youth groups.
Agroforestry	MINICOM, RDB, MoE, MINAGRI, MININFRA, RFA, FONERWA, REMA, RAB, MINEDUC, MINALOC, MoH, MIDMAR, MIGEPROF, NGOs and civil society including women/ youth groups.
Improved Cook Stoves (ICS) & carbonization	MININFRA, MoE, REMA

Additionally, Rwanda has developed voluntary targets for Land Degradation Neutrality (LDN) with a view to strengthening SLM monitoring and progress in several other frameworks and policies, including the newly approved Rwanda Land Use and Development Master Plan. Rwanda recognises that although progress towards LDN is reported at a national scale, solutions will need to target multiple scales and embrace the LDN hierarchy through efforts that avoid, reduce and reverse land degradation (Orr et al., 2017) in both rural and urban areas.

Moreover, the country has mainstreamed the SDGs into several of its national programmes, including the National Strategy for Transformation and Prosperity, as well as into National Budgetary allocations. SDG indicators and targets are currently being integrated into appropriate sector and local government plans and budgets, alongside the development of appropriate monitoring and evaluation frameworks. Research from a range of African countries (Antwi-Agyei et al., 2018) highlights the importance of cross-sector coordination and the need to harness synergies and complementarities amongst land management options so that multiple SDGs can be achieved through SLM and restoration. Rwanda is one of the Africa's leaders in moving towards a more integrated and collaborative approach through joint programming and land use planning that takes into account the implications of decisions for multiple sectors.

### 3.7.3. Adoption of sustainable forest and land management practices

Despite this enabling policy and institutional environment, the adoption of SFM, SLM and biodiversity agricultural practices is limited in Rwanda. Indeed, in most of the country land is cultivated intensively and with no fallow, and even on steep slopes. Deforestation

is also a constant. Furthermore, the use of chemical fertilisers increased from 37% to 38% between 2013/14 and 2016/2017 (EICV5, 2017), polluting soil and water. This figure might even be lower than the actual use as the report only captures use in terms of expenditures, thus events of freed fertilizer distribution are not captured. In terms of quantities of chemical fertilizers used, by 2019 MINAGRI reported a total annual fertilizer use of 60,903 MT (MINAGRI, 2019).

As a result of these practices, about 40 per cent of Rwanda's land is classified by the Food and Agriculture Organisation of United Nations (FAO) as having a very high erosion risk with about 37 per cent requiring soil retention measures before cultivation. More importantly, according to MINAGRI, 90% of arable land is on slopes ranging between 5 and 55% (MINAGRI, 2019). This is consistent with other reports as only 23.4 per cent of the country's lands are not prone to erosion (REMA, 2019).

However, some progress has been achieved. In 2017, 69% of the country's land was protected against soil erosion and 6% had access to irrigation (EICV5, 2017). By June 2019, the total land under irrigation was estimated around 61,944 ha (MINAGRI, 2019). Land protection and irrigation in the southern province that includes the 4 districts of the Mayaga region are estimated to be 70.3% and 7.2% (proportion of farmers with at least one plot protected and irrigated, respectively) (EICV5, 2017) coming from 83.7% and 4.3% in 2013/2014 (EICV4, 2014). Specifically, on agriculture land, 88% of crop-cultivating households had a plot protected from erosion.

SLM practices such as agroforestry and terracing used both separately and in combination have been shown to improve the soil fertility and yield for local farmers in studies from other places. Such practices have also been demonstrated to reverse land degradation in line with national commitments to international policy goals such as Sustainable Development Goal target 15.3 (Nyamihana et. al. ,2020). An example of the implementation of a sustainable land management incorporating agroforestry and terraces in the Nyanza District is shown in Figure 18.



**Figure 18 – A sustainable land management incorporating agroforestry and terraces in Nyanza District.**

### **3.7.3.1. Forest planting and rehabilitation**

A large number (40 to 45 million) of seedlings is produced each year in the country (produced, but not necessarily used or grown). Many of these are planted through forest plantation campaigns especially in season A (September – December). As noted in the forest productivity report, in Mayaga agroecological zone the preferred species are *Eucalyptus*, *Grevillea*, *Calliandra*, *Leucena* and fruity trees such as avocado, mangoes, oranges, lemon and papaya. While eucalyptus is the dominant specie, few existing fruit trees are used for agroforestry.

There are however important caveats. To begin with, the location of nurseries tends to be inadequate. FGDs in the target districts highlighted that there are very few nursery beds close to them. Moreover, seeds are of low quality, compromising the growth of trees. Besides, sometimes nurseries do not have the varieties that farmers need, and seedlings tend to be expensive. Furthermore, when provided to communities, this is sometimes not done in a timely manner, offering them before or after the planting season. In addition, the growth of planted trees is not appropriately monitored and supervised. As opposed to seeds of other priority crops, tree seeds are not subsidised and there is not any formal private sector-led seed production system, and as a result, the government is the sole provider of seeds and highly involved in seed availability and accessibility chain. Nevertheless, private initiatives from individuals or farmer's groups are slowly investing in nursery preparation activities with the support of local NGOs and government projects. It is worth to note that various forest plantation initiatives have

privileged mostly exotic species at the expense of the traditional indigenous species which resulted into poor adaptation in the region and low forest species diversity. In the region. As for the seed issues, most of the available (commercialized seeds) are of exotic species as there is no formal seed production system for most of indigenous species such as *Vernonia* and *Erythrina*.

As per the Rwanda Environment Management Authority, wetlands and swamps are supposed to be protected with a layer of a variety of trees species to cater for buffer zones, but in the most part of the Mayaga region protected cites such as Akagera, Akanyaru, and Rwabusoro are in constant reclamation by agriculture activities which contribute to soil erosion in the area and the destruction of the ecological biodiversity in the area (MINILAF, 2017).

Of note also, is that most forest planting that were initiated in the region left the provision of manure to the farmers, yet though most of them have small livestock to be used for fertilization but a big portion of the population does not own any livestock, and this makes compost availability difficult for the farmers. In fact, few available grasses and crop residues are preferably used as mulch for coffee and banana plantation rather than compost making.

More importantly, a key percentage of land is not properly regulated from a forest cover perspective. While most landowners have less than 0.5 ha of land, the existing law does not require a license from districts to cut trees below that threshold. Indeed, even those with larger pieces of land can cut forests progressively if every time they do not cut more than 0.5 ha. Moreover, the districts of the Mayaga region are yet to develop specific district forest management plan that would serves as a driving board for sustainable forest management.

### **3.7.3.2. Terracing**

In Rwanda, terraces are principally designed to (1) reduce soil losses through enhanced retention and infiltration of runoff, (2) promote permanent agriculture on steep slopes and (3) promote land consolidation and intensive land use. Newly established terraces should be protected at their risers and outlets, especially in the first or second year of the establishment. After establishing a terrace, a riser should be shaped, and grasses or shrubs/trees should be planted soon after. Napier grass should be planted – it can be used as forage for livestock. In this sense, risers on radical terraces are seen as a new production niche of forage as a result of land shortage and a strict zero grazing policy. Terraces have the potential of improving farmers' livelihoods and increasing the resilience of a degraded environment in Rwanda (Kagabo and Bizoza, 2012).

There is very high adoption of terracing in Rwanda (WOCAT, 2014) as there was a cumulative area of land developed of 122,465.5 ha under radical terraces and 945,093.7 hectares under progressive terraces in 2019 (MINAGRI, 2019). This is largely due to the existing policies and land consolidation, land management and crop intensification programs. The government of Rwanda has promoted these in close collaboration with multilateral development banks such as the African Development Bank and the World Bank and NGOs.

In Mayaga these types of works have also been conducted and are considered a priority in the DDSs. FGDs revealed that Vision Umurenge Programme has significantly contributed to this, promoting sustainable land and forest management. In addition to radical terraces, in most parts of the Mayaga region, having gentle slopes, progressive terraces combined with ditches and furrows has been the main strategy to control erosion. However, most of the old terraces and ditches were not rehabilitated and a rehabilitation campaign should be recommended in most parts of the region.

Given that terracing is very labour intensive, through this programme employment opportunity are provided to women and men, old and youth. Beneficiaries indicated that they use the income earned to buy medical insurance, pay school fees for their children, and get seeds and fertiliser for their gardens. In addition, an official from FONERWA said that all their interventions are gender sensitive and that they always allocate jobs to women at an average of 51% being women and about 41% being youth. However, work on terraces under a programme supported by MINAGRI showed that radical, top-down transformation of existing land use practices could lead to economic displacement and social issues if engagement of local communities is limited.

### 3.7.3.3. Extension services

In 2009, the Government of Rwanda adopted the National Agricultural Extension Strategy, which seeks to ensure ideal and harmonised conditions for the dissemination and exchange of information between producers, farmer organizations and other different partners in order to transform and to modernise the agricultural sector, so that it can effectively contribute to achieve international development goals, Vision 2020, and NST1.

However, the number of extension workers is still limited. To improve efficiency in management and delivery, an integrated extension model was designed in 2013, becoming active in 2014. This model, nationally known as *Twigire Muhinzi*, is based on two extension approaches: The Farmer Promoter approach and the Farmer Field School approach. The model works with agents that are selected by fellow farmers, on the basis of having helped others and having some level of education (able to read and write). These agents are then trained and supported to transferring the good agriculture practices to other farmers, by distributing agriculture extension materials and conducting trainings that help farmers to increase crop productivity. For instance, in year 2018/2018, the have reached out to 1,239,578 farmers (MINAGRI, 2019).

These extension agents have a technical advantage of being under direct supervision of government extension agents and on routine refresher courses. On top of this, coming from the community helps in faster technology transfer and mindset change towards certain technologies for which farmers would be otherwise reluctant to adopt. Such model may be and is applicable to any other field, forest landscape rehabilitation included.

Rwanda has promoted three community planning platforms, namely the Monthly Community Work (*Umuganda*), the parents evening forum (*Umugoroba w'Ababyeyi*) and general village assemblies (*Inama Rusange y'Abaturage*). FGDs considered that these platforms are useful to promote SLM, SFM and biodiversity friendly agriculture practices.

Monthly Community Work (*Umuganda*) refers to compulsory community work done every end of a month by all people in Rwanda. Hosted under MINALOC, it comprises drainage construction, cleaning, and planting of trees, among other activities. This is followed by a meeting where information is exchanged, and initiatives and practices discussed. This includes sustainability practices.

The parents evening forum takes place at the village level where women and men meet to discuss existing issues and share best practices. It started as a family centred platform, but it has been scaled up to cater for other existing social, economic, and political concerns.

Finally, village assemblies take place once a week apart from when there is an emergency. This is convened as an information sharing platform, including reminding people regarding their medical insurance, planting season, available inputs, immunisation for children, kitchen gardens to eliminate malnutrition, among others. It is also used as a channel to understand issues in the village and identify solutions.

The above platforms seem to provide tangible solutions for the Mayaga region as the percentage of people (households) accessing information environmental issues remained generally higher than the national average (81.4%): Gisagara (74.8%), Nyanza (94.1%), Ruhango (83.9%) and Kamonyi (90.5%) (EICV5, 2017).

In addition, a number of other tools will be required for proper knowledge and skills transfer to the community. Some suggestions include a Sustainable Land and Forest Management Practices timely magazine, educational media such as short videos, sketches and dramas illustrating various land and forest management practices and benefits, use info-graphic for farmers training, educational animations (e.g. cartoons for specific groups of people), radio and TV adverts, documentaries and segments, promotion material development for wider outreach, success stories collection to be shared within and outside the project intervention area, use of manual and booklets, leaflets, *etc.* All these tools should aim at strategically disseminating skills and knowledge with emphasis on target stakeholders, towards continuous ownership of sustainable land management practices and safe guarding the project's achievements.

No matter the methods adopted, the project's disclosure should privilege a two-step flow of communication (with community opinion leaders), lateral knowledge transfer (based on farmer-to-farmer approach such as FFS) and pre-testing (based on what farmers deciding what message they want to know and the way they want it to be packaged i.e., never force but persuade the farmer).

### **3.7.4. Barriers and opportunities**

#### **3.7.4.1. Opportunities**

In 2014, with support from IUCN, the country conducted a Forest Landscape Restoration Opportunity Assessment (MINIRENA, 2014). As noted in other reports under this baseline assessment, it identified a total of 1.5 million ha with opportunities for forest restoration; about 300,000 ha in forests that need improvement in management; and opportunities for new plantation. Among other areas, there is room to plant more trees along roads, in coordination with the Rwanda Transport Development Authority.

In this framework, DDSs, DFMPs and performance contracts in target areas constitute opportunities for SLM, SFM and sustainability friendly agriculture practices. Furthermore, *Umuganda*, *Umugoroba w'Ababyeyi* and general village assemblies as well as the *Twigire Muhinzi* extension model can contribute to this. The local market development report also provides insights on this.

Other opportunities supporting Sustainable Land and Forest Management in Mayaga region include:

- Government will and commitment in supporting policy measures that improve overall framework for forest governance as most of policies incorporating FLR in Rwanda.
- High and increasing demand of forests products in different districts of Rwanda compared to supply create a good opportunity for investment.
- Growing number of local and international organization that provide funds for forest and biodiversity conservation projects. This is also making private sector understanding the potentials of investing in forest landscape restoration activities.

#### **3.7.4.2. Barriers for sustainable land and forest management practices**

Barriers that limit SLM, SFM and sustainability friendly agriculture practices in Mayaga include the following:

- Limited allocation of national budget for forestry and landscape restoration.

- Inadequate participatory planning – limited awareness and information exchange between investors and public institutions on how profitable is when investing in FLR.
- Low level of awareness for private entities on opportunities arising from FLR.
- Lack of enough skilled people in forestry sector and even those that are in place are not well supported in carrying out their activities like monitoring and raising awareness in the community on how they can sustainably manage the forests.
- The current existent range of species options is restrict thus limiting the opportunities for securing a wide range of products and services from plantings.
- Low level of enforcement of laws related to harvesting of forests, reported during the focus groups discussions held within the assignment scope.
- Limited involvement of women and youth in forest management partly due to the type of land ownership, reported during the focus groups discussions held within the assignment scope.
- Low level of involvement of youth and women in some sustainable forest/land management activities like tree nursery production and terraces making.
- The management of the Tree Seed Centre and the policy and institutional report identifies barriers especially related to decentralization of its activities to reach the farmers (there is a need for a closer relationship with local farmers, coordination with action at the local level; management operations at local level).

### **3.7.5. Conclusion and recommendations**

Forest rehabilitation and landscape management is critical aspect of Rwanda's economic growth and must well integrated in the planning process both at national and decentralized level. Important steps especially at institutional and legal perspective have been achieved. However, bottlenecks are still hindering the proper implementation of FLR from inception to implementation. Thus, the following action are recommended:

- Promote terracing, which, as demonstrated by Kagago and Bizoza (2012), has important benefits on agriculture and forestry. In this process, local

communities should be engaged, directly and through local firms, to reduce poverty and boost local markets. More detailed recommendations on this are provided in the forestry and local market development reports.

- Increase the quantity and quality of seeds and improve their distribution and timeliness. More detailed recommendations are provided in the forestry and local market development reports.
- Promote private sector involvement in tree seed business and put in place private sector-led formal tree seed production.
- Strengthen the provision of technical assistance. In this front, as noted in the climate vulnerability report, the Farmer Field School approach could be used, considering as well the Twigire Muhinzi model. As noted in the forestry report, the growth of trees should also be monitored and supervised.
- Use existing platforms for knowledge sharing. In particular, the project should use the Parents Evening Forum Monthly Community Work (Umuganda), parents evening forums and general village assemblies (Inama Rusange y'Abaturage). These are very appropriate platforms to disseminate the project activities and ensure full participation of the communities.
- Adjust the legal framework and the institutional setting so that trees cannot be cut without any supervision in plots smaller than 0.5 ha.
- It is recommended to ensure that a more adequate allocation of resources for forestry to the districts. The local market development report provides insights on how to increase the engagement of the private sector.
- Afforestation on degraded and other vacant land suitable for forests.
- Promote clean and efficient energy technologies such as biomass pyrolysis and certification schemes for charcoal and wood to encourage more investment in FLR and push forward the energy sector in Rwanda towards a more sustainable and efficient supply chain.
- Ensure the adequate representativeness, participation of women in every operational planning regarding the management of forests.
- Increase fuelwood use efficiency by providing improved cookstoves to every household.
- Promote women and youth involvement in all aspect of forest management cycle.

### 3.8. Gender Analysis Report

#### 3.8.1. Introduction

Rwanda's forthcoming Vision 2050 highlights gender and family promotion as well as disability and social inclusion as being key cross-cutting areas among others. This is a reiteration of the GoR's commitment to gender equality, social inclusion, and the fight against gender-based violence which is overwhelming.

Accordingly, long-term development goals set in Vision 2050 cannot be achieved if men, women, boys and girls are not brought on board to air their voices so as to effectively and sustainably benefit and equally contribute to the journey of national transformation. Gender equality is a human right and an important component of sustainable development. Women have valuable experience in managing land use and water resources, conserving forests and biodiversity, especially in fragile environments. Their knowledge is key to adapting to climate change (World Bank, 2017).

In 2018, Rwanda was leading the world in securing gender equality in governmental institutions by having more seats of women in the parliamentarians (61.3%). Moreover, by 2018 women ministers represented 50% of cabinet; female judges and clerks represented 49.6% of judiciary; and 45.2% of Districts Councils members were women. Indeed, gender mainstreaming and accountability is one of the foundations of the National Development Agenda. As of the fiscal year 2018/2019, the Ministry of Gender and Family Promotion through the Gender Promotion Unit has conducted many activities in advancing community awareness on gender equality, namely implementation of International Commitments and Resolutions related to gender equality, as well as coordination of stakeholders intervening in gender equality promotion. Regarding gender gaps and differences at the country level to inform gender-sensitive and socially inclusive development programming, the lack of women's equal access to productive agricultural land and financial capital is reported as one of the main issues (USAID/ Rwanda, 2019).

In the context of Rwanda's forest and landscape restoration intervention, and particular in Mayaga region, gender has led to the limitation of sharing benefits from forest, which is still a burden to women who only rely on forest as source of energy in their households. Besides benefits limitation, gender integration and mainstreaming are not fully considered in natural resources management. As promised by *Mukangayaberura* women council representative "women in Mayaga are ready to showcase the power of women".

### 3.8.2. Access to land and natural resources in Mayaga

The Government of Rwanda has demonstrated strategies and commitment to guarantee women's access to land through gender-sensitive land laws and policies. However, the implementation of these legal frameworks still faces challenges. One indicator is the fact that, with the implementation of the Land Tenure Registration Program (LTRP), there has been an increase of intra-household disputes over land, mainly relating to inheritance. According to the LTRP, women inherit land and register on the land title document as equal owners of property, with men and women having legally the same rights to the land tenure and other natural resources. As women claim their rights provided by the LTRP, male family members (fathers, husbands and brothers) are still resistant to these changes, leading to such disputes. These disputes have a disproportionate impact on women as the nonlocality is usually on the side of husbands.

During the focus groups discussions (see section 3.1.2) women revealed that they are subjugated when it comes to the benefits on land and other resources incorporated thereon (e.g., decision making on forests harvesting, bee hiving, mining and quarry use), specifically in Mayaga region where there is shortage of forest resources. When it comes to forest value chains, women don't have the same power as stated at 50% of rights on the land title which leads to gender inequality. These statements were reported in the FGDs held in 2020 (Kinazi and Ntongwe sectors of Ruhango district; Muyira and Kibirizi sectors in Nyanza district; Mugina and Nyamiyaga sectors in Kamonyi district) and in the interviews with representatives from Gisagara. The FGDs included gender representatives, agriculture and women cooperative representatives, forestry technicians and youth groups. FGDs revealed that, though adequate and legal reforms have been implemented, in gender policy and the customary law, men remain the principal land users, limiting women's land and tree ownership.

In the FGDs, women and girls confirmed that they have right to succession to their parents' heritage like their brothers. Furthermore, the housing characteristics and conditions of female-headed households are almost similar to those of male-headed households, except for the main source of lighting, where the percentage of male-headed households using electricity as the main source of lighting (29.2%) is higher than that of female-headed households (20.3%) (EICV5). As per the findings from EICV5, women remain on high number in agriculture and forestry occupation has shown in Table 47.

**Table 47 – Main occupation according to gender.**

Occupation	Sex		Total
	Male	Female	
Managers	0.6%	0.1%	0.3%
Professionals	4.3%	2.2%	3.2%
Technical and associate professionals	1.1%	0.2%	0.6%
Clerical support workers	0.2%	0.4%	0.3%
Service and sales workers	11.9%	8.9%	10.3%
Skilled agricultural, forestry, and fishery	43.1%	62.7%	53.6%
Craft and related trades workers	4.3%	1.3%	2.7%
Plant and machine operators, and assemble	2.4%	0.2%	1.2%
Elementary occupations	32.2%	24.0%	27.8%

Source: NISR (2018d).

### 3.8.3. Vulnerability to deforestation, forest degradation and climate change

Deforestation and forest degradation results in different negative impacts for the environment and the livelihoods depending on them including loss of loss fertility, increasing soil erosion, decreased carbon sequestration, intensification of climate change effects, and decline of forest-related products. In the Mayaga region women are the group collecting most fire wood and fuelwood. However, men also contribute for forest degradation by cutting down trees for charcoal.

According to the key informant interview held with the vice Mayor in charge of Economic Development in Nyanza district “one of the major challenges today is that women are often more directly dependent on natural resources, with responsibility for the unpaid work of securing food, water, fuel and shelter for their household; firewood gathering, water collection and feeding families; when these resources are threatened, women and children suffer more”. He also added that women participation in re-greening the Mayaga region will impact not only to the southern province in terms of climate change, but also agriculture intensification.

During the FGDs, women stated that having chore works and the responsibility of feeding their families, and also of being the ones in charge of finding energy resources to cook, of preparing land for cultivating, namely their main staple food of cassava in the region,

is tiresome for female headed households (referred in Kamonyi, Ruhango and Nyanza districts). Women also claimed of having no affordable source of energy and monetary limitations to improve cooking techniques in order to use firewood more sustainably, thus reducing deforestation.

Additionally, vulnerability to deforestation includes the effects of arable land changing to marginal land and occupational activities. Forests provide more than 86 million green jobs and support the livelihoods of many more. An estimated 880 million people spend part of their time collecting fuel wood or producing charcoal, with 90% of the people living in extreme poverty being dependent on forests for at least part of their livelihoods. In Mayaga region, the so-called green employment is scarce. Moreover, a failed green economy may affect women in different ways; as workers, women can be excluded from the green economy due to gender segregated employment patterns and discrimination.

#### 3.8.4. Drivers of gender inequality in Mayaga

EICV5 data shows that 3% of female aged 16 to 30 years were attending tertiary level education, compared to 3.5% of male. With regards to the change observed since EICV4, it is worth noting that, there has been an increase in the percentage of females aged 16-30 years attending university from 2.5% to 3%, while for males there was almost no change since 2013/14.

Regarding occupation activities, most communities in Rwanda depend on agriculture and livestock. The Mayaga region is a typical example of the domination of ownership of a rearing livestock. According to the EICV5 Gender Thematic Report, in the four target districts, livestock raising by male headed household and female headed households is distributed as shown in the next table.

**Table 48 – Any livestock raised, by sex of household head and district (2016/2017).**

Districts/ total	Any livestock raised, by sex of household head		
	Male headed	Female headed	Total
Gisagara	62.7%	58.6%	61.3%
Kamonyi	57.9%	64.9%	59.6%
Nyanza	67.4%	52.7%	63.3%
Ruhango	76.5%	62.9%	72.7%
<b>All Rwanda</b>	<b>60.3%</b>	<b>57.3%</b>	<b>59.6%</b>

Source: (NIRS, 2018d).

From the table above, male headed households are more likely to have power of decision making which leads to inequality.

During the focus group discussions, female revealed that the following are the main inequality drivers regarding gender:

- Lack of full access to forest value chains (e.g., their husband can only inform them how they decided) – women referred in FGDs that despite their participating in planting trees, weeding them, they are not much consulted in the harvesting phase, neither in selling them. There were even comments of women saying their husbands keep the profits fully for themselves.
- Financial limitations (e.g., having access to loans) – female headed households struggle with acquiring loans; as they have low resources, and being considered vulnerable, it's difficult for banks to grant them loans as they present additional risks.
- Lack of mobility from home to their daily work – lack of enough public transport connecting farms to their homes. Women usually return home carrying babies on the back and firewood on the head through long distance whereas men can use bicycles; currently few women ride in the area, due to the existent cultural barriers.
- Lack of business opportunities for women – as reported in the EICV5 gender report, and in previous related reports, forest business in rural areas like carpentry, charcoal businesses and construction wood and furniture are mostly owned by men.
- Lack of career guidance (specific in natural resources area) – there is no gender center of excellence in the region to foster open discussions and sharing good experiences as in urban areas. Men still control decision making on the agricultural and forest production.
- Gender bias and lack of individual women activists – although Rwanda has strengthened gender balance through gender mainstreaming and women empowerment, some men find it difficult to change their mindset, and some women as well as they believe it will lead to family conflict. Lack of gender-based organisations capable of coupling together and educate them towards successful equal partnerships is still a problem, as most of them are located in urban areas.

### 3.8.5. Conclusion and recommendations

After an analysis on the gender situation in the Mayaga region and findings from the focus groups undertaken, the following recommendations should be considered during the project implementation:

1. Develop social and environmental inclusion in natural resources management.
2. Conduct awareness raising campaigns at the institutional level, clarifying that each institution is in charge of implementing gender mainstreaming and collecting gender disaggregated data (highlighting that this is not the role of MIGEPROF or GMO).
3. Promote the designation of gender focal points in the Department of Planning of every institution with enough time to attend this responsibility.
4. Train existing gender focal points on gender mainstreaming and reporting, increasing in the medium term the availability of gender disaggregated data. Ensure a regular communication with MIGEPROF and GMO.
5. Promote coordination between the sectoral and gender focal points, including the forestry focal point. To that end, the sectoral focal points should participate in the above-mentioned training.
6. Enforce gender-sensitive legislation by increasing the access to legal aid to women seeking to claim their rights, extending the service of justice bureaus;
7. Promote awareness of gender-sensitive legislations at community level, highlighting that equal control over resources, especially land and assets incorporated thereon, is an obligation not a favour;
8. Ensure the close participation of women at all levels of policy and project formulation in natural resource and environmental management, conservation, protection and rehabilitation. In this sense the proposed project should have an equitable recruitment procedure and recruit women for supervisory roles, ensuring a significant female representation in decision-making. By the same token, the proposed project should also involve the National Women's Council, which has a good network at grass root level, for awareness raising and other type of activities. Women should also be closely engaged in the selection of tree species. At this regard, the data collected in the field suggests that fruit trees could contribute to gender equality, given that women have more control over

them and fruit trees favour food security, directly and indirectly. In addition, the access to information on opportunities should be promoted;

9. Train women on landscape and forest management, complementing this with efforts to engage women at the different levels of the landscape and forest management value chain. This could involve both the creation of new cooperatives or the involvement of more women in existing cooperatives in higher positions;
10. Promote the access of women to financial services, in collaboration with the BDF, which, as noted, could help overcome the problem of access to land as collateral;
11. Support family planning to control population growth;
12. Develop cooperation with existing center of excellence of natural resources that promotes gender equality in Rwanda;
13. Creation of self-help groups for better management and communication between the beneficiary community and the implementing team;
14. Introduction of center of excellence for the components of gender development and social inclusion;
15. Creation of business opportunities in Mayaga with government subsidies for women;
16. Introduction of family week to comprehend shared decision making and to avoid gender bias.



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### 3.9. Forest Productivity Report

#### 3.9.1. Introduction

Forests of Rwanda occupy about 724,695 hectares of the total country land (30.4%) of which 387,425 hectares (53.5%) are plantations, 130,850 hectares (18.1%) are natural mountain rainforests, 161,843 hectares are wooded savannah (22.3%), and 43,963 hectares are Shrubs (6.1%). Bamboo stands occupy only 613 hectares. In terms of the forest density and tree cover, about 318,434 hectares are very dense forests (44%), 234,004 are moderately dense (32%), 146,222 hectares are sparse (20%) and only 26,035 hectares are much degraded (4%). Southern and Western Provinces contain 50% of total forests of which 174,199 hectares are in Western Province and 177,537 hectares are in Southern Province. Eastern province takes up to 38% of the total forestland (274,630 hectares). Northern Province contains only 85,688 hectares and Kigali city remains only with 12,641 hectares (MoE, 2019).

Rwanda's forests consist of forests in protected areas (afro-montane rainforests of Nyungwe and Gishwati-Mukura and Volcanoes, savannahs forests in Akagera), forest reserves, natural forests (Busaga, Buhanga, Kibirizi-Muyira and other relict forests), plantations, woodlots, and scattered stands of agroforestry. It is documented that 10.8 per cent of the country (258,066 ha) is covered by "natural forests". In addition to that, man-made forests cover 18.4 per cent (438,336 ha) of the country and represent nearly 63 per cent of all forest cover (REMA, 2015).

Many of these man-made plantations were established before independence to provide woodfuel and reduce pressure on natural forests. Eucalyptus plantations (nine different species) are the most abundant, covering almost 59% of all forests, followed by *Pinus species* (mostly *Pinus patula*) at 28%, and small percentage of *Callitris spp*, *Acacia spp* and *Cupressus spp* and mixed plantations/woodland. Eucalyptus has been preferred due to its fast growth, coppicing ability, calorific value, and its capacity to adapt to most soils and climates of Rwanda.

Table 49 and Table 50 demonstrate that 318,434 hectares have a high density of tree cover (about 44% of the total forest area), of which 179,562 hectares are forest plantations i.e., 56% of the total high-density forest area. This shows that although the current consumption of forest resources in various economic sectors like energy, construction and manufacturing is alarming, forests in Rwanda are still valued and harvested respecting guidelines governing the use of forests, preventing degradation of forests in Rwanda and afforestation is at the same pace as of the harvest. Young

plantations are also kept in good health. High-density forests of Southern and Western provinces are the highest compared to other provinces. Eastern Province remains the least forested in both area and density (MoE, 2019).

**Table 49 – Summary statistics of forest cover types per category of forest density.**

Forest Cover	Very low (0-10%)	Low (10-40%)	Medium (40-70%)	High (>70%)	Total (ha)	Percent age (%)
Bamboo stand	15	39	149	410	613	0.1
Forest plantation	11,034	46,077	150,752	179,562	387,425	53.5
Natural forest	466	2,848	207	127,329	130,850	18.1
Shrub	3,184	13,791	24,470	2,518	43,963	6.1
Wooded savannah	11,336	83,466	58,425	8,616	161,843	22.3
<b>Grand Total (ha)</b>	<b>26,035</b>	<b>146,222</b>	<b>234,004</b>	<b>318,434</b>	<b>724,695</b>	<b>100.0</b>

Source: MoE (2019).

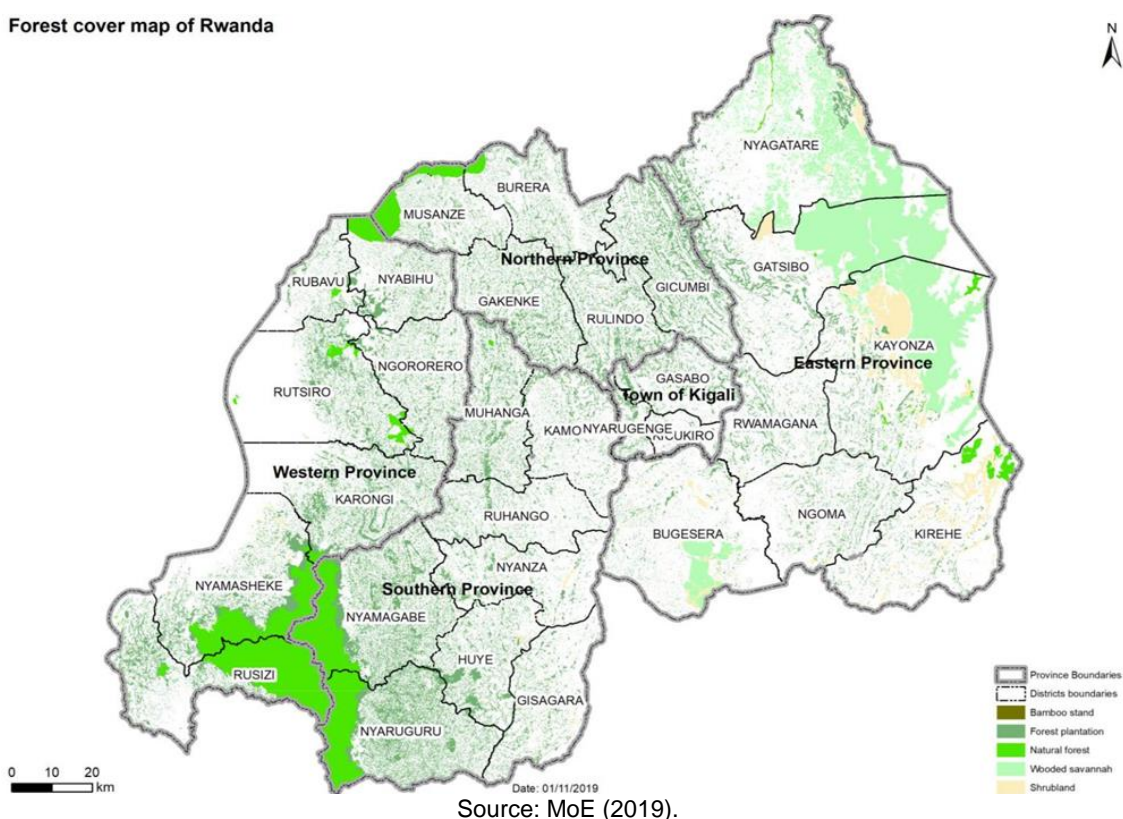
**Table 50 – Summary statistics of forest cover type and density per province.**

Forest Cover	Kigali City (ha)	East (ha)	North (ha)	South (ha)	West (ha)	Total
<b>Bamboo</b>						
High (>70%)	110	66	71	46	117	410
Medium (40-70%)	22	36	59	14	18	149
Low (10-40%)	1	24	9	1	5	39
Very low (0-10%)	1	24	9	1	5	39
<b>Bamboo total</b>	<b>133</b>	<b>135</b>	<b>144</b>	<b>62</b>	<b>141</b>	<b>613</b>
<b>Forest plantation</b>						
High (>70%)	4,690	20,620	34,873	55,214	64,164	179,562
Medium (40-70%)	5,668	30,005	30,165	53,720	31,194	150,752
Low (10-40%)	1,664	10,288	7,027	20,045	7,052	46,077
Very low (0-10%)	356	3,735	1,725	3,704	1,514	11,034
<b>Forest Plt. total</b>	<b>12,379</b>	<b>64,649</b>	<b>73,791</b>	<b>132,683</b>	<b>103,924</b>	<b>387,425</b>
<b>Natural forest</b>						
High (>70%)		3,645	11,740	43,000	68,944	127,329
Medium (40-70%)		146		4	57	207
Low (10-40%)		2,833	0	6	9	2,848
Very low (0-10%)		460	0	4	1	466
<b>Natural forests total</b>		<b>7,085</b>	<b>11,740</b>	<b>43,014</b>	<b>69,012</b>	<b>130,850</b>

Source: MoE (2019).

Although the Eastern part is the least forested area, the Amayaga agro-ecological zone (covering the Gisagara, Nyanza and Ruhango districts) is under risk as well, as being the least forested part of Southern Province, thus needing considerable attention. Reducing harvesting permits in the region, reinforcing afforestation interventions and rehabilitation of existing forests should be implemented to ensure the regeneration of exhausted forest plantations while planning a long-term strategy for sustainable forest management in the area.

Forest cover map of Rwanda



Source: MoE (2019).

**Figure 19 – Forest cover in Rwanda.**

### 3.9.1.1. Forest coverage at Provincial level

Table 51 indicates that Western Province is the highest forested Province while Northern Province is the least forested. The difference in forest cover between provinces may have a relationship with the demographic pressure in rural areas. In fact, Northern Province is the second-highest populated rural area with 90.2% of its people living in rural area (EICV5, November 2018). Eastern Province appears to be the second forested

region with a total of 274,630 hectares due to its large part covered by savannah woodland (161,832 hectares, i.e., 59%) leaving 40,930 ha for shrubs, 7,085 ha along water bodies, and 12,379 ha for forest plantations.

Only 4.5% of forests in Eastern Province are plantations. In fact, the savannah woodland and shrubs are the main sources of firewood in the East, putting pressure on indigenous tree species in the relics. This is confirmed by the tree density cover in Eastern Province (see Table 50) where 60% of the total savannah and 37% of total shrubs are degraded (very low to low tree density). It is recommended that the restoration of savannah landscapes be part of priority actions for the government of Rwanda and stakeholders working in forestry, agriculture, and environment protection in order to anticipate the mitigation measures to induced droughts in this region.

**Table 51 – Summary statistics of forest cover and distribution per Province.**

Province	Province land (water bodies excluded) (ha)	Total Forest cover (ha)	Forestland (%)	Non- forestland (%)
Kigali City	72,829	12,641	17.4	82.6
Eastern Province	910,555	274,630	30.2	69.8
Northern Province	319,318	85,688	26.8	73.2
Southern Province	596,355	177,537	29.8	70.2
Western Province	486,773	174,199	35.8	64.2
Grand Total	2,385,830	724,695	30.4	69.6

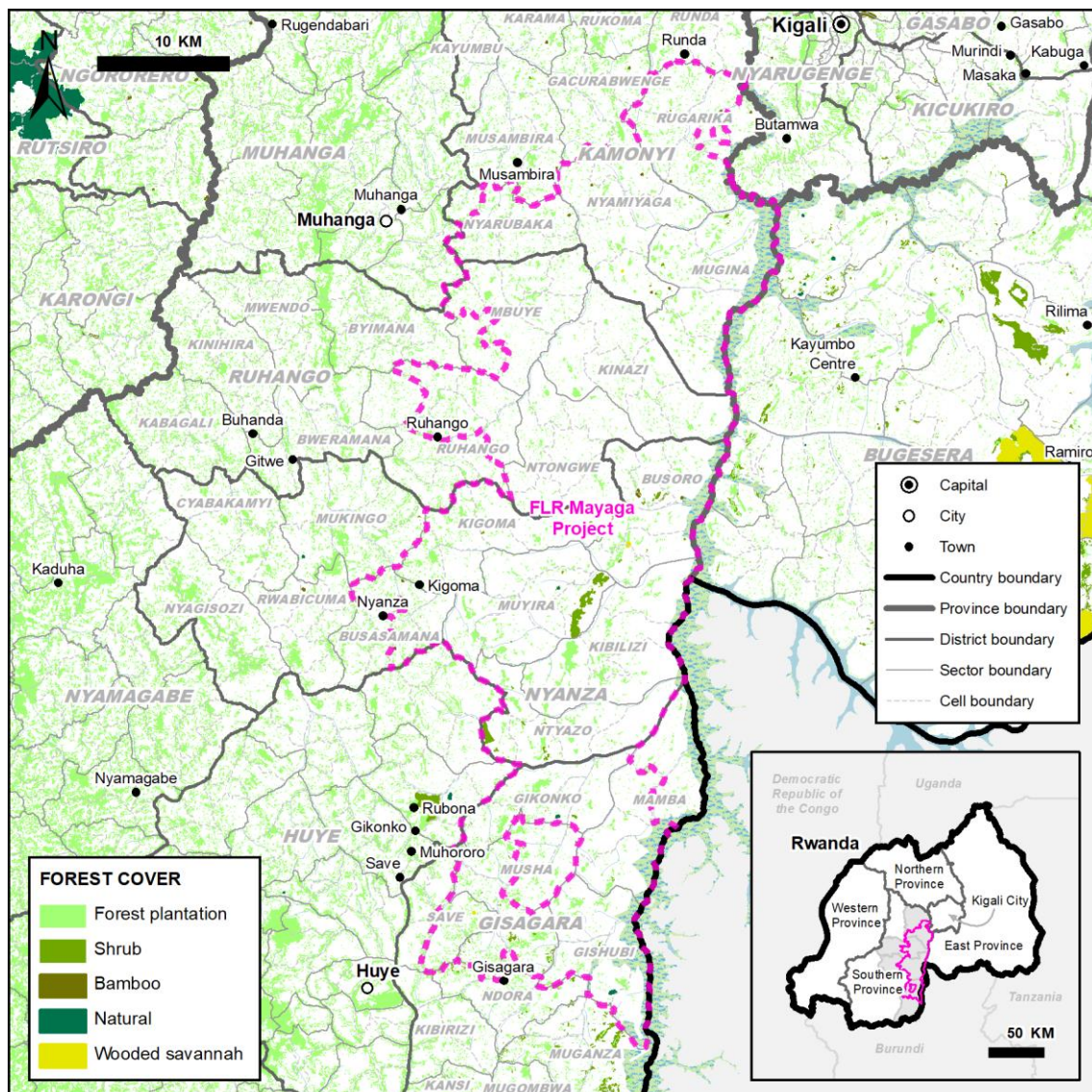
Source: MoE (2019).

Amayaga agro-ecological zone (Gisagara, Nyanza and Ruhango districts) is one of the areas that is least forested of Southern Province and needs much attention as well. Reducing harvesting permit in least forested sectors could also be a short-term solution to ensure the regeneration of exhausted forest plantations while planning a long-term strategy for sustainable forest management in such area. A study could also be conducted to understand the root causes of deforestation and forest degradation in the region.

### 3.9.2. Forest resources in Mayaga

There are no large size private or commercial forest plantations in Mayaga (see Figure 20). Most of the large forest plantations belong to the state or the Districts because they

were established by projects funded by various donors or international financial institutions. However, there are several small private woodlots plantations scattered throughout Mayaga which are owned by individual farmers and institutions such as private companies (mainly tea factories), churches, schools, and religious institutions most of them are less than 2.5 ha and thus do not qualify to be called forests. There is no reliable statistics on private plantations, species or age distribution as many reports have concentrated on public forests (owned by state or district), but based on personal communication with District officers, the dominant species in private forest plantations are Eucalypts including *E. globulus*, *E. maidenii*, *E. grandis*, *E. saligna*, *E. camaldulensis*, *E. tereticornis*, *E. maculata*, *E. dunnii*, *E. microcorys* and several hybrids.



Source: MoE (2019).

**Figure 20 – Forest Cover in Mayaga (2019).**

Mayaga as other areas in the country is dotted with woodlots, where the most common tree species is Eucalyptus, practically found in all farming systems of Mayaga. This is due to fact that farmers who own woodlots target fuelwood production and to some extent building poles for domestic and commercial purposes. In case of commercial purposes, farmers work closely with a private company called “the New Forest Company”, which has a pole treatment plant in Nyanza and others sale to local carpentry houses that are located in urban centres.

According to a survey carried out by FAO (2011) to determine the extent of tree resources outside forests (including woodlots below 0.5 ha), Rwanda, in general, and Mayaga, in particular, is predominantly dotted with trees in small groups, rows or single trees on farm. These resources cover about 6.6% of total land area of the country. Other species found in woodlots and other agroforestry systems include *Grevillea robusta*, *Casuarina equisetifolia*, *Acacia melanoxylon*, *Acacia mearnsii*, *Alnus acuminata*, *Maesopsis eminii*, *Senna spectabilis*, *Senna siamea*, *Leucaena leucocephala* and *Calliandra calothyrsus*. Other species like *Pinus ssp.*, *Cupressus spp.*, *Callitris spp.*, *Grevillea spp.*, are also planted and were considered for sawn timber, while Eucalyptus spp. were mainly fuelwood.

Eucalypts have become naturalized in the country and there are so many hybrids that it is difficult to identify with 100% certainty the exact types of Eucalyptus species found in Mayaga. Moreover, any farmers obtain seedlings from eucalypts wildlings. Very few indigenous species are found in plantations and agroforestry. Recorded species include *Entandrophragma excelsum*, *Podocarpus falcatus*, *Markhamia lutea* (or *platycalyx*), *Symphonia globulifera*, *Polyscias fulva* and *Prunus africana*.

**Table 52 – Biomass properties and species composition (means±SD and range) of all sites visited in Mayaga (plantations and natural forests) (2018).**

Site Properties	Mean ± SD	Range
No of stems, DBH >10 cm (ha <sup>-1</sup> )	1,192± 1,346	50.0 – 4,200
Stand Basal area (BA, m <sup>2</sup> ha <sup>-1</sup> )	37 ± 54	2.4 – 173.2
Volume (m <sup>3</sup> /ha)	179 ± 307	5.7-976.6
Mean Height	14±5	2.0 – 26
Number of big trees, DBH>40 cm(ha <sup>-1</sup> )	3±4	0 – 11
No of species	6±8	1 – 29

Source: Baastel (2018b).

Table 53 indicates that among the most abundant species some are invasive, such as *Psidium guajava* and *Eucalyptus saligna*, and others are exotics, like *Eucalyptus grandis*, *Eucalyptus microcorys* and *Callitris robusta*.

The understorey of most of the plantation forests have been affected by the presence of *Lantana camara*, an invasive species threatening even farms around those forests. Most of the native species are found in natural forests of Kibirizi (in Nyanza) and another forest on the top of Nyamiyaga (Muyira sector), also in Nyanza.

**Table 53 – Most Abundant Species.**

Most Abundant Species
<i>Eucalyptus grandis</i> (exotic)
<i>Eucalyptus microcorys</i> (exotic)
<i>Eucalyptus saligna</i> (exotic and invasive)
<i>Callitris robusta</i> (exotic)
<i>Parinari curatellifolia</i> (native)
<i>Combretum molle</i> (native)
<i>Psydrax schimperiana</i> (native)
<i>Dalbergia nitidula</i> (native)
<i>Coptosperma graveolens</i> (native)
<i>Pinus patula</i> (invasive)
<i>Rhus natalensis</i> (native)
<i>Psidium guajava</i> (invasive)
<i>Euclea schimperi</i> (native)
<i>Acacia hockii</i> (native)
<i>Canthium lactescens</i> (native)
<i>Albizia adianthifolia</i> (native)
<i>Olea europaea</i> (native)

Source: Baastel (2018b).

According to the Tree Seed Center, indigenous species are not common in private plantations as the community is not willing to plant them. Most of these indigenous species are slow growing species, with long-term investment without short returns either commercially or in other services (construction, energy etc.).

There are no statistics on encroachments and removals of forest plantations in recent years. However, excessive forest degradation due to encroachment was experienced in the 1990s during the war which culminated in the genocide of 1994 against Tutsis and afterwards when returning refugees were looking for settlements. Many public forests

were logged and cleared while others were encroached for agriculture and settlement through illegal appropriation. Currently most of small woodlots and trees as means to have firewood for cooking which is very scarce in Mayaga region.

Most recent forest distribution data for the project area is shown in Table 54.

**Table 54 – Forest cover distribution in the four target districts (2019).**

Districts	Forest Cover Type (ha)			
	Plantation	Natural/ Bamboo	Shrub	Wooded savannah
Gisagara	8,214	7	798	1
Kamonyi	8,796	49	166	5
Nyanza	8,375	11	560	4
Ruhango	8,958	0	7	0

MoE (2019).

The ecosystem services that these forests provide to the owners and/or communities living around them are various. First of all, forest offer provisioning services, such as the production of food, wood, fiber, or fuel. Besides of provision of wood, these forests are source of non-timber forest products such as honey, wild mushrooms, and medicinal plants. In addition, forests in Mayaga, as in the rest of the country, contribute for climate and diseases regulation, protection against weather events and its impacts, such as soil erosion, and provide cultural services (aesthetic, spiritual, educational, or recreational benefits), as well as and supporting benefits, such as soil formation or nutrient cycling.

In Mayaga, forests resources are particularly important for providing timber products, as more than 90% of people in the districts under analysis used firewood for cooking. Other provisioning services provided by forest products are related to the production of timber for construction and also for furniture production (NISR, 2018b).

According to the Rwanda Supply Master Plan for Fuelwood and Charcoal, woodfuel is the most important provisioning service provided by forests in Mayaga region. Construction represents only about 1% to 2% of total consumption of wood in the region. In a business-as-usual scenario, it's expected total consumption of wood products to increase almost 20% in a decade, which can only be sustainable in an ameliorated demand scenario (assuming an increased use of improved stoves, higher efficiency in charcoal production and a higher use of LPG in urban areas).

### 3.9.2.1. Soil erosion in Mayaga

Gullies (deep excavation of soils mainly caused by excessive water and exposing bare rocks at the bottom), rills (removal of surface soils mainly caused by droplets of rainwater), sheet (removal of the surface layer of the soil mainly caused by water moving runoffs) and root exposure are the main soil erosion classes observed in Mayaga. Gullies were observed on hills with steep terrain, disturbed forested land with little canopy, with presence of grazing, and mining sites. Most of the forest plantations are degraded, and threatened by illegal logging, and this results in clearance. Forest clearance, especially in steep slopes, increases surface runoff and river sediment loads and siltation (movement of fine soil particles that are accumulated along water channels, riverbanks, and flat plains). Gullies and siltation were mainly observed in valleys of mountains with little vegetation cover at the top. This was observed mainly in Mamba sector, Gisagara District (see Figure 18).



**Figure 21 – Gully erosion in Amayaga region (Gisagara District).**

Soil erosion is among major environmental problems the country is facing and it is exacerbated by the fact that wood is the source of energy for 99% of the population (the household energy report provides more detailed information on this), which leads to massive deforestation and soil degradation. The dependency on agriculture for livelihood increases the pressure on forest ecosystems and this agricultural intensification without soil conservation practices can have significant detrimental effects on soil, such as

increased erosion and lower fertility. This makes the Mayaga region greatly vulnerable to potential soil erosion by water.

The reduction of overstorey canopy; removal or alteration of vegetation, mining, soil compaction from domestic animals grazing, and steep topography were the causes of observed soil erosion. The erosion on undisturbed forestland was very low. Studies (Lal et al., 1999; Pimentel, 2006; FAO, 2015b; Paganos et al., 2015) have shown that very high soil loss rates existed mainly in high altitudes with scattered vegetation, without enough biomass coverage. Landslides rarely occur in areas with high forest cover because tree roots stabilize ridge, hill and mountain slopes and provide the soil with the necessary mechanical structural support to prevent shallow movements of land mass (FAO, 2015b). Hence, sustainable managed forests are needed to control soil erosion and to conserve soil in this region.

Erosion reduces forest productivity mainly by decreasing the soil water availability, this is a result of changing the water-holding capacity and thickness of the root zone. Furthermore, erosion removes plant-available nutrients while fertilizer applications can partly offset these losses, but they greatly increase costs and are uncommon. Another impact of erosion on productivity that may be specific for the case of Mayaga region, is degraded soil structure whereby in areas of sandy soil like it is the case of Mayaga, the forest or plants can be easily washed away as a result of leaching. Removal of the loose, organic surface materials promotes surface sealing and crusting that decrease infiltration capacity and may increase erosion. Finally, soil erosion also results in loss of important soil biota, such as mycorrhizal fungi, which facilitate nutrient uptake by plants.

### **3.9.2.2. Carbon stocks and Productivity**

#### **A) Natural Forests**

In the Mayaga region, the mean aboveground biomass (dry) carbon stock for D classes > 10 cm was  $28 \pm 18 \text{ MgCha}^{-1}$ . This aboveground biomass C stock is within the range of other dry forests in Africa reported by Carreiras et al., (2013); Baccini et al., (2008) and Saatchi et al., (2011) and could be explained by the high wood density which ranged from 0.42 to 0.85  $\text{tm}^{-3}$ , with a mean density of  $0.70 \pm 0.08 \text{ tm}^{-3}$ .

Within the scope of the project, the eight defining natural forest species (*Psydrax schimperiana*, *Rhus natalensis*, *Dalbergia nitidula*, *Psidium guajava*, *Parinari*

*curatellifolia*, *Olea europaea*, *Rhus longipes*) assessed in visited sites had density values of 0.76; 0.78; 0.70; 0.65; 0.62; 0.76; 0.81; 0.70  $\text{tm}^{-3}$  respectively, slightly above the average wood density of all other species and DBH ranging from 0.3 to 25.5 cm. The wood density of these species is above the mean of other dry areas such as Miombo woodland in Mozambique, for example (Williams et al., 2008) which is  $0.56 \pm 0.08 \text{ tm}^{-3}$  ranging from 0.40 to 0.71  $\text{tm}^{-3}$ .

Subsequently the C stocks are above those reported in Miombo woodlands. Also, it is important to note that wood density was estimated using the average of the compiled species from online database by Chave et al. (2009) and Zanne et al. (2009). Natural forests in Mayaga region are indeed characterised by shrubland vegetation, typical for dry areas (Baastel, 2018b).

**Table 55 – Biomass and Carbon stock in Natural Forests (2018).**

Site Properties	Mean	$\pm$ SD	Range		
Mean AGB <sub>dry</sub> (Mg.ha <sup>-1</sup> ), D>10 cm	58	38	19.5	-	136.2
Mean AGB <sub>dry</sub> (Mg.ha <sup>-1</sup> )	9	17	0.0039	-	136.2
Mean C (MgCha <sup>-1</sup> )	4	8	0.0018	-	64.4
Mean C (MgCha <sup>-1</sup> ), D>10 cm	28	18	9.2	-	64.4

Source: Baastel (2018b).

## B) Forest Plantations and mixed plantations

Dominant species within these plantations are *Acacia hockii*, *Callitris robusta*, *Eucalyptus grandis*, *Eucalyptus microcorys*, *Eucalyptus saligna*, *Grevillea robusta*, *Pinus patula* and *Parinari curatellifolia*. *Parinari curatellifolia* is an indigenous species appearing in Nyamirama site, at the top of the hill, in a very degraded natural forest.

The results from Table 56 show that productivity estimated as Aboveground Volume (AGvol in  $\text{m}^3/\text{ha}$ ) is low, in line with the findings on the Southern Province of RNRA (2017). There is also variability between species and, due to the lack of any kind of standard silvicultural treatment, the standing volume varies from site to site mainly due to haphazard harvesting and edaphic conditions.

**Table 56 – Structural characteristics of the plantation forests at the study sites for D>10cm (2018).**

Species	Mean AGVol/ha	Mean C (Mg C ha <sup>-1</sup> )	Mean AGB (Mg/ha)	Mean DBH (cm)	Mean Height (m)
<i>Acacia hockii</i>	124.86	290.01	611.83	17.50	7.10
<i>Callitris robusta</i>	89.46	207.78	438.35	17.05	16.20
<i>Eucalyptus grandis</i>	151.02	350.76	740.00	20.74	16.27
<i>Eucalyptus microcorys</i>	70.75	164.32	346.67	20.88	13.67
<i>Eucalyptus saligna</i>	55.36	128.58	271.26	14.61	12.03
<i>Grevillea robusta</i>	33.76	78.41	165.42	11.87	13.45
<i>Pinus patula</i>	222.92	517.75	1092.31	25.25	16.85

Source: Baastel (2018b).

The cumulative results of all sites in the four target Districts (presented in Table 57) reveal that the mean aboveground biomass in plantations stands with D>10 cm was  $522.31 \pm 588.13$  Mg ha<sup>-1</sup> while the Carbon stocks was  $247.58 \pm 278.78$  Mg C ha<sup>-1</sup>. The mean Volume (m<sup>3</sup>/ha) of these mixed plantations is  $106.61 \pm 104.67$  m<sup>3</sup>/ha ranging from 1.32 to 716.67 m<sup>3</sup>/ha. This indicates that if these trees are sustainably managed, they can stock a substantial amount of biomass, and subsequently large amount of carbon. However, this depends on the age of the forest and the management regime, which in return affects availability of nutrients in the soil and their uptake.

*Pinus patula* has the highest carbon stock followed by *Eucalyptus grandis*, and *Acacia hockii* which could be explained by the highest values of diameter. However, biomass allocation of plants depends on several factors, such as the growth habitat of the species, soil quality, the soil on which plants are growing, the age of the plant, management practices and interaction with belowground vegetation (Justine et al., 2015).

**Table 57 – Biomass and Carbon stock in Plantation Forests (2018).**

Site Properties	Mean $\pm$ SD	Range
Mean AGBdry (Mg.ha <sup>-1</sup> ), D>10 cm	$522.31 \pm 588.13$	6.46 - 3,511.66
Mean C (Mg C ha <sup>-1</sup> ), D>10 cm	$247.58 \pm 278.78$	3.06- 1,664.53
Mean AGVol (m <sup>3</sup> /ha), D>10 cm	$106.61 \pm 104.67$	1.32 - 716.67
Mean DBH (cm)	$18.90 \pm 7.62$	10 - 48.5
Mean Height (m)	$14.74 \pm 4.58$	2.5 - 26

Source: Baastel (2018b).

### **3.9.3. Forest management in Mayaga**

#### **3.9.3.1. Kamonyi**

In Kamonyi District, most of the forests were established around the 1980s. Most of the woodlots are old and degraded; the main species is Eucalyptus. The main forest silvicultural practices should be focusing on maintenance and rehabilitation. Besides, many woodlots are mature, hence the need for a well-planned harvest.

According to the forest cover mapping report of 2019, forests in Kamonyi District covers 9,016 ha, which is about 14% of total district land area (Table 58) of which 8,796 ha are forest plantations (97.5%) and 220 ha are natural vegetation (mainly shrubs). Despite that Kamonyi is among the least forested districts of Rwanda, some sectors are doing better than others. For example, Rukoma sector with 1,171.8 ha (23% of the sector land), Kayenzi with 809 ha, and Ngamba sector with 745.3 ha (24% of the sector land). The least forested sectors are Nyamiyaga sector with only 587 ha (8% of the total sector land), and Mugina with 667 ha (only 8% of the total sector land).

Concerning the forest density (an indicator of forest productivity), Figure 22 (see also Map 3b in Appendix) shows that Kamonyi District has very low to medium density forests and very few forest patches with high tree density. Thus, it is recommended that Kamonyi District forest management plan prioritize afforestation and reforestation across all sectors. Reducing harvesting permit in least forested sectors could also be a short-term solution to ensure the regeneration of exhausted forest plantations while planning a long-term strategy for sustainable forest management in Kamonyi district. Like Gisagara district, Kamonyi also could consider conducting a study to understand the root causes of deforestation and forest degradation and recommend the mitigation measures for sustainable management of forests. This is because they both received, besides the GoR earmarked transfer budget, the African Development Bank support program for afforestation and reforestation, a four-year project (2012-2016) that apparently, the impact seems to be minimal as compared to other districts in Southern Province. Therefore, an in-depth understanding of the situation would reveal priority actions to be taken in order to enable sustainable forest management and woodland expansion in Kamonyi district.

**Table 58 – Summary statistics of forest cover per sector in Kamonyi District.**

Sector	Total land (ha)	Forest cover (ha)					Forest cover (%)
		Bamboo	Forest Plantation	Shrub	Wooded savannah	Total	
Gacurabwenge	5,108	0.2	802			802	16
Karama	5,231	0.3	826			826	16
Kayenzi	3,588	3	794	12.4		809	23
Kayumbu	3,372		540	0.6		541	16
Mugina	8,871	0.3	650	16.8		667	8
Musambira	6,317	0.4	787	5.3		793	13
Ngamba	3,157	14.7	628	98.6	4.2	745	24
Nyamiyaga	7,785	0.8	574	12.3	0.3	587	8
Nyarubaka	4,486	0.1	612	3.9		616	14
Rugalika	7,475	3.7	719	9.2		732	10
Rukoma	5,154	0.9	1,169	2.1		1,172	23
Runda	5,009	24.7	697	5.3		727	15
<b>Total</b>	<b>65,554</b>	<b>49.2</b>	<b>8,796</b>	<b>166.4</b>	<b>4.5</b>	<b>9,016</b>	<b>14</b>

Source: MoE (2019).

Besides the density and the cover, the size of the forest plantations in Kamonyi district is also low as compared to other districts in Southern Province. Table 59 shows that overall, 64% of forest plantations (4,561 ha) are formed by forest plots greater than 2 ha. The sectors with highest forest plots greater than 2 ha are Rukoma with 1,021 ha (87% of the total sector forest plantations), Kayenzi with 598 ha (75%), Ngamba sector with 554 ha (88%), and Runda sector with 524 ha (75% of the total sector forest plantations).

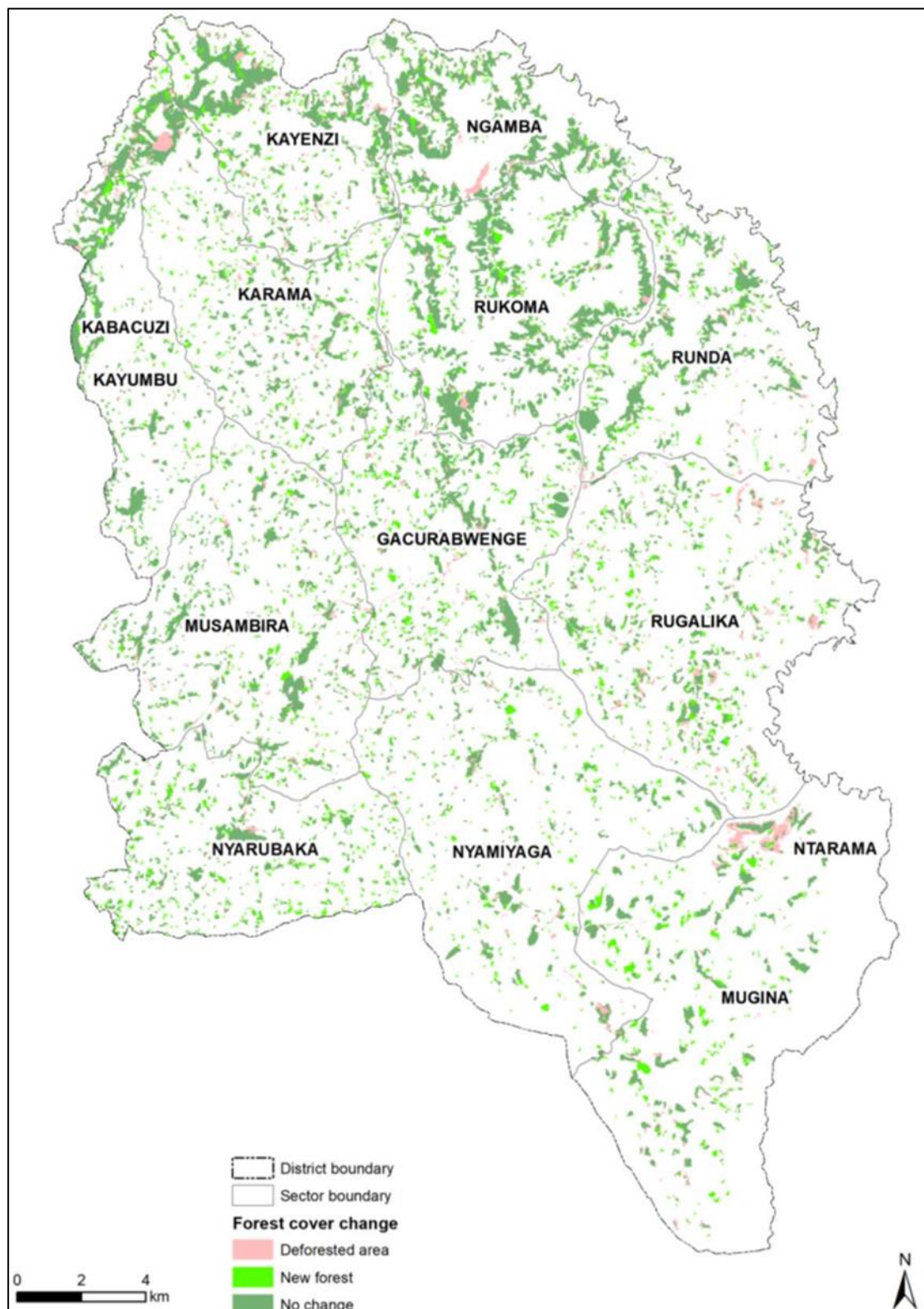
**Table 59 – Classification of forest plantations by size in Kamonyi District.**

Sector	Area > 2 ha	Between 1 and 2 ha	Between 0.5 and 1 ha	Between 0.25 and 0.5ha	Between 0.25 and 0.5ha	Total	% FC >2 ha
Gacurabwenge	448	134	109	66	45	802	56
Karama	463	143	91	76	52	826	56
Kayenzi	598	69	52	41	33	794	75
Kayumbu	406	33	46	29	26	540	75
Mugina	477	60	45	36	32	650	73
Musambira	382	152	112	89	53	787	49
Ngamba	554	34	16	14	11	628	88

Sector	Area > 2 ha	Between 1 and 2 ha	Between 0.5 and 1 ha	Between 0.25 and 0.5ha	Between 0.25 and 0.5ha	Total	% FC >2 ha
Nyamiyaga	243	93	97	77	63	574	42
Nyarubaka	257	129	95	73	58	612	42
Rugalika	301	132	143	86	57	719	42
Rukoma	1,021	55	47	24	21	1,169	87
Runda	524	69	47	36	21	697	75
<b>Total</b>	<b>5,673</b>	<b>1,105</b>	<b>899</b>	<b>646</b>	<b>474</b>	<b>8,796</b>	<b>64</b>

Source: MoE (2019).

Forest cover change in Kamonyi District during the last decade is summarized in Table 60 and presented in Figure 22. The results show that afforestation is only 29% against a deforestation of 15% over ten years from 2009. The highest afforestation rate is 52% found in Ruhango sector, 43.4% found in Rugalika sector, and 42.5% found in Nyanza sector. The overall trend is a 14% increase of forest cover for the past ten years, which is only 1.5% of forest gain every year in Kamonyi district. This increase is not much significant as the big part of Kamonyi district is located close to Bugesera and Amayaga agroecological zones prone to drought, where forests could play a vital role in addressing issues of drought and mitigation of climate change impact. Hence, there is a pressing need to increase afforestation and reforestation to improve the productivity of existing woodlots, to expand forest cover to meet the national target (30%) and to address timber and biomass energy demand, which is seemingly the main cause of degradation of eucalypt forests in Kamonyi District.



Source: MoE (2019).

**Figure 22 – Change of forest cover detected from 2009 to 2019 in Kamonyi District.**

**Table 60 – Deforestation and afforestation status in Kamonyi District.**

<b>Sector</b>	<b>FC 2019 (ha)</b>	<b>FC 2009 (ha)</b>	<b>Defo rested area (ha)</b>	<b>Affore sted area (ha)</b>	<b>No change (ha)</b>	<b>Defores tation rate (%)</b>	<b>Afforestati on rate (%)</b>
Gacurabwenge	802	630	97	224	533	12	36
Karama	826	705	129	200	575	16	28
Kayenzi	809	743	123	154	620	15	21
Kayumbu	541	459	47	102	412	9	22
Mugina	667	584	173	224	411	26	38
Musambira	793	660	109	189	551	14	29
Ngamba	745	731	105	105	626	14	14
Nyamiyaga	587	432	92	183	340	16	43
Nyarubaka	616	403	54	209	349	9	52
Rugalika	732	605	196	262	409	27	43
Rukoma	1,172	1,041	91	201	950	8	19
Runda	727	638	104	159	534	14	25
<b>Total</b>	<b>9,016</b>	<b>7,630</b>	<b>1,321</b>	<b>2,214</b>	<b>6,309</b>	<b>15</b>	<b>29</b>

Source: MoE (2019).

### 3.9.3.2. Gisagara

Forests in Gisagara District cover 9,021 ha; about 13% of total district land area (Table 61, and Map 3a in Appendix) of which 8,214 ha are forest plantations (91%) and 807 ha are natural vegetation (mainly shrubs). Despite that Gisagara is among the least forested districts, the highest forested sectors are Kigembe sector with 877 ha (20% of the sector land), Ndora with 1,053 ha (17% of the sector land), Kansi with 808 ha (19%), and Save with 769 ha (19%). The least forested sectors are Mamba sector with only 391 ha (5% of the total sector land), Gishubi sector with only 396 ha (6% of the total sector land) and Gikonko sector with 459 ha (9%).

The forest density map (Figure 23) shows that Gisagara District has very low to medium density forests. Very few forest patches with high density, hence it is recommended that Gisagara District forest management plan (DFMP) prioritize afforestation and reforestation across all sectors. It is also important that a study on underlying and proximate factors of accelerated deforestation and forest degradation in Gisagara district is conducted to understand the root causes of deforestation and forest degradation and

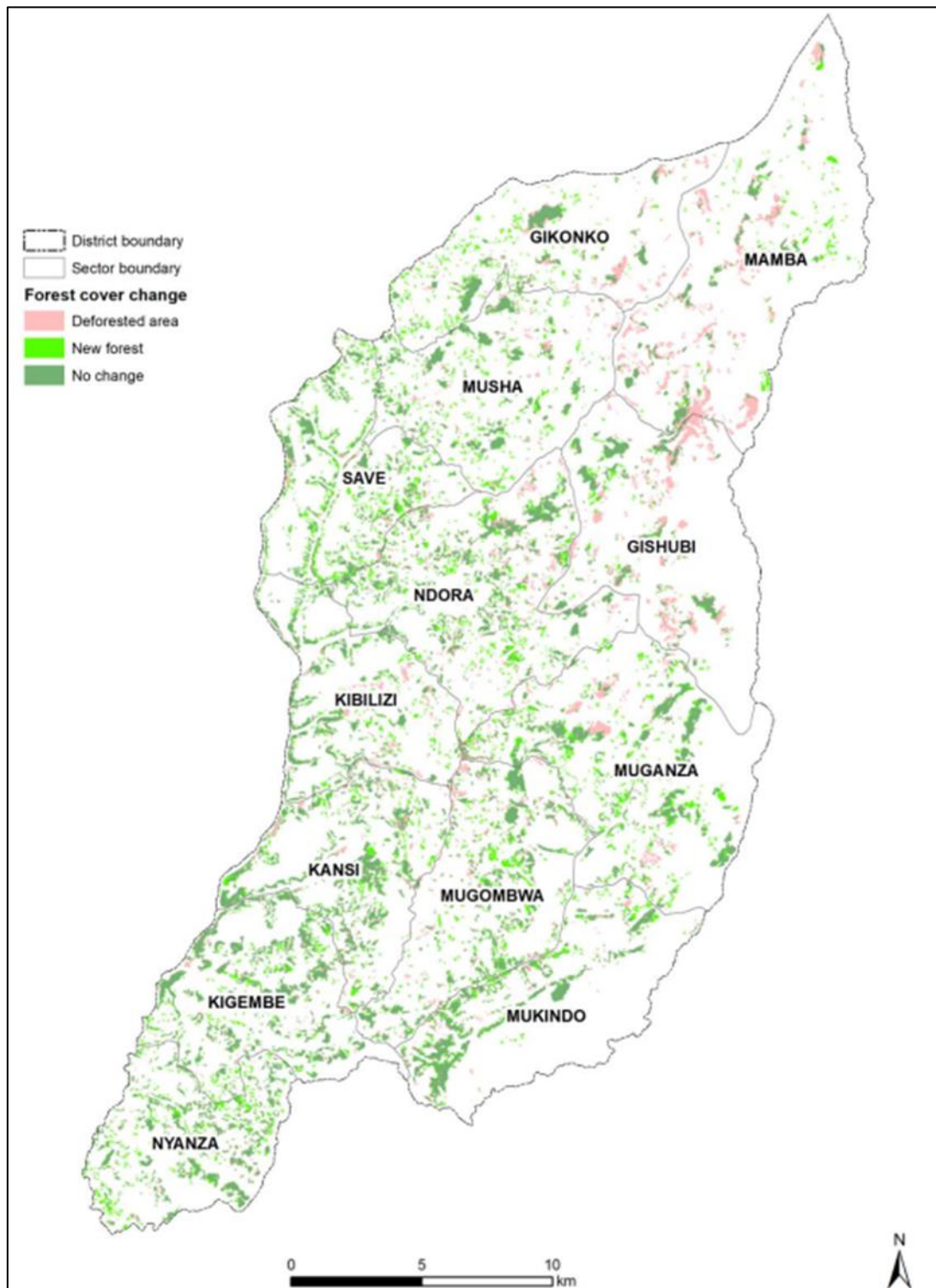
recommend the mitigation measures for sustainable management of forests. In fact, Gisagara district received, besides the GoR earmarked transfer budget, the African Development Bank support program for afforestation and reforestation, a four-year project (2012-2016), and apparently their impact is not visible as it is in other Southern Province districts. An in-depth understanding of the situation would reveal priority actions to be taken in order to enable sustainable forest management and woodland expansion in Gisagara district.

**Table 61 – Summary statistics of forest cover per sector in Gisagara District.**

Sector	Total land (ha)	Forest cover (ha)					Forest cover (%)
		Forest Plantation	Natural forest	Shrub	Wooded savannah	Total	
Gikonko	4,929	439	1.25	19		459	9
Gishubi	6,143	365	5.80	26		396	6
Kansi	4,241	755		54		808	19
Kibilizi	3,983	605		0		605	15
Kigembe	4,482	865		12		877	20
Mamba	8,011	387		3		391	5
Muganza	7,039	566		395		962	14
Mugombwa	4,985	701		44	0.64	746	15
Mukindo	5,044	567		57		624	12
Musha	4,977	623		11		634	13
Ndora	6,103	908		145		1,053	17
Nyanza	3,876	671		23		695	1
Save	4,108	761		7	0.85	769	19
<b>Total</b>	<b>67,920</b>	<b>8,214</b>	<b>7.05</b>	<b>798</b>	<b>1.48</b>	<b>9,021</b>	<b>13</b>

Source: MoE (2019).

Besides the density and the forest cover, the size of the forest plantations is also low as compared to Western and Northern districts. Table 62 shows that overall, 56% of forest plantations (4,561 ha) are formed by forest plots greater than 2 ha. The sectors with highest forest plots greater than 2 ha are Kigembe with 557 ha (64% of the total sector forest plantations), Ndora with 461 ha (51%), Kansi sector with 440 ha (58%), and Mukindo sector with 410 ha, i.e., 72% of the total sector forest plantations.



Source: MoE (2019).

**Figure 23 – Change of forest cover detected from 2009 to 2019 in Gisagara District.**

**Table 62 – Classification of forest plantations by size in Gisagara District.**

<b>Sector</b>	<b>Area &gt; 2 ha</b>	<b>Between 1 and 2 ha</b>	<b>Between 0.5 and 1 ha</b>	<b>Between 0.25 and 0.5ha</b>	<b>Between 0.25 and 0.5ha</b>	<b>Total</b>	<b>% FC &gt;2 ha</b>
Gikonko	229	60	60	46	44	439	52
Gishubi	231	42	39	26	27	365	63
Kansi	440	120	85	62	47	755	58
Kibilizi	335	85	79	53	53	605	55
Kigembe	557	111	91	61	46	865	64
Mamba	208	43	45	44	47	387	54
Muganza	262	95	86	74	49	566	46
Mugombwa	349	131	111	62	49	701	50
Mukindo	410	51	58	25	23	567	72
Musha	345	86	76	61	54	623	55
Ndora	461	152	124	93	78	908	51
Nyanza	313	150	109	55	45	671	47
Save	421	124	103	68	46	761	55
<b>Total</b>	<b>4,561</b>	<b>1,248</b>	<b>1,068</b>	<b>731</b>	<b>606</b>	<b>8,214</b>	<b>56</b>

Source: MoE (2019).

Forest cover change in Gisagara District during the last decade is summarized in Table 63 and presented in Figure 23. The results show that the afforestation is 35.4% against deforestation of 30% over ten years from 2009. The highest afforestation rates are 62.7% observed in Ruhango sector, 48.5% observed in Nyanza sector, and 48% observed in Musha sector. The overall trend is 5.4% increase of forest cover for the past ten years, which is only 0.5% of forest gain every year in Gisagara district, an increase that is not significant while the district is located in Amayaga agro-ecological zone where forests could play a vital role in addressing drought and climate change impacts. There is a pressing need for afforestation and reforestation to improve the productivity of existing woodlots, to expand to meet the national forest cover target (30%) and to address timber and biomass energy demand in Gisagara District.

**Table 63 – Deforestation and afforestation status in Gisagara District.**

Sector	FC 2019 (ha)	FC 2009 (ha)	Defo rested area (ha)	Affores ted area (ha)	No change (ha)	Deforesta tion rate (%)	Afforestat ion rate (%)
Gikonko	459	408	168	174	240	37	42.6
Gishubi	396	685	405	89	280	102	13
Kansi	808	708	168	220	540	21	31.1
Kibilizi	605	527	143	169	384	24	32.1
Kigembe	877	738	125	218	613	14	29.6
Mamba	391	713	502	132	211	129	18.6
Muganza	962	800	253	362	547	26	45.2
Mugombwa	746	656	206	247	450	28	37.6
Mukindo	624	545	100	156	445	16	28.7
Musha	634	489	143	235	346	22	48
Ndora	1053	935	304	342	630	29	36.6
Nyanza	695	496	88	241	408	13	48.5
Save	769	503	94	315	408	12	62.7
<b>Total</b>	<b>9021</b>	<b>8,204</b>	<b>2,701</b>	<b>2,901</b>	<b>5,503</b>	<b>30</b>	<b>35.4</b>

Source: MoE (2019).

### 3.9.3.3. Nyanza

The forest landscape of Nyanza District is dominated by forest plantations influenced by the relief and climatic variations of the district. The West of the District is characterized by a much more rugged terrain and a wetter climate than the East zone. Forest plantations dominated by *Eucalyptus* alternate with fields occupied by seasonal crops (beans, cassava, maize, etc.) and perennial crops such as coffee and banana.

Forests in Nyanza district cover 8,949 hectares; about 13% of total district land area (Table 64) of which 8,375 ha are forest plantations (93.5%) and 574 ha are natural vegetation (6.5% and mainly shrubs). Despite that, Nyanza is among the least forested districts of Rwanda, some sectors are doing better than others are. For example, Nyagisozi sector with 1,622 ha (22% of the sector land) and Mukingo with 1,392 ha (18% of the sector land). The least forested sectors are Busoro sector with only 511 ha (7% of the total sector land), and Kibirizi with 758 ha which is only 9% of the total sector land.

**Table 64 – Summary statistics of forest cover per sector in Nyanza District.**

Sector	Total land (ha)	Forest cover (ha)						Forest cover (%)
		Bamboo	Forest Plantation	Natural forest	Shrub	Wooded savannah	Total	
Busasamana	4,903	2.4	752		0.9		756	15
Busoro	7,361	5.6	455		46.6	3.9	511	7
Cyabakamyi	6,042		918				918	15
Kibirizi	8,327		758				758	9
Kigoma	6,597		707		32.6		740	11
Mukingo	7,614	0.9	1,386	0.6	3.9		1,392	18
Muyira	8,787		578	0.3	315.8		894	10
Ntyazo	5,564		382		159.8		541	10
Nyagisozi	7,253		1,622				1,622	22
Rwabicuma	4,765	0.8	816				817	17
<b>Total</b>	<b>67,215</b>	<b>9.7</b>	<b>8,375</b>	<b>0.9</b>	<b>559.6</b>	<b>3.9</b>	<b>8,949</b>	<b>13</b>

Source: MoE (2019).

Concerning the forest density (an indicator of forest productivity), Figure 24 (see also Map 3c in Appendix) shows that Nyanza district has very low to medium density forests. Very few forest patches with high tree density are found in Mukingo, Rwabicuma and Nyagisozi sectors. Eastern Nyanza is much degraded with very low to low-density forests (<40% of tree cover); hence it is recommended that Nyanza District forest management plan (DFMP) prioritize afforestation and reforestation across all sectors with special attention to above-listed sectors with least forest coverage (Busoro and Kibirizi). Reducing harvesting permit in least forested sectors could also be a short-term solution to ensure the regeneration of exhausted forest plantations while planning a long-term strategy for sustainable forest management in Nyanza district. Like Gisagara and Kamonyi district, Nyanza also could consider conducting a study to understand the root causes of deforestation and forest degradation especially in eastern Nyanza and recommend the mitigation measures for sustainable management of forests. This is because they all received, besides the GoR earmarked transfer budget, the African Development Bank support program for afforestation and reforestation, a four-year project (2012-2016) that apparently, the impact seems to be minimal as compared to other districts in Southern Province. Therefore, an in-depth understanding of the situation would reveal priority actions to be taken in order to enable sustainable forest management and woodland expansion in the Nyanza district.

Besides the low density and the limited forest cover in Nyanza District, the size of the plantations is also low as compared to other southern districts. Table 65 shows that overall, 8,375 ha of forest plantations (66%) are formed by forest plots of greater than 2 hectares. The sectors with highest forests with 2ha and above are Nyagisozi with 1,302 ha (80% of the total sector forest plantations), Kibirizi with 608 ha (80%), and Mukingo sector with 846 ha (61% of the total sector forest plantations).

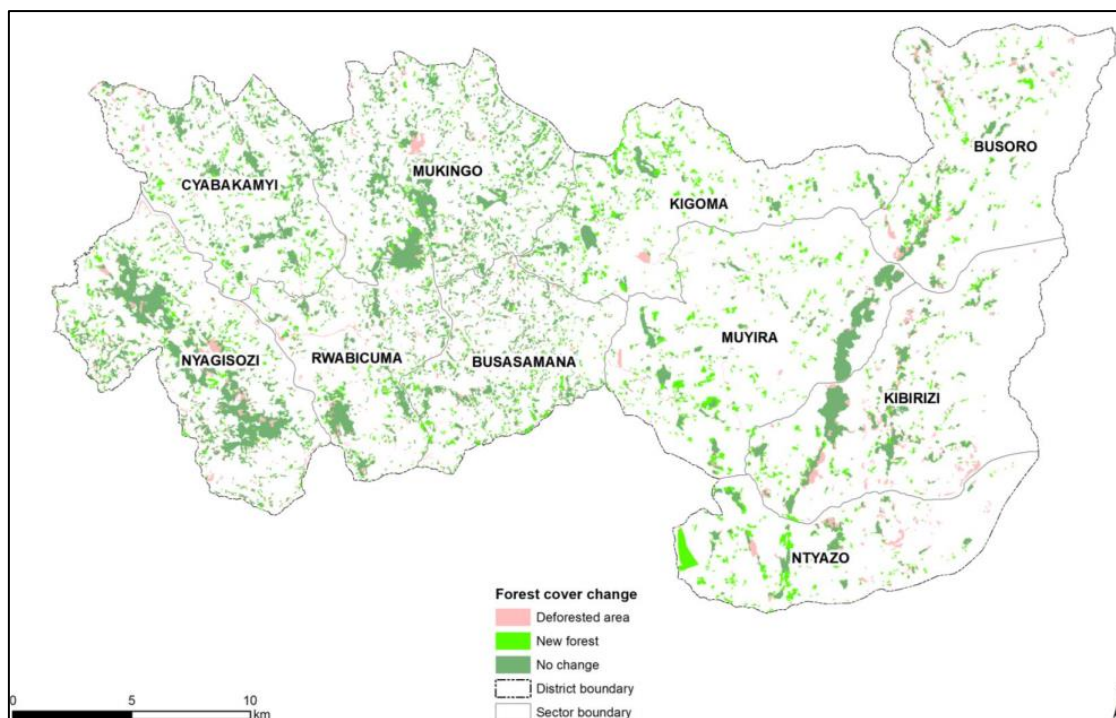
**Table 65 – Classification of forest plantations by size in Nyanza District.**

<b>Sector</b>	<b>Area &gt; 2 ha</b>	<b>Between 1 and 2 ha</b>	<b>Between 0.5 and 1 ha</b>	<b>Between 0.25 and 0.5ha</b>	<b>Between 0.25 and 0.5ha</b>	<b>Total</b>	<b>% FC &gt;2 ha</b>
Busasamana	292	166	150	89	55	752	39
Busoro	300	64	48	27	16	455	66
Cyabakamyi	575	160	110	51	22	918	63
Kibirizi	608	65	45	24	15	758	80
Kigoma	430	116	78	56	27	707	61
Mukingo	846	197	181	117	45	1,386	61
Muyira	361	72	78	47	21	578	62
Ntyazo	266	48	32	21	14	382	70
Nyagisozi	1,302	152	103	45	20	1,622	80
Rwabicuma	540	115	89	52	20	816	66
<b>Total</b>	<b>5,519</b>	<b>1,156</b>	<b>914</b>	<b>529</b>	<b>256</b>	<b>8,375</b>	<b>66</b>

Source: MoE (2019).

Forest cover change in Nyanza District during the last decade is summarized in Table 66 and presented in Figure 24. The results show that the afforestation is 35.2% against deforestation of 21.1% for the period of ten years from 2009. Despite that Nyanza is the least afforested districts countrywide, a notable effort in afforestation is found in Ntyazo sector (94.1% forest area added from FC 2009), followed by Kigoma sector (92.6%), Muyira sector (59.8%) and Busoro (53%). The deforestation in Nyanza District is important (21.1%). The net balance is 14.1% increase of forest cover for the past ten years, which is only 1.4% of forest gain every year in Nyanza district. This increase is not much significant as the big part of Nyanza district is located in Amayaga agroecological zones which is prone to drought, and where forests could play a vital role in addressing issues of drought and mitigation of climate change impact. Hence, there is a pressing need for increasing afforestation and reforestation to improve the productivity of existing woodlots, to expand forest cover to meet the target (30%) and to address

timber and biomass energy demand, which seemingly degrade forest plantations in Nyanza District.



Source: MoE (2019).

**Figure 24 – Change of forest cover detected from 2009 to 2019 in Nyanza District.**

**Table 66 – Deforestation and afforestation status in Nyanza District.**

Sector	FC 2019 (ha)	FC 2009 (ha)	Deforested area (ha)	Afforested area (ha)	No change (ha)	Deforestation rate (%)	Afforestation rate (%)
Busasamana	756	661	168	207	493	25.4	31.3
Busoro	511	423	152	224	271	35.9	53
Cyabakamyi	918	745	120	271	625	16.1	36.4
Kibirizi	758	811	268	201	542	33	24.8
Kigoma	740	393	44	364	349	11.2	92.6
Mukingo	1,392	1,245	166	267	1,080	13.3	21.4
Muyira	894	605	94	362	511	15.5	59.8
Ntyazo	541	337	127	317	210	37.7	94.1
Nyagisozi	1622	1,620	315	296	1,306	19.4	18.3
Rwabicuma	817	782	157	172	625	20.1	22
<b>Total</b>	<b>8949</b>	<b>7,623</b>	<b>1,611</b>	<b>2,682</b>	<b>6,013</b>	<b>21.1</b>	<b>35.2</b>

Source: MoE (2019).

### 3.9.3.4. Ruhango

Forests in Ruhango District cover 8,965 ha (Table 67); about 14% of total district land area of which 8,958 ha are forest plantations (99.9%). Although Ruhango is among the least forested districts of Rwanda, some sectors are doing better. For example, Kabagali sector with 1,425 ha (24% of the sector land), Byimana with 1,426 ha (23% of the sector land) and Mwendo with 1,104 ha (20% of the sector land). The least forested sectors are Kinazi sector with only 430 ha (6% of the total sector land), and Ntongwe with 520 ha which is also 6% of the total sector land.

Concerning the forest density (an indicator of the forest productivity), Figure 25 (see also Map 3d in Appendix) shows that except a few forest patches scattered across the sectors, Ruhango District has very low to medium density forests. Since both forest cover and density are below the national forest cover target, it is recommended that Ruhango District forest management plan prioritize afforestation and reforestation across all sectors with special attention to above-listed sectors with least forest coverage (Kinazi and Ntongwe sectors). Reducing harvesting permit in least forested sectors could also be a short-term solution to ensure the regeneration of exhausted forest plantations while planning a long-term strategy for sustainable forest management in Ruhango district. Like Gisagara, Kamonyi district, and Nyanza, Ruhango also could consider conducting a study to understand the root causes of deforestation and forest degradation and recommend the mitigation measures for sustainable management of forests. This is because they all received, besides GoR earmarked transfer budget, the African Development Bank-supported program for afforestation and reforestation; a four-year project (2012-2016) that apparently, the impact seems to be minimal as compared to other districts in Southern Province. Therefore, an in-depth understanding of the situation would reveal, priority actions to be taken in order to enable sustainable forest management and woodland expansion in Ruhango district.

**Table 67 – Summary statistics of forest cover per sector in Ruhango District.**

Sector	Total land (ha)	Forest cover (ha)				Forest cover (%)
		Bamboo	Forest Plantation	Shrub	Total	
Bweramana	5,492		977		977	18
Byimana	6,182		1426		1,426	23
Kabagali	6,059		1422	2.4	1,425	24
Kinazi	7,198		430		430	6
Kinihira	6,084	0.1	1143		1,143	19

Sector	Total land (ha)	Forest cover (ha)				Forest cover (%)
		Bamboo	Forest Plantation	Shrub	Total	
Mbuye	7,784		821	0.1	821	11
Mwendo	5,555		1104		1,104	20
Ntongwe	8,897	0.2	516	4.3	520	6
Ruhango	9,426		1119		1,119	12
<b>Total</b>	<b>62,678</b>	<b>0.2</b>	<b>8,958</b>	<b>6.9</b>	<b>8,965</b>	<b>14</b>

Source: MoE (2019).

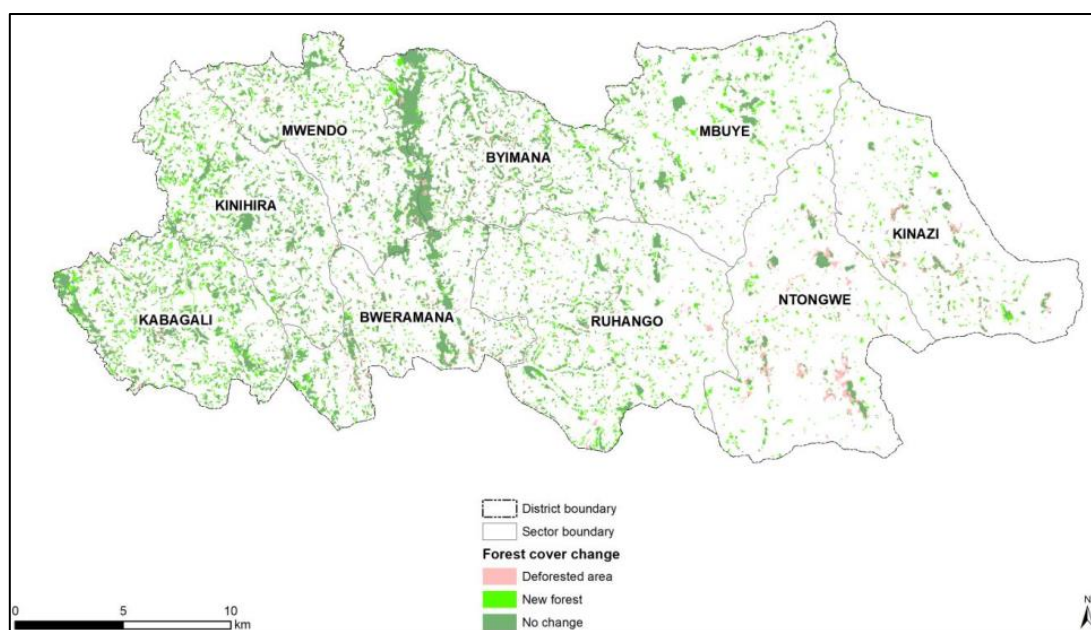
Besides the low density and the limited forest cover in Ruhango District, the size of the plantations is also the least countrywide (about 46% of overall forest plantations) as compared to other districts. Table 68 shows that overall, 8,958 ha of forest plantations (46%) are formed by forest plots of greater than 2 hectares. Sectors with forested areas greater than or equal to 2ha are Byimana with a total of 785 ha (55% of the total sector forest plantations), Mwendo with 585 ha (53%), Kinihira with 545 has (48%) and Bweramana sector with 505 ha (52% of the total sector forest plantations).

Forest cover change in Ruhango District during the last decade is summarized in Table 69 and presented in Figure 25. The results show that the afforestation is 41.2% against deforestation of 22.4% for a period of ten years from 2009. Despite that Ruhango remains the least afforested districts countrywide, notable effort in afforestation is found in Mbuye sector (78.6% of forest area added from FC 2009), followed by Ruhango sector (61.1%), and Kabagali sector (51.2%). The net balance is about 18.8% of forest cover for the past ten years, which is only 1.8% of forest gain every year in Ruhango district. This increase is not of much significance as the big part of Ruhango district is located in Amayaga agroecological zone, which is prone to drought, and where forests could play a vital role in addressing issues of drought risks and mitigation of their impact. Hence, there is a pressing need of increasing afforestation and reforestation to improve the productivity of existing woodlots, to expand forest cover to meet the national target (30%) and to address timber and biomass energy demand, which apparently is the main cause of degradation of forest plantations in Ruhango District.

**Table 68 – Classification of forest plantations by size in Ruhango District.**

Sector	Area > 2 ha	Between 1 and 2 ha	Between 0.5 and 1 ha	Between 0.25 and 0.5ha	Between 0.25 and 0.5ha	Total	% FC >2 ha
Bweramana	505	163	140	103	67	977	52
Byimana	785	238	191	123	89	1,426	55
Kabagali	720	306	208	132	58	1,422	51
Kinazi	127	64	77	72	89	430	30
Kinihira	545	247	180	114	57	1,143	48
Mbuye	369	96	117	112	127	821	45
Mwendo	585	176	165	113	66	1,104	53
Ntongwe	189	70	72	71	114	516	37
Ruhango	326	207	228	197	161	1,119	29
<b>Total</b>	<b>4,152</b>	<b>1566</b>	<b>1378</b>	<b>1035</b>	<b>827</b>	<b>8,958</b>	<b>46</b>

Source: MoE (2019).



Source: MoE (2019).

**Figure 25 – Change of forest cover detected from 2009 to 2019 in Ruhango District.**

**Table 69 – Deforestation and afforestation status in Ruhango District.**

Sector	FC 2019 (ha)	FC 2009 (ha)	Defo rested area (ha)	Affor ested area (ha)	No change (ha)	Deforest ation rate (%)	Afforestat ion rate (%)
Bweramana	977	884	194	221	690	21.9	25
Byimana	1,426	1,267	204	277	1,063	16.1	21.9
Kabagali	1,425	1,020	174	522	845	17.1	51.2
Kinazi	430	329	152	164	177	46.2	49.8
Kinihira	1,143	815	127	400	687	15.6	49.1
Mbuye	821	429	71	337	358	16.6	78.6
Mwendo	1,104	896	148	291	748	16.5	32.5
Ntongwe	520	526	308	188	218	58.6	35.7
Ruhango	1,119	696	163	425	534	23.4	61.1
<b>Total</b>	<b>8,965</b>	<b>6,860</b>	<b>1,540</b>	<b>2,824</b>	<b>5,320</b>	<b>22.4</b>	<b>41.2</b>

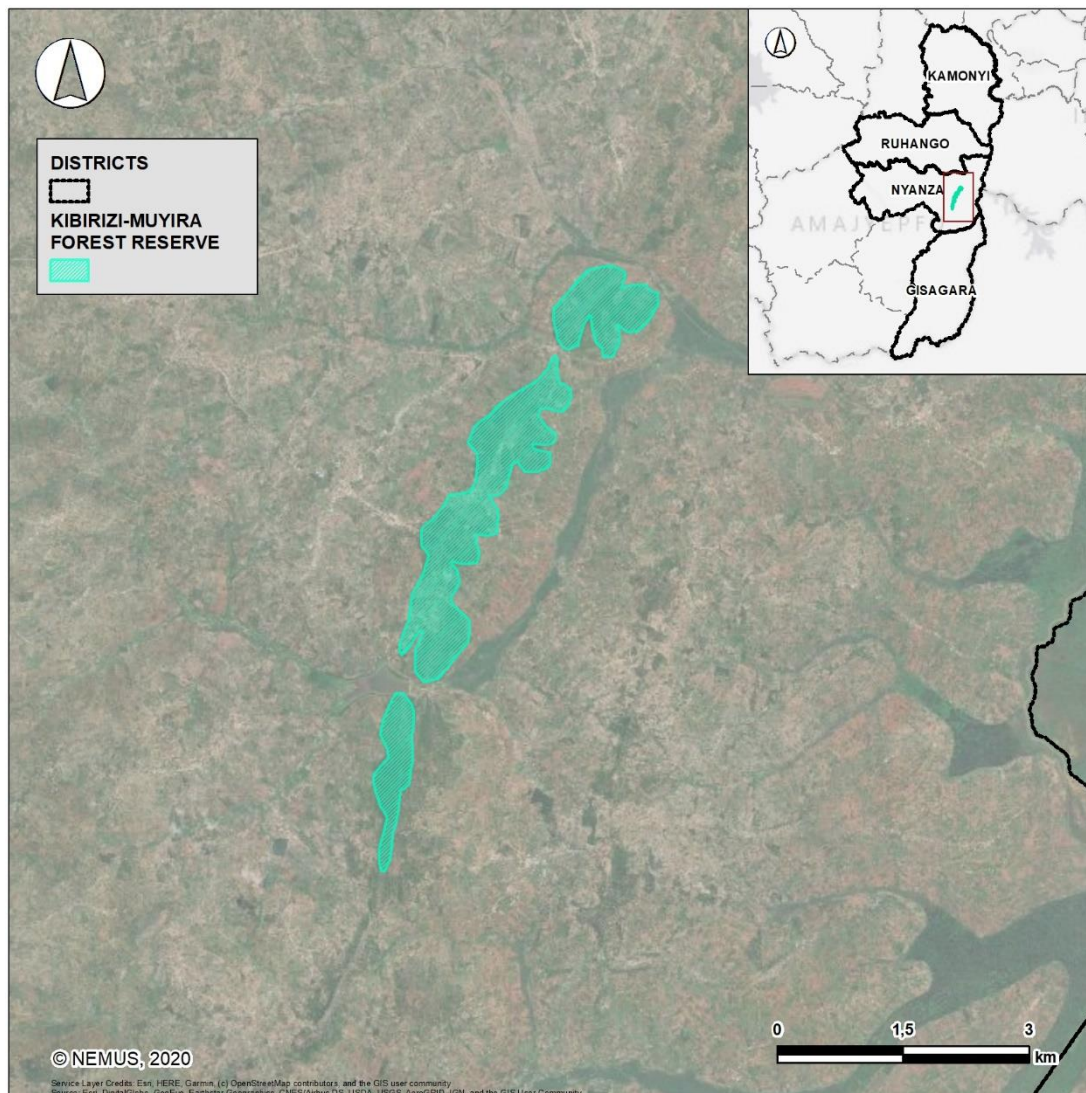
Source: MoE (2019).

### 3.9.3.5. Natural/relict forests in project area of Mayaga

Kibirizi and Muyira are two fragmented natural remnant forests, savannah habitat, located in Nyanza district, covering around 354 ha (see Figure 26). Kibirizi remnant forest is located in Kibirizi sector, and Muyira fragment is located in Muyira sector, at an altitude varying between 1,399 m and 1,588 m. Kibirizi and Muyira forests were connected before but currently are separated by a valley dam, roads, agricultural land, and human settlements.

In terms of biodiversity, Kibirizi-Muyira forests are rich in plant species dominated by 50 tree species, 43 herbs, 10 lianas, 9 shrubs and 7 species of grass characteristic of low altitude savannas among which endemics like orchids are found. The presence of exotic species such as *Eucalyptus sp*, *Persea Americana* and *Manguifera indica* have been observed, and invasive species, mainly *Lantana camara*, which presence is caused by anthropogenic activities inside these relicts such as farms and settlements. Species like *Strychnos lucens* with sweet orange-yellowish fruits and *Parinari curatellifolia*, eaten by monkeys, have been observed as well. Many grasses found in these forests, such as *Hyparrhenia sp.* and *Digitaria sp.*, constitute a good fodder for the cows, sheep, and goats of local cattle keepers. Some tree species specific to climax forests like *Syzygium*

*guineense*, *Polycias fulva*, *Tabernaemontana* sp., *Parinari curatellifolia*, *Bersema* sp., *Cassia spectabilis*, *Acacia sieberana*, etc; are observed.



**Figure 26 – Kibirizi and Muyira Forests.**

These forests are home to 9 species of mammals including *Cercopithecus aethiops* (Vervet monkey, Inkende), *Poelagus marjorita* (Hare, Urukwavu), *Viverra civetta* (African civet, Impimbi), *Felis serval* *Imbibe* (Imondo), *Genetta servalina* *Servaline* genet (Urutoni), *Herpestes ichneumon* (Mongoose, Umutereri), *Canis adustus* (Jackal Umuhari) and unidentified Rats (imbeba). All these mammals were detected through personal communication with the local guides and communities and sometimes via indirect observations and signs (scats, feeding remain, paws, burrows, trails of mammals). However, Vervet monkey (*Cercopithecus aethiops*) was detected during an inventory (RECOR/CARPE, 2011). During the same survey, 79 bird species were

recorded in Kibirizi-Muyira. Additionally, the presence of various fruiting plant species found there and the fact that these forests are surrounded by the local communities' agricultural lands, attract the presence of birds. One bird species, 'Grey-crowned Crane (*Balearica regulorum*), is cited in the IUCN red list as a vulnerable species. Some large species such as Ross's Turaco (*Musophaga rossae*), Red-chested cuckoo (*Cuculus solitaries*), and Brown Parrot (*Poicephalus meyeri*) were recorded in the forests.

The main threats assessed are logging, cultivation, charcoal, grazing, bee keeping, and hunting as well as invasive species (see Table 70). The fact that these forests were not under protection make them susceptible to more threats.

**Table 70 – Threats to Kibirizi-Muyira forests (2011).**

Threats	%
Hunting	7.1
Logging	23.8
Cultivation	28.6
Bee-keeping	7.1
Charcoal	16.7
Free grazing	16.7
Total	100

Source: RECOR/CARPE (2011).

In Kibirizi remnant forest, agriculture and agriculture land expansion are the main threats. The main crop that is cultivated within and around the two forests is cassava, largely because it is the only crop that is not eaten by Vervet monkeys. Grazing and charcoal production are other significant threats to the forests.

### 3.9.4. Conclusion and recommendations

Afforestation efforts are still needed in Amayaga agroecological zone which is under risk of least forested districts of Southern Province and needs much attention as well in order to mitigate consequences related to lack of forests in these agroecological zones. In fact, not only the coverage is below the target (30%) but also the tree density is generally below 40% tree cover. The sector statistics of forest cover informs the intervention scenarios in the District Forest Management Plans. All 416 sectors distributed in 30 districts are presented and recommendations are formulated accordingly in order to

ensure a fair distribution of forests within the district and to sustainable management of district forest resources.

As per local authorities and stakeholders' suggestions in Mayaga region, the following are recommended to make sure this region regain forest and biodiversity is enhanced:

- Increase the quantity and quality of seeds and improve their distribution and timeliness by availing tree nurseries at the community level.
- Enhance the capacity of local communities especially youth and women in forest management and tree nursery establishment.
- Increase fuelwood use efficiency by providing Improved Cooking Stoves to every household in Mayaga region.
- Ensuring the adequate representativeness, participation of women in every operational planning regarding the management of forest.
- Afforestation on degraded and other vacant land suitable for forests.
- Rehabilitate public and community forests in Mayaga region to enhance the productivity.
- Enhance sustainable harvesting in the area by enforcing forest laws and guidelines.
- Promote roadside tree planting on all public and community roads in Mayaga regions.
- Promote agroforestry and fruits tree planting in all agricultural fields in Mayaga regions.
- Promote sustainable agricultural practices including progressive and radical terraces to reduce soil erosion in the region.



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### **3.10. Biodiversity Report**

#### **3.10.1. Introduction**

Residents of the four districts covered by the Mayaga region, namely Kamonyi, Ruhango, Nyanza and Gisagara, state that their region covers large patches of natural and planted forests, rich in plants and home to a variety of animal and bird species. These forests harbour carbon stocks and provide critical watershed services to the agricultural landscapes surrounding them. Today, a significant part of these forests has disappeared. The remnants are natural and scattered indigenous forests covering 555 ha (REMA, 2020).

Agricultural expansion and overharvesting of the forests have been among the major causes of this environmental crisis. In addition, the lack of adequate mechanisms and financial capacity to restore and protect biodiversity in the Mayaga region exacerbated the situation. The degradation of biodiversity in this region has brought many consequences, including soil erosion and land degradation which resulted in decreased agricultural productivity, endangerment or disappearance of some fauna and flora species.

The alarming level of threat to biodiversity and to the Mayaga region inhabitants, in particular, prompted the Government of Rwanda to work with partners to adopt stringent mechanisms. Such interventions include the establishment of an ambitious initiative aiming at restoring forest landscape of Mayaga and improve the livelihood of its inhabitants and create green jobs.

#### **3.10.2. Biodiversity in Mayaga**

##### **3.10.2.1. Fauna and Flora**

The natural vegetation was initially dominated by thorny plants such as *Acacia Kocki* (*Umugenge*) and *Acacia Abyssinica* (*Umunyinya*) and latex species adapted to prolonged drought of the arid and semi-arid tropics such as *Euphorbia tinualli* (*Umuyenzi*), *Euphorbia candelabrum* (*Umuduha*), *Synadenoni grantii* (*Umukoni*) and short and slowly growing shrubs especially from the *rubiceae* family such as *Coffea eugenoides* (*Umumenamabuye*). On the other hand, introduced species such as *Lantana camara*, became well adapted to the extent of being confused to native species

such as *Umuhengeri* (*Lantana trifolia*). In other places, it is found spots of monospecific introductions that are gradually replacing indigenous species (Fischer & Hinkel, 1992).

The marshlands were initially dominated by species such as *Cyperus papyrus* (*urufunzo*) but are gradually being dislodged by agriculture-related activities mainly rice cultivation and recently activities such as Hakan Peat Power Plant installation increased the level of anthropic disturbance to the natural vegetation and ecosystem. Meanwhile, during the establishment of the Mayaga agglomeration (*Paysannat*), the region was mainly left to coffee production, but the crop is also lately being replaced by banana plantations, with a very high level of land use and soils exploitation without or with little crop rotations.

These intensive agriculture activities contributed much to the disappearance of wild animal species naturally characteristic of savannah such as *Hyperolius bayoni* (*Umutubu*) which normally feeds on mosquitoes or *Gerrhosaurus nigrolineatus* (*Ikibangu*) which also feeds on insects, partly explaining the recent proliferation of mosquitoes in the region with increased levels of malaria cases. This is also testified by the disappearance of other insect feeding animals in the region such as *leptoperis sp* (*Ibikeri*), that are rarely seen in the marshlands as they used to be. Thus, the wild fauna characteristic of the savannah type of vegetation such as reptiles is increasingly decreasing at the expenses of agriculture-type (especially rice cultivation) fauna such as birds. Other mammals such as buffalos, zebras and antelopes have completely disappeared in the region, yet they are reported to have been in the region in abundance (Fischer & Hinkel, 1992).

According to data from the inventory of biodiversity in natural remnant forests of Rwanda, by the Central African Regional Programme for Environment and the Rwanda Environmental Organization (RECOR/ CARPE, 2011), Mayaga region harboured 0.14% of natural forests and 10% of man-made plantations of Rwanda's total forested area in 2011. Forests in the agro-ecological zone of AMAYAGA region include the following:

- A. Kibirizi-Muyira forests**, which are two remnant natural forests, savanna relict forests, with savannah plant species. The forests are currently disconnected and are undergoing degradation due to encroachment and mining. These forests are situated in Nyanza district, in the sectors of Kibirizi and Muyira respectively, covering an area of around 354 ha. The canopy is open, and the soil is rocky (More details on these two forests are provided in the Result section). They host a large biodiversity, supporting approximately 123 plant species (some of them are endemic species like orchids, exotic

species such as *Eucalyptus spp.*, *Persea Americana* and *Manguifera indica*), 79 bird species among which one is IUCN species and ten are Forest Visitors. These forests are home to different mammals, including one primate (*Cercopithecus aethiops*, *Vervet monkey*). They are also home to *Osyris lanceolata* (African Sandalwood, *umusheshe*), an evergreen multi-stemmed hemi-parasitic plant, which is threatened by illegal exploitation. The tree is harvested from the forest, sold locally, and traded internationally for its essential oil. Roots and wood are scented and used to make cosmetics and perfume. The tree is very slow growing, and in the early stage of growth, it requires shade from nursing trees. These forests are also threatened by invasive species of *Lantana camara* covering spaces inside them and at their perimeter.

- B.** Mayaga region is also dotted with other small patches of indigenous forests, located mainly on top of hills. One example is **Muyaga/ or Nyamirama forest** at the top of Muyaga hill in Gisagara District, ranging from 1300 to 1700 metres above sea level. This forest is very significant for watershed services in the micro-catchments of Akanyaru river and wetland. The top is very rocky, and this attracts mining activities. The most dominant specie at the top is *Parinari curatellifolia* (*umunazi*), threatened by frequent fires, grazing, and praying ground. The lower part is dominated by plantations of *Eucalyptus spp.* with very poor understorey vegetation.



**Figure 27 – An overview of a part of Amayaga illustrating the biodiversity of natural forest, agroforestry and wetland.**

### 3.10.3. Conclusion and recommendations

In conclusion, Mayaga region is characterized by a variety of Natural forest with diversified species mainly in the hilltop of the hills. The forests are protected for deforestation, but the population around encroach them.

In order to overcome the natural forest disturbance, the following could be the best practices:

- A buffer should be created with a physical boundary demarcation and a seasonal afforestation to regenerate the existing species;
- Increase resilience to climate change by investing in nature-based solutions.

### **3.11. Stakeholders Analysis Report**

#### **3.11.1. Introduction and context**

The Government of Rwanda has devoted ambitious plans to integrate landscape restoration into its national development plans such as the EDPRS II, the National Transformation Strategy and in the District Development Strategies to pursue a goal that would witness large-scale national wide restoration of land, soil, forest, and water resources for the benefit of the Rwandan population. Over time the government of Rwanda has engaged different stakeholders to facilitate the realisation of the plan.

This study analyses the main stakeholders in Rwanda, with a focus on Mayaga. The study identifies relevant stakeholders to be involved in project implementation of the upcoming landscape restoration project in Mayaga and identifies their roles and responsibilities and explores the likely opportunities where the same can co-fund the Mayaga project as well as leverage their interventions.

Focus group discussions (FGDs) with national level authorities at ministry/policy level, district authorities, opinion leaders and interviews with people from communities' women and men as well as youth were conducted to be able to understand a range of stakeholders operating in the area under study, what they do, community's opinion about the project intervention, challenges these projects face and best practices that can be adopted for the ongoing project.

#### **3.11.2. Stakeholder mapping**

This study has identified a number of stakeholders operating in landscape restoration as follows in Table 71.

**Table 71 – Key Stakeholders.**

Group	Stakeholders
Government institutions	<ul style="list-style-type: none"> <li>• Rwanda Environment Management Authority (REMA)</li> <li>• Ministry of Environment (MoE)</li> <li>• Rwanda Green fund (FONERWA)</li> <li>• Rwanda Forestry Authority (RFA)</li> <li>• Rwanda Water Resources Board (RWB)</li> <li>• Ministry of Infrastructure (MININFRA)</li> <li>• Ministry of Agriculture and Animal Resources (MINAGRI)</li> <li>• Ministry of Local Government (MINALOC)</li> <li>• Ministry of Finance and Economic Planning (MINECOFIN)</li> <li>• Rwanda Agriculture and Animal Resources Development Board (RAB)</li> <li>• Rwanda Meteorological Agency (Meteo Rwanda)</li> <li>• Rwanda Land Management and Use Authority (RLMUA)</li> <li>• National Women Council (NWC)</li> <li>• National Youth Council (NYC)</li> <li>• National Council of People with Disabilities (NCPD)</li> <li>• National Agriculture Export Development Board (NAEB)</li> <li>• Gender Monitoring Office (GMO)</li> </ul>
Regulators	<ul style="list-style-type: none"> <li>• Rwanda Standards Board (RSB)</li> </ul>
Local government entities and/or community representatives	<ul style="list-style-type: none"> <li>• Districts</li> <li>• Sector representatives</li> <li>• Cell Representatives</li> <li>• Community representatives (opinion leaders)</li> <li>• National Women Council (NWC)</li> </ul>

Group	Stakeholders
Civil society in general, including Non-Governmental Organisations, academic and research institutions	<ul style="list-style-type: none"> <li>• Private Sector Federation (PSF)</li> <li>• Albertine Rift Conservation Society (ARCOS)</li> <li>• International Union for the Conservation of Nature (IUCN)</li> <li>• One Acre Fund (TUBURA)</li> <li>• New Forest Company (NFC)</li> <li>• Forum for environmental NGOs</li> <li>• National Industrial Research and Development Agency (NIRDA)</li> <li>• Rwanda Tree Seed Centre (TSC)</li> <li>• World Agroforestry (ICRAF)</li> <li>• National University of Rwanda, College of Agriculture, animal sciences and veterinary medicine (UR-CAVM)</li> <li>• Institute of Policy Analysis and Research – Rwanda (IPAR-Rwanda)</li> <li>• Action AID</li> <li>• World Vision Rwanda (WVR)</li> </ul>
Development Cooperation Agencies	<ul style="list-style-type: none"> <li>• <i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i> (GIZ)</li> <li>• Netherland Development Organization (SNV)</li> </ul>
UN organizations local and Regional	<ul style="list-style-type: none"> <li>• United Nations Environment Programme (UNEP)</li> <li>• Food and Agriculture Organization (FAO)</li> <li>• World Food Programme (WFP)</li> <li>• United Nations Development Programme (UNDP)</li> </ul>

The mentioned stakeholders will intervene at different levels but the main interventions are as follows:

1. **Government institutions:** Research, planning, law enforcement, program orientation, mobilization, supervision, monitoring and evaluation of project activities, Developing policies, rules and regulations,
2. **Local governments:** Facilitate community approach, availing the extension workers right from the district, sector and cell level. The social protection department to orient project on VUP and home-grown initiatives towards poverty reduction.
3. **Civil society in general,** including NGOs, academic and research institutions: Training on the science of trees, facilitate a private sector

driven approach for forestry development in line with the National Transformation Strategy. Nursery bed development and preparation of knowledge about appropriate landscape vegetation to be promoted.

4. **Development Cooperation Agencies:** Fund landscape private sector-oriented restoration activities, facilitate exhibitions and business markets to showcase best practices.
5. **UN Agencies.**

### 3.11.3. Challenges

The main challenge is insufficient collaborative action between sectors and stakeholders. In Rwanda there are a number of mechanisms in place that encourage and enable collaborative action – such as national legal and regulatory frameworks, the establishment of the National Board and regular planning meetings between sectors, the Joint Action Forum for Development that coordinates and holds accountable the operating partners at district level. However, there remains much room for improvement in this regard as a number of factors continue to hinder effective collaboration often resulting in inefficiencies and duplication. These barriers include:

- Conflicting points of view and interests (and by extension targets and indicators).
- Inadequate integration of non-environment related sectors (e.g., infrastructure).
- Inadequate institutional capacities.
- Duplicated mandates (e.g., it is often unclear whether extension workers have to respond to the Ministry of Agriculture or the Ministry of Local Governments).
- Some stakeholders are present but inactive because they work only when they have a sub-award grant running so once the project phases out, they remain inactive since grant acquired used up.
- Dynamism in the field, with some stakeholders finalizing activities and new ones coming in.

#### 3.11.4. Conclusion and recommendations

As a conclusion, the Forest Landscape restoration of Mayaga Project will engage many stakeholders which include the Government institutions, the Local Governments entities, the Civil society in general, including Non-Governmental Organizations, academic and research institutions, Development Cooperation Agencies and the UN Agencies. These stakeholders will be key to the implementation of the project.

In order to follow up on the stakeholder's engagement, the following recommendations are to be taken into account:

- Ensure the leadership of the Government of Rwanda at the central and decentralised level. For a more strategic collaboration, strengthen the capacity of government staff to understand the language and processes of international climate change funds, in order to express national priorities in ways that are accepted by these funds.
- Ensure the integration of non-environmental related sectors (e.g., infrastructure) in environmental coordination spaces. For instance, use land use planning as crucial integration process and tool. At decentralised level, the JADFs have a great role to play.
- Ensure that all approved programmes and projects have a solid sustainability and exit strategy. Among other things, terminal evaluations of programmes and projects should be shared with all relevant stakeholders and considered in the design of new ones.
- Conduct more regular stakeholder mapping exercises, given the dynamism of the sector and the project.

**Table 72 – Proposed stakeholders by output.**

Outcome	Output	Proposed stakeholders and justification
1. Forest restoration plans with institutional and legislative frameworks to guide afforestation, natural resources management and agriculture in four districts	1.1. Legislation and coordination mechanisms in place for effective FLR	- Establishment of a thematic group on FLR under the JADF with the following stakeholders forming the basis of the collaboration: a) the Ministry of Environment represented its agencies: the Rwanda Environment Management Authority (REMA); the National Fund for Environment in Rwanda (FONERWA); Rwanda Land Management and Use Authority; Rwanda Forestry Authority (RFA); b) the Ministry of Agriculture and Animal Resources, including the Rwanda Agriculture and Animal Resources Development Board (RAB); c) the National Industrial Research and Development Agency (NIRDA); d) Ministry of Local Government; e) Districts Decentralized Structures – the District Administrative Units, which supervise several technical and administrative activities; f) civil society, international organisations (IUCN/WRI), academia and community based organizations.
	1.2. Four FLR plans ready for implementation, covering 263,270 ha	- Technical Group to be led by RFA with members from WRI, IUCN, ICRAF, JADF FLR Thematic group, academia, local CSOs

Outcome	Output	Proposed stakeholders and justification
2. Enhancement of individual and institutional capacities for planning and implementing gender sensitive forest landscape restoration strategies, supported by knowledge management	2.1. Training programs implemented for all stakeholders	- Training on tree husbandry to be based on two practical forestry manuals produced in 2015 – a) Tree harvesting techniques, manual for Rwanda; b) Tree plantation establishment and management Manual. These manuals should be assessed for relevance and appropriateness and modified if modification is deemed necessary. Community groups and cook stove technicians should also be trained on the use and maintenance of improved cook stoves while charcoal producers should be trained on the concept of sustainable charcoal production (including harvesting wood for carbonization, improving efficiency during carbonization, packaging, and marketing).
	2.2. Institutional capacity for the extension service and community knowledge sharing forums	- Targeting the three community platforms for disseminating knowledge; the Monthly Community Work ( <i>Umuganda</i> ), the parents evening forum ( <i>Umugoroba w'Ababyeyi</i> ) and general village assemblies ( <i>Inama Rusange y'Abaturage</i> )
	2.3. Monitoring & evaluation plans, knowledge management and gender mainstreaming strategy in place	- The project should facilitate the implementation of these plans and strategies to ensure that: a) project management involves all relevant stakeholders and utilizes an adaptive management approach; b) gender is mainstreamed into all aspects of project management, ensuring that project responsibilities and benefits are equitably distributed to all gender groups; c) implementation of the FLR is monitored and data/information is provided to support adaptive management, and that a system of monitoring the initiatives is in place and capacities availed for its continuation post project.

Outcome	Output	Proposed stakeholders and justification
3.Implementation of Forest Landscape Restoration Plans that will secure 555 ha of natural forests, bring 300 ha of forests under participatory forest management, establish 1,000 ha of plantations under the New Forest Company through co-finance, increase the productivity of agriculture and planted forests on 25,000 and 1,000 ha respectively, and, finally, reduce wood consumption by at least 25%.	3.1. Enhanced management on 555 ha of high conservation value forest, including increasing the protection status of 354 ha of the 555	- Stakeholder Working Groups (SWGs) should be established for the natural forest under protection, eventually to become institutionalized as Forums within the governance system of the forests under protection; SWGs should comprise representatives of local communities, CSOs, NGOs, research and educational institutions, private sector and other Government Agencies that show interest. SWGs should be gender balanced.
	3.2. Buffer zones and hill-tops afforested with a mix of indigenous trees and higher productivity plantations	- These tasks can utilize the Umurenge Programme, which provides cash transfers as payment for public works. In addition, interested youth groups (both men and women) could be supported to convert Lantana Camara into charcoal briquettes. Part of the benefits for the communities will be harvesting of non-timber forest products from the natural forests, under sustainable use plans.
	3.3. SLM/ SFM practices implemented in more than 25,000 ha of agriculture land, including agroforestry on 1,000 ha of consolidated land	- Adoption of a value chain approach where households will be facilitated to collectively put at least 1,000 hectares under land consolidation, growing one tree crop for the markets, in addition to food crops. The project will then provide extension support (skills acquired under outcome 2) and linkages to agro-processors and markets.
	3.4. Reduction of wood consumption by 25% by improving household and institutional cooking energy technologies	- Facilitate charcoal producers and sellers not yet in cooperatives, to form or join existing cooperatives. New cooperatives should be facilitated to develop constitutions explaining rules and regulations as well as governance structures.

## 3.12. GIS Report

### 3.12.1. Introduction

This report aims to present the Maps and Figures prepared within the scope of this work, as well as to present geographical data on the focus groups and interviews carried out.

### 3.12.2. Maps and figures produced

In the Appendix it is possible to consult the following Maps:

- 1a – Administrative Map – Gisagara.
- 1b – Administrative Map – Kamonyi.
- 1c – Administrative Map – Nyanza.
- 1d – Administrative Map – Ruhango.
- 2a – Hydrological Map – Gisagara.
- 2b – Hydrological Map – Kamonyi.
- 2c – Hydrological Map – Nyanza.
- 2d – Hydrological Map – Ruhango.
- 3a – Population Density in Gisagara.
- 3b – Population Density in Kamonyi.
- 3c – Population Density in Nyanza.
- 3d – Population Density in Ruhango.
- 4a – Agriculture in Gisagara.
- 4b – Agriculture in Kamonyi.
- 4c – Agriculture in Nyanza.
- 4d – Agriculture in Ruhango.
- 5a – Forests in Gisagara.
- 5b – Forests in Kamonyi.
- 5c – Forests in Nyanza.
- 5d – Forests in Ruhango.
- 6a – Land cover in Gisagara.
- 6b – Land cover in Kamonyi.
- 6c – Land cover in Nyanza.
- 6d – Land cover in Ruhango.
- 7a – Erosion Mapping for Gisagara.
- 7b – Erosion Mapping for Kamonyi.

- 7c – Erosion Mapping for Nyanza.
- 7d – Erosion Mapping for Ruhango.
- 8a – Soil types – Gisagara.
- 8b – Soil types – Kamonyi.
- 8c – Soil types – Nyanza.
- 8d – Soil types – Ruhango.

The delimitations of the FLR Project in Mayaga (information provided directly by manging staff team) for each of the four districts can be seen in the Maps 1a to 1d. Maps 2a to 2b provide hydrological information for each district. Population density (Maps 3a to 3d) were produced with data from WorldPop (2018). The consultation of these maps makes it possible to identify the places with the highest population density in the four districts under analysis. Furthermore, these maps show the delimitations of the FLR Project in Mayaga (see also Figure 28 and Figure 29).

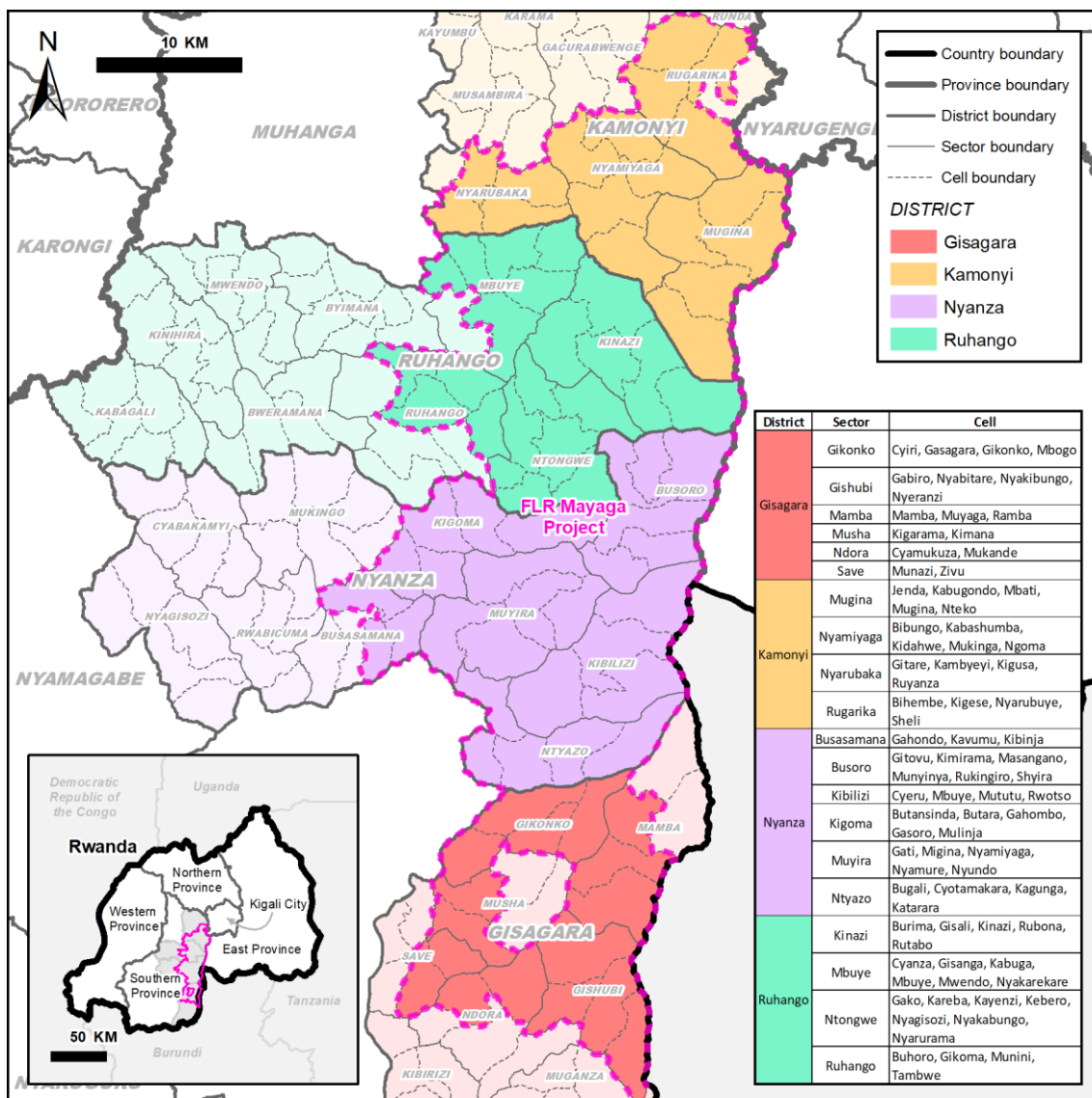


Figure 28 – Sectors and Cells of FLR Mayaga Region Project.

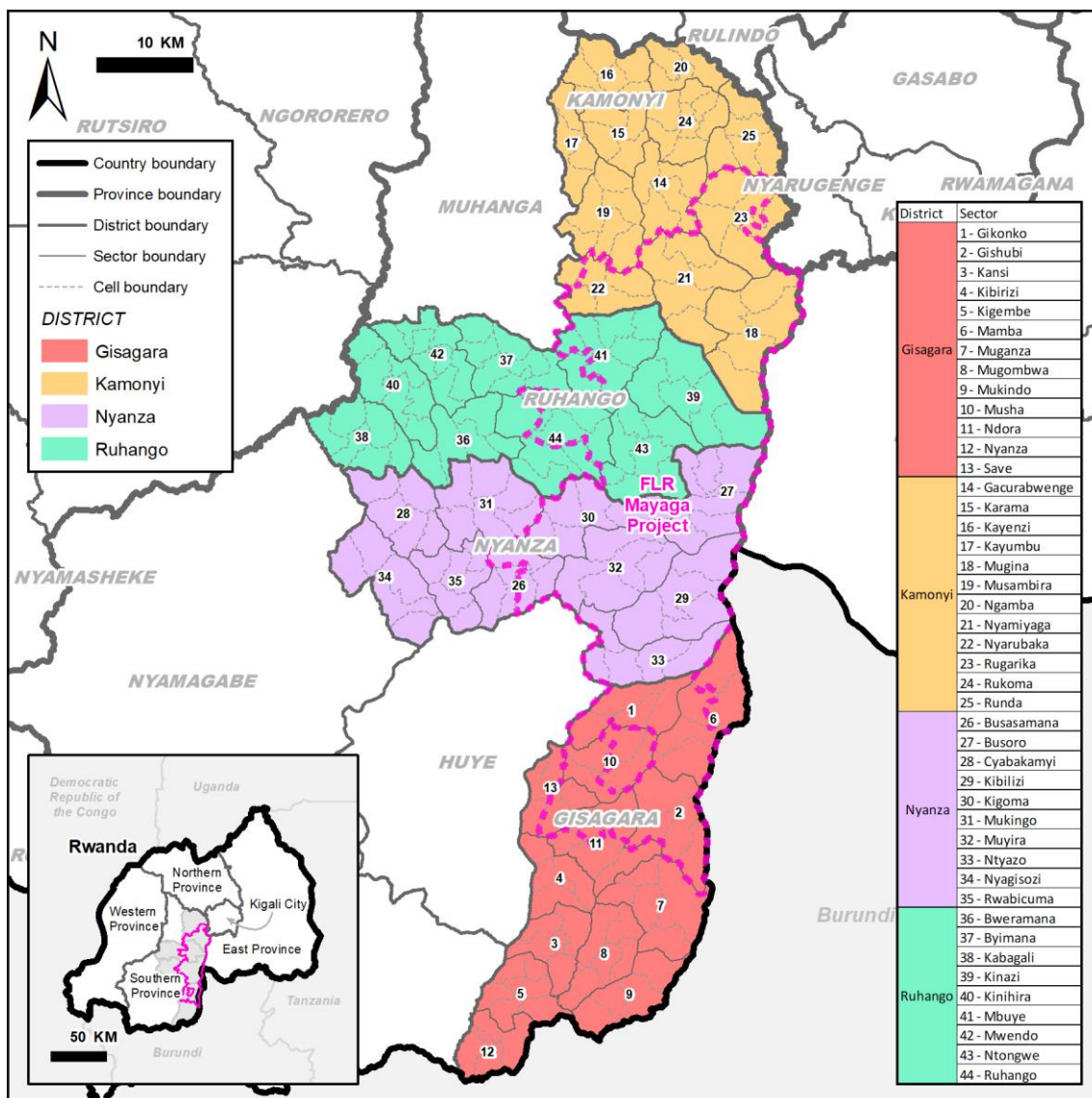


Figure 29 – Sectors of Gisagara, Kamonyi, Nyanza and Ruhango and the FLR Mayaga Region Project delimitations.

Agriculture maps (Maps 4a to 4d) were produced with the land use and land cover data for 2018. Therefore, in addition to the delimitations of the FLR Project in Mayaga, each map shows agricultural area, namely, open areas or grass; seasonal agriculture; and perennial agriculture.

Forest maps (Maps 5a to 5d) were produced with the forest cover data for 2019 (Ministry of Environment, 2020b). Consequently, in addition to the delimitations of the FLR Project in Mayaga, each map shows forest area, namely, forest plantations; shrubs; natural forests; and wooded savannahs.

Land cover maps (Maps 6a to 6d) were produced with the land use and land cover data for 2018. Therefore, in addition to the delimitations of the FLR Project in Mayaga, each map shows agricultural area (namely, open areas or grass; seasonal agriculture; and perennial agriculture); forests (including sparse forests); settlements and buildings; water; wetlands; and mines.

Erosion maps (Maps 7a to 7d) were produced using data from the Catchment-based landscape Restoration Opportunity Mapping Decision Support System (CROM DSS) (data provided directly). These maps show erosion risks data per each district (high, very high and extremely high) in addition to the delimitations of the FLR Project in Mayaga.

Finally, Soil type maps (Maps 8a to 8d) were produced using data from the Soil and Terrain Database for Central Africa (2006). These maps show soil data per each district (dominant soil) in addition to the delimitations of the FLR Project in Mayaga.

Lastly, geographic data collected from key informant interviews and focus groups discussions can be seen in section 3.1.2.



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## 4. Results framework and evaluation

### 4.1. Strategic results framework

The updated results framework presented in this report is based on the last available strategic results framework (provided directly by managing staff team) with a few changes to streamline indicators and facilitate the monitoring process. The changes are the following:

- Each indicator is linked to a specific output in order to establish if the expected results were achieved at the end of the project (except for indicator 11, linked to the overall outcome 3);
- Each indicator is clearly defined and streamlined, meaning only one target per indicator (in mid-term target/ and end-of-project target);
- Whenever possible, targets are easily identified and accounted for, in order to facilitate the process of monitoring the evolution of the project;
- Whenever possible, the targets are accountable by simple direct observation, not implying (in most cases) high expenditures on surveys or primary data collection;
- In a few cases (indicators 04 and 05), surveys are required in order to assess institutional capacity improvement and participation and gender mainstreaming;
- Reporting is performed via the Project Monitoring Report, due each year (at the beginning of the year after).

The results framework table can be seen in Table 73, with the following 11 objective and outcome indicators:

1. Thematic group on FLR under the JADF established and functioning;
2. Definitions of SFM and FLR clarified in the National Forest Policy;
3. Number of FLR plans guiding restoration at landscape level;
4. Aggregated Capacity Score using UNDP Capacity Scoring for all stakeholder's groups;
5. Participatory and gender inclusive plans;
6. Area of high conservation value forest with enhanced management;
7. Participatory Forest Management agreements completed and under implementation;

8. Area of landscapes under sustainable land management in production systems;
9. Additional consolidated land with agroforestry;
10. Improved cookstoves distributed;
11. Tons of carbon mitigated.

For each indicator above, Table 73 presents the baseline information (or how to obtain it), the targets (including the mid-term target and the end of project target), and data collection methods, and finally, reporting details. Moreover, except for indicator 11 (tons of carbon mitigated), each indicator is linked to an expected output of the “Forest Landscape Restoration in the Mayaga Region Project”. Furthermore, the project logframe (indicators, baseline, and milestones per year) can be seen in Annex 4 (Table 78).

**Table 73 – Results Framework.**

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
<b>1. Forest restoration plans with institutional and legislative frameworks to guide afforestation, natural resources management and agriculture</b>					
Output 1.1. Legislation and coordination mechanisms in place for effective FLR	<b>Indicator 01:</b> - Thematic group on FLR under the JADF established and functioning	No thematic group established	Thematic group on FLR under the JADF established and with regular meetings	Thematic group on FLR under the JADF established and with regular meetings	Direct observation; JADF FLR Thematic Group Reports (annual)
	<b>Indicator 02:</b> - Definitions of SFM and FLR clarified in the National Forest Policy	No clear definitions at the national level	Recommendation to clarify SFM and FLR definitions available in an addendum to the National Forest Policy	Addendum clarifying SFM and FLR definition part of the National Forest Policy	Direct observation; Project Implementation Reports (annual)
Output 1.2. Four FLR plans ready for implementation, covering 263,270 ha	<b>Indicator 03:</b> - Number of FLR plans guiding restoration at landscape level	0 [zero FLR plans]	2 [two FLR plans], covering at least 96,000 ha	4 [four FLR plans], covering at least 263,270 ha	Direct observation and review of plans; Project Implementation Reports (annual)

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
<b>2. Enhancement of individual and institutional capacities for planning and implementing gender sensitive forest landscape restoration strategies</b>					
Output 2.1. Training programs implemented for all stakeholders	<b>Indicator 04:</b> - Aggregated Capacity Score using UNDP Capacity Scoring for all stakeholder's groups	Aggregated score is 36.5 (systemic - 41.67; institutional - 31.25; individual - 36.46)	Baseline plus 12 points in the capacity score for all stakeholder's groups (average per group: national institutions; district institutions; NGOs and community-based institutions)	Baseline plus 25 points in the capacity score for all stakeholder's groups (average per group: national institutions; district institutions; NGOs and community-based institutions)	Via Survey (Ministry of Environment, RFA; REMA; MINAGRI; RAB; MIGEPROF; GMO; NWC; NYC; departments in target districts; NGOs and community-based institutions) with results published in the Project Implementation Reports (biannual)
Output 2.2. Institutional capacity for the extension service and community knowledge sharing forums					

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
Output 2.3. Monitoring & evaluation plans, knowledge management and gender mainstreaming strategy in place	<b>Indicator 05:</b> - Participatory and gender inclusive plans	0 [zero related plans]	2 [M&E plan plus Gender Mainstreaming Strategy Plan; approved and in place with an adequate participatory and gender inclusive process]	3 [M&E plan plus Knowledge Management Plan and Gender Mainstreaming Strategy Plan; approved and in place with an adequate participatory and gender inclusive process]	Direct observation and evaluation via survey (regarding the adequate participatory and gender inclusive process) with results published in the Project Implementation Reports (annual)

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
<b>3. Implementation of Forest Landscape Restoration Plans, increase productivity of agriculture and plantations forests, and reduce wood consumption by at least 25%</b>					
Output 3.1. Enhanced management on 555 ha of high conservation value forest	<b>Indicator 06:</b> - Area of high conservation value forest with enhanced management	0 ha of forest with enhanced management [354 ha of Forest Reserve; no Participatory Forest Management agreements and levels of degradation are high]	354 ha of forest with enhanced management [management plan for 354 ha approved and in place; Nomination file for the 354 ha Forest Reserve completed to upgrade it to PA Category IV status]	555 ha of forest with enhanced management [management plan for 555 ha approved and in place; Nomination file for the 354 ha Forest Reserve completed and submitted to upgrade it to PA Category IV status]	Direct observation and review of plans; Project Implementation Reports (annual)

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
Output 3.2. Buffer zones and hill-tops afforested with a mix of indigenous trees and higher productivity plantations	<b>Indicator 07:</b> - Participatory Forest Management agreements completed and under implementation	0 [zero Participatory Forest Management under implementation]	5 [five Participatory Forest Management under implementation; at least 120 ha]	10 [ten Participatory Forest Management under implementation; at least 300 ha]	Direct observation and review of plans; Project Implementation Reports (annual)
Output 3.3. SLM/ SFM practices implemented in more than 25,000 ha of agriculture land, including agroforestry on 1,000 ha of consolidated land	<b>Indicator 08:</b> - Area of landscapes under sustainable land management in production systems	See Table 21 (specific statistics to be included in first PIR)	Additional 12,000 ha with SLM/ SFM practices (under Farmer Fields Schools)	Additional 25,000 ha with SLM/ SFM practices (under Farmer Fields Schools)	Direct observation and survey with local Farmer Fields Schools; Project Implementation Reports (annual)
	<b>Indicator 9:</b> - Additional consolidated land with agroforestry	Additional 0 ha of consolidated land with commercial tree crops	Additional 400 ha of consolidated land with commercial tree crops	Additional 1,000 ha of consolidated land with commercial tree crops	Direct observation and survey with local NRM departments; Project Implementation Reports (annual)

Output	Objective and Outcome Indicators	Baseline	Mid-term Target (2023)	End of Project Target	Data Collection Methods/ Reporting
Output 3.4. Reduction of wood consumption by 25% by improving household and institutional cooking energy technologies	<b>Indicator 10:</b> - Improved cookstoves distributed	0 improved cookstoves distributed (under the project)	25,000 improved cookstoves distributed (under the project)	60,000 improved cookstoves distributed (under the project)	Direct observation and survey with local cooperatives, cookstove producers, MININFRA and NGOs; Project Implementation Reports (annual)
Outputs 3.1. to 3.4	<b>Indicator 11:</b> - Tons of carbon mitigated	To be determined in year one, reported in the first PIR	At least 2,060,000 tCO <sub>2e</sub>	At least 4,700,825 tCO <sub>2e</sub>	Monitoring information be undertaken via sample surveys and direct observation; Project Implementation Reports (annual); Results also to be shown in the Rwanda NDC implementation plan.

## 4.2. Monitoring and evaluation

### 4.2.1. Monitoring responsibilities

The results outlined in the results framework will be monitored annually and evaluated periodically to ensure that the project effectively achieves the desired results. Monitoring will be supported by output 2.3 of outcome 2 (knowledge management, monitoring, and evaluation). The project monitoring and evaluation plan will also facilitate learning and ensure knowledge is shared and widely disseminated to support the scaling up and replication of project results.

Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the UNDP Programme and Operations Policies and Procedures and UNDP Evaluation Policy. The UNDP Country Office will work with the relevant project stakeholders to ensure UNDP monitoring and evaluation requirements are met in a timely fashion and to high quality standards. Additional mandatory GEF-specific M&E requirements will be undertaken in accordance with the GEF M&E policy and other relevant GEF policies.

M&E oversight and monitoring responsibilities:

- **Project Manager:**
  - Responsible for day-to-day project management and regular monitoring of project results and risks, including social and environmental risks. The Project Manager will ensure that all project staff maintain a high level of transparency, responsibility and accountability in M&E and reporting of project results. The Project Manager will inform the Project Board, the UNDP Country Office and the UNDP-GEF Regional Technical Advisor of any delays or difficulties as they arise during implementation so that appropriate support and corrective measures can be adopted;
  - Reporting: the project manager will develop annual Project Implementation Reports, including annual output targets to support the efficient implementation of the project. This includes, but is not limited to, ensuring the results framework indicators are monitored annually, and that the monitoring of risks and the various plans/strategies developed to support project implementation occur on a regular basis;

- **Project Board:**
  - The Project Board will take corrective action as needed to ensure the project achieves the desired results. The Project Board will hold project reviews to assess the performance of the project and appraise the Project Implementation Reports and Annual Work Plan for the following year. In the project's final year, the Project Board will hold an end-of-project review to capture lessons learned and discuss opportunities for scaling up and to highlight project results and lessons learned with relevant audiences. This final review meeting will also discuss the findings outlined in the project terminal evaluation report and the management response;
- **REMA:**
  - As the Implementing Partner, REMA is responsible for providing all required information and data necessary for timely, comprehensive, and evidence-based project reporting, including results and financial data, as necessary. The Implementing Partner will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems;
- **UNDP Country Office:**
  - The UNDP Country Office will support the Project Manager as needed, including through annual supervision missions. The annual supervision missions will take place according to the schedule outlined in the annual work plan. Supervision mission reports will be circulated to the project team and Project Board within one month of the mission. The UNDP Country Office will initiate and organize key GEF M&E activities including the annual GEF PIR, the independent mid-term review and the independent terminal evaluation. The UNDP Country Office will also ensure that the standard UNDP and GEF M&E requirements are fulfilled to the highest quality;
  - The UNDP Country Office is responsible for complying with all UNDP project-level M&E requirements as outlined in the UNDP Programme and Operations Policies and Procedures. Any quality concerns flagged during these M&E activities (e.g. annual GEF PIR quality assessment ratings) will be addressed by the UNDP Country Office and the Project Manager.

- **UNDP-GEF Unit:**
  - Additional M&E and implementation quality assurance and troubleshooting support will be provided by the UNDP-GEF Regional Technical Advisor and the UNDP-GEF Directorate as needed.

#### 4.2.2. Reporting

**Inception\_Report:** In the beginning of the project, and after the **Inception Workshop** (with the objectives shown in Table 74), the Project Manager is to present the Inception Report (no later than one month after the inception workshop). The Inception Report will be cleared by the UNDP Country Office and the UNDP-GEF Regional Sector Specialist and will be approved by the Project Board.

**Table 74 – Inception Workshop objectives.**

#	Objective
1	Re-orient project stakeholders to the project strategy and discuss any changes in the overall context that influence project strategy and implementation
2	Discuss the roles and responsibilities of the project team, including reporting and communication lines and conflict resolution mechanisms
3	Review the results framework and finalize the indicators, means of verification and monitoring plan
4	Discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E budget; identify national/regional institutes to be involved in project-level M&E; discuss the role of the GEF OFP in M&E
5	Update and review responsibilities for monitoring the various project plans and strategies, including the risk log; SESP, Environmental and Social Management Plan and other safeguard requirements; project grievance mechanisms; the gender strategy; the knowledge management strategy, and other relevant strategies
6	Review financial reporting procedures and mandatory requirements, and agree on the arrangements for the annual audit
7	Plan and schedule Project Board meetings and finalize the first year annual work plan

Source: M&E Plan (provided directly by managing staff team).

**Annual Project Implementation Reports:** The Project Manager, the UNDP Country Office, and the UNDP-GEF Regional Technical Advisor will provide objective input to the annual GEF Project Implementation Report covering the reporting period July (previous year) to June (current year) for each year of project implementation. The Project Manager will ensure that the indicators included in the project results framework are monitored annually in advance of the PIR submission deadline so that progress can be reported in the PIR. Any environmental and social risks and related management plans will be monitored regularly, and progress will be reported in the PIR.

The PIR submitted to the GEF will be shared with the Project Board. The UNDP Country Office will coordinate the input of the GEF Operational Focal Point and other stakeholders to the PIR as appropriate. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR.

**Lessons learned and knowledge generation** (to be shared in Annual Project Implementation Reports): Results from the project will be disseminated within and beyond the project intervention area through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to the project. The project will identify, analyse, and share lessons learned that might be beneficial to the design and implementation of similar projects and disseminate these lessons widely. There will be continuous information exchange between this project and other projects of similar focus in the same country, region and globally.

**GEF Focal Area Tracking Tools:** The following GEF Tracking Tools will be used to monitor global environmental benefits (e.g. indicator 11): SFM Tracking Tool, Land Degradation Tracking Tool and the Climate Change Mitigation Tracking Tool.

**Independent Mid-term Review:** An independent mid-term review process will begin after the second PIR has been submitted to the GEF, and the Mid-term Review Report will be submitted to the GEF in the same year as the 3<sup>rd</sup> PIR. The Mid-term Review findings and responses outlined in the management response will be incorporated as recommendations for enhanced implementation during the final half of the project's duration. The terms of reference, the review process and the Mid-term Review Report will follow the standard templates and guidance prepared by the UNDP IEO for GEF-financed projects. The evaluation will be "independent, impartial and rigorous". The

consultants that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing, or advising on the project to be evaluated. The GEF Operational Focal Point and other stakeholders will be involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the UNDP-GEF Directorate. The final Mid-term Review Report will be available in English and will be cleared by the UNDP Country Office and the UNDP-GEF Regional Technical Specialist and approved by the Project Board.

**Independent Terminal Evaluation:** An independent terminal evaluation will take place upon completion of all major project outputs and activities. The terminal evaluation process will begin three months before operational closure of the project allowing the evaluation mission to proceed while the project team is still in place, yet ensuring the project is close enough to completion for the evaluation team to reach conclusions on key aspects such as project sustainability. The Project Manager will remain on contract until the Report and management response have been finalized. The terms of reference, the evaluation process and the final Terminal Evaluation Report will follow the standard templates and guidance prepared by the UNDP IEO for GEF-financed projects. As the Mid-term Review, the terminal evaluation will be “independent, impartial and rigorous”. The consultants that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing, or advising on the project to be evaluated. The GEF Operational Focal Point and other stakeholders will be involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the UNDP-GEF Directorate. The final Terminal Evaluation Report will be cleared by the UNDP Country Office and the UNDP-GEF Regional Sector Specialist and will be approved by the Project Board. The Terminal Evaluation Report will be publicly available in English on the UNDP Evaluation Resource Center.

Once uploaded to the Evaluation Resource Center, the UNDP Independent Evaluation Office will undertake a quality assessment and validate the findings and ratings in the Terminal Evaluation Report and rate its quality. The UNDP Independent Evaluation Office assessment report will be sent to the GEF Independent Evaluation Office along with the project terminal evaluation report.

**Final Report:** The project’s terminal PIR along with the Terminal Evaluation Report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.



The M&E requirements (in what it refers to meetings, reports and tools) can be seen in Table 75, including responsibility and time-frame.

**Table 75 – M&E requirements.**

Requirement	Responsible(s)	Time-frame
Inception Workshop	<ul style="list-style-type: none"> <li>UNDP Country Office</li> </ul>	Within two months of project document signature
Inception Report	<ul style="list-style-type: none"> <li>Project Manager</li> </ul>	Within two weeks of inception workshop
Standard UNDP monitoring and reporting requirements (as outlined in the UNDP POPP)	<ul style="list-style-type: none"> <li>UNDP Country Office</li> </ul>	Quarterly, annually
Risk management	<ul style="list-style-type: none"> <li>Project Manager &amp;</li> <li>UNDP Country Office</li> </ul>	Quarterly, annually
Monitoring of indicators in project results framework	<ul style="list-style-type: none"> <li>Project Manager</li> </ul>	Annually before PIR
GEF Project Implementation Report (PIR)	<ul style="list-style-type: none"> <li>Project Manager, UNDP Country Office &amp; UNDP-GEF team</li> </ul>	Annually
National Implementation Audit as per UNDP audit policies	<ul style="list-style-type: none"> <li>UNDP Country Office</li> </ul>	Annually or other frequency as per UNDP Audit policies
Lessons learned and knowledge generation	<ul style="list-style-type: none"> <li>Project Manager</li> </ul>	Annually
Monitoring of environmental and social risks, and corresponding management plans as relevant	<ul style="list-style-type: none"> <li>Project Manager &amp;</li> <li>UNDP Country Office</li> </ul>	On-going
Stakeholder Engagement Plan	<ul style="list-style-type: none"> <li>Project Manager &amp;</li> <li>UNDP Country Office</li> </ul>	On-going
Gender Action Plan	<ul style="list-style-type: none"> <li>Project Manager,</li> <li>UNDP Country Office &amp;</li> <li>UNDP GEF team</li> </ul>	On-going

Requirement	Responsible(s)	Time-frame
Addressing environmental and social grievances	<ul style="list-style-type: none"> <li>Project Manager &amp;</li> <li>UNDP Country Office</li> </ul>	On-going
Project Board meetings	<ul style="list-style-type: none"> <li>Project Board,</li> <li>Project Manager &amp;</li> <li>UNDP Country Office</li> </ul>	At minimum annually
Supervision missions	<ul style="list-style-type: none"> <li>UNDP Country Office</li> </ul>	Annually
Oversight missions	<ul style="list-style-type: none"> <li>UNDP GEF team</li> </ul>	Troubleshooting as needed
GEF Secretariat learning missions/site visits	<ul style="list-style-type: none"> <li>Project Manager,</li> <li>UNDP Country Office &amp;</li> <li>UNDP GEF team</li> </ul>	To be determined
Mid-term GEF Tracking Tool to be updated by Project Management Unit	<ul style="list-style-type: none"> <li>Project Manager</li> </ul>	Before mid-term review mission takes place
Independent Mid-term Review and management response	<ul style="list-style-type: none"> <li>UNDP Country Office,</li> <li>Project team &amp;</li> <li>UNDP GEF team</li> </ul>	Between 2 <sup>nd</sup> and 3 <sup>rd</sup> PIR
Terminal GEF Tracking Tool to be updated by Project Management Unit	<ul style="list-style-type: none"> <li>Project Manager</li> </ul>	Before terminal evaluation mission takes place
Independent Terminal Evaluation included in UNDP evaluation plan, and management response	<ul style="list-style-type: none"> <li>UNDP Country Office,</li> <li>Project team &amp;</li> <li>UNDP GEF team</li> </ul>	At least three months before operational closure

Source: Based on the M&E Plan (provided directly by managing staff team).

## 5. Conclusion

The present document represents the Final Report of the *Baseline study and development of indicators and targets for “Forest Landscape Restoration in the Mayaga region project”*. The aim of this consultancy was to carry out a baseline study, which will provide guidance and tools required to the effective implementation of the project mentioned above and its ultimate objectives in four districts (Kamonyi, Ruhango, Nyanza, Gisagara). For that, 11 Baseline Report were produced and presented in Chapter 3, namely:

- 3.2 – Socioeconomic and Household Energy Report.
- 3.3 – Social and Environmental Safeguards Report.
- 3.4 – Vulnerability Assessment Report.
- 3.5 – Legal Policy and Institutional Report.
- 3.6 – Local Market Development Report.
- 3.7 – Sustainable Land Management & Sustainable Forest Management Practices Report.
- 3.8 – Gender Analysis Report.
- 3.9 – Forest Productivity Report.
- 3.10 – Biodiversity Report.
- 3.11 – Stakeholders Analysis Report.
- 3.12 – GIS Report.

The main results regarding the baseline reports are:

- **Socioeconomic and Household Energy Report** – In 2020, around 1.5 million people lived in the four districts under analysis; rural population is the majority; literacy levels are relatively low but improving in the young generations; employment in agriculture is the most common, with the majority of agricultural households producing crops and livestock; environmental issues affected 24% of households in Ruhango in 2016/17, with destructive rains being the most common problem; poverty was very common in 2016/17, predominantly in Gisagara; firewood is the primary fuel for cooking (from 89% in Kamonyi to 96% in Gisagara) (2016/17); forest cover in the districts under analysis represents around 13%-14% of total area, with the majority being plantations (2019); 2015 physical supply data shows that forests provide significant services in the area, namely

carbon storage, sediment retention, and also provide important ecosystem services regarding the water supply; however, since 1990 these services show a negative evolution in all districts; the majority of forest landscape restoration opportunities in the region are related to agroforestry, but also to improve management.

- **Social and Environmental Safeguards Report** – main positive impacts to be derived from the project will include: reduction of the GHG emissions, increased resilience of smallholder farmers vulnerable to climate change, better access to energy sources, protection of around 500 hectares of natural habitats, rehabilitation of plantations and woodlots, and establishment of a financial support path or funding's to continue to finance adaptation and mitigation activities; potential adverse impacts of the project include: loss of biodiversity, contamination of soils, increased vulnerability to tree diseases and pests, shortage of water resources, social conflicts, planning, framing and regulations that are not compatible with local contexts, loss of income for some households from the reduced trade in fuel wood and charcoal, relocation of households or goods. Mitigations measures for potential adverse impacts and a monitoring plan is also presented;
- **Vulnerability Assessment Report** – climate change impacts, to which the districts of the Southern Province are particularly exposed to, are prolonged droughts and rainfall variations which affect the agriculture and forestry sectors; Gisagara District might be particularly affected by changes in the river water level and by instability on the hillsides where infrastructures are located, while the Nyanza District is the most exposed to temperature variations and warm spells. Whereas the Ruhango District vulnerability is very much associated with its lack of adaptive capacity, namely with regard to their extent of social capital, that means, the existing social networks. Furthermore, decreasing vulnerability to climate change in the Mayaga region can be achieved through direct measures, such as interventions to secure access to land and to agriculture/ livestock inputs, and indirect interventions related to responding to the people's basic needs in terms of water, sanitation, and health facilities for example;

- **Local Market Development Report** – barriers for private sector engagement in the region include: limited land availability, considerable land degradation, presence of pests and invasive species, limited stakeholder specialization and collaboration, limited access to finance. Opportunities for advancing the local economy include: production of primary goods such as fruits, crops, timber and non-timber products, production of wine and services related to the primary sector;
- **Sustainable Land Management & Sustainable Forest Management Practices Report** – although efforts were made, including enabling policies, adoption of SFM and SLM practices is still insufficient in the region; barriers to the adoption of more sustainable practices include: limited allocation of funds, compromise between economic and non-economic benefits, need to integrate different techniques and ecosystems services, limited awareness, lack of skilled people, need to improve the services of the Tree Seed Centre. However, that are opportunities: government commitment; high demand for forest products; growing availability of funds, and level of involvement of youth and women in SFM/SLM related activities;
- **Gender Analysis Report** – In FGDs women highlight the following main gender inequality drivers: lack of full access to forest value chain (e.g. their husband can only inform them how they decided), financial limitations (e.g. access to loans), lack of mobility from home to their daily work, lack of business opportunities for women, lack of career guidance (specific in natural resources area), lack of individual women activists;
- **Forest Productivity Report** – afforestation efforts are still needed in Amayaga agroecological zone which is under risk and needs much attention in order to mitigate consequences related to lack of forests. In fact, not only the coverage is below the target (30%) but also the tree density is generally below 40% tree cover. Forest management recommendations include the prioritization of afforestation and reforestation according to the sectors characteristics, the reducing of harvesting in most sensitive areas, among others already presented in other reports;

- **Biodiversity Report** – Mayaga region is characterized by a variety of Natural forest with diversified species mainly in the hilltop of the hills. The forests are protected for deforestation, but the population around encroach them;
- **Stakeholders Analysis Report** – the Forest Landscape restoration of Mayaga Project needs to engage many stakeholders which include the Government institutions, Local Governments entities, Civil society in general, including Non-Governmental Organizations, academic and research institutions, Development Cooperation Agencies and UN Agencies. There are challenges (conflicting points of view and interests; inadequate integration of non-environment related sectors; inadequate institutional capacity; duplicated mandates; stakeholders' inaction and excess of mobilization and demobilization in the field) that need to be faced and dealt with in the development of the project;
- **GIS Report** – included the preparation and presentation of the following data in district maps: administrative limitations; hydrological data; population density data; agriculture areas; forest cover; land cover; Erosion mapping and soil types.

Furthermore, Chapter 4 presents the **results framework** which includes: indicators, the baseline information (or how to obtain it), the targets (including the mid-term target and the end of project target), and data collection methods, and finally, reporting details. The following 11 objective and outcome indicators are proposed for the FLR Mayaga Project:

1. Thematic group on FLR under the JADF established and functioning;
2. Definitions of SFM and FLR clarified in the National Forest Policy;
3. Number of FLR plans guiding restoration at landscape level;
4. Aggregated Capacity Score using UNDP Capacity Scoring for all stakeholder's groups;
5. Participatory and gender inclusive plans;
6. Area of high conservation value forest with enhanced management;
7. Participatory Forest Management agreements completed and under implementation;

8. Area of landscapes under sustainable land management in production systems;
9. Additional consolidated land with agroforestry;
10. Improved cookstoves distributed;
11. Tons of carbon mitigated.

The project logframe is also presented in Annex 4. Monitoring and evaluation responsibilities, tools and reporting procedures are presented in section 4.2.

With the approval of this Final Report by UNDP/ REMA, the Baseline Study and Development of Indicators and Targets for “Forest Landscape Restoration in the Mayaga Region Project” concludes.



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## Appendix

### Maps:

- 1a – Administrative Map – Gisagara.
- 1b – Administrative Map – Kamonyi.
- 1c – Administrative Map – Nyanza.
- 1d – Administrative Map – Ruhango.
- 2a – Hydrological Map – Gisagara.
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- 3a – Population Density in Gisagara.
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- 4a – Agriculture in Gisagara.
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- 5a – Forests in Gisagara.
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- 6a – Land cover in Gisagara.
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- 7a – Erosion Mapping for Gisagara.
- 7b – Erosion Mapping for Kamonyi.
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- 8a – Soil types – Gisagara.
- 8b – Soil types – Kamonyi.
- 8c – Soil types – Nyanza.
- 8d – Soil types – Ruhango.



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## Annexes

### Annex 1: Key gender concepts and definitions

**Table 76 – Key gender concepts and definitions.**

Concept	Definition
Gender	The social differences or roles allotted to women and to men, roles that are learned as we are growing up, change over time, and depend on our culture, ethnic origin, religion, education, class, and the geographical, economic, and political environment we live in (EU, 2004)
Sex	The biological difference between women and men that is universal (EU, 2004)
Gender equality	That 'all human beings are free to develop their personal abilities and make choices without the limitations set by strict gender roles; that the different behaviour, Aspirations and needs of women and men are considered, valued and favoured equally. (EU, 1998).
Gender Analysis	The systematic gathering and examination of information on gender differences and social relations in order to identify, understand and redress inequalities based on gender (Baden and Reeves, 2000).
Women empowerment	A 'bottom-up' process of transforming gender power relations, through individuals or groups developing awareness of women's subordination and building their capacity to challenge it (Baden and Reeves, 2000).
Gender equity	Entails the provision of fairness and justice in the distribution of benefits and responsibilities between women and men. The concept recognizes that women and men have different needs and power and that these differences should be identified and addressed in a manner that rectifies the imbalances between the sexes.
Gender mainstreaming	It is the integration of a gender equality perspective into every stage of policy process - design, implementation, monitoring and evaluation - with a view to promoting equality between women and men. It means assessing how policies impact on women and men and taking steps to change policies if necessary. The aim is to make gender equality a reality and to improve policy-making by bringing it closer to citizens' needs. (EU, 2011)

Concept	Definition
Sex-disaggregated Data	For a gender analysis, all data should be separated by sex in order to allow differential impacts on men and women to be measured (UNECE, 2010).
Gender-Awareness	An understanding that there are socially determined differences between women and men based on learned behaviour, which affects access to and control resources. This awareness needs to be applied through gender analysis into projects, programs, and policies (UNECE, 2010).
Gender Training	A facilitated process of developing awareness and capacity on gender issues, to bring about personal or organizational change for gender equality (Baden and Reeves, 2000).
Gender based Violence	Any act or threat by men or male-dominated institutions that inflicts physical, sexual, or psychological harm on a woman or girl because of their gender (Baden and Reeves, 2000).
Gender gap	It is a measure of gender inequality. It is a useful social development indicator. For example, one can measure the gender gap between boys and girls in terms of health outcomes, as well as educational levels achieved and labour income and resistance to emotions.
Women's human rights	The recognition that women's rights are human rights and that women experience injustices solely because of their gender (Baden and Reeves, 2000).
Gender bias	This is the tendency to make decisions or take actions based on preconceived notions of capability according to gender or misunderstand what gender is and translate to women supremacy to men as supported by the government e.g. If women fight for their right men will say that they are no longer heads of the household
Gender integration	This involves identifying and then addressing gender inequalities during strategy and program design, implementation, and monitoring and evaluation.
Gender-sensitive	Encompasses the ability to acknowledge and highlight existing gender differences, issues and inequalities and incorporate these into strategies and actions (World Bank, 1999)

Concept	Definition
Gender transformation	This attempts to transform the underlying social structures, policies, and social norms to achieve gender equality and promote positive change by making people understand what is gender by right, sex, heritage, and competitions towards equality.
Gender – Planning	Refers to the process of planning developmental programs and projects that are gender sensitive and which consider the impact of differing gender roles and gender needs of women and men in the target community or sector. It involves the selection of appropriate approaches to address not only women and men’s practical needs, but also identifies entry points for challenging unequal relations (i.e., strategic needs) and for enhancing the gender-responsiveness of policy dialogue (UNECE, 2010).
Gender – Blind	A failure to recognize that gender is an essential determinant of social outcomes impacting on projects and policies. A gender-blind approach assumes gender is not an influencing factor in projects, programs, or policy (EU, 1999).

Source: Baden and Reeves (2000).



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## **Annex 2: Gender action guidelines**

This plan seeks to make the concerns and experiences of women and men an integral part of the design, implementation, monitoring and evaluation of the project in all the spheres, so that women and men benefit equally, and inequality is not perpetuated.

Steps to follow right from project design, implementation through monitoring, evaluation, and reporting.

### **Women as key stakeholders**

Empower women as major stakeholders:

- Include women in the senior management positions/decision making levels.
- Identify potential organizations for collaboration such as; Non-Governmental Organizations (NGOs); International Union for Conservation of Nature and Natural Resources (IUCN), UNDP, and government institutions such as FONERWA, REMA, Ministry of Gender and Family Promotion and the Gender Monitoring Office and local organisations such as women cooperatives to spearhead the implementation and recognition of women's role in forestry.
- Creation of small women groups for global agricultural practises.
- Ensure women's participation in all events organized by the project.
- Build the capacity of women in exercising their rights to control over property as provided by the gender sensitive legal systems of Rwanda and the science of trees and forestry, to empower them and ensure meaningful participation.
- Preparation of women matching grants for small projects in Amayaga.
- Introduction of radio spots and campaign on gender empowerment.

### **Mass recruitment for project activities**

Recruitment for working on terraces and for planting trees, among other tasks, should use the VUP approach that takes in account the vulnerable people, women and men, youth and the old. This shall be done in collaboration with the local council members including the National Women's Council (NWC). It is key to recruit some women for supervisory roles.

In addition, a flexible kind of arrangement in work ought to be employed whereby work is given to a nursing or pregnant mother and she is allowed to work on it at her convenience. This enables nursing mothers, pregnant and vulnerable people to be able to meet their daily household chores and work at their convenience other than the classic kind of arrangement where one has to stick to the time allocated. The organization of works should take into consideration women's as well as men's daily and seasonal schedules. Accordingly, there should be flexibility in the working hours and a task, establishing a rate per hour in some cases.

Hearing women voice by creating breastfeeding stations during working hours and not looking down their energy because of carrying babies.

### **Gender friendly work environment**

The project facilitators shall ensure that the work environment promotes women's as well as men's efficiency and effectiveness and does not sustain gender stereotypes. For instance, project staff should use a gender neutral language; wash rooms for women and men should properly be separated and private; women's washrooms must have at least an emergency kit for their monthly periods; a safe space for mothers employed on the project shall be installed at the work site to enable breast feeding mothers to keep their children and are permitted to breast feed during work hours; paternity and maternity leave should be granted to mothers as a right not a favour; and equal wage payment for women and men should be observed, among others.

### **Capturing the success stories of women in restoration, analysing impact, and monitoring**

Document and systematize women success on FLR from literature, interviews, and project documentation as part of monitoring and evaluation, given that they minimize doubts and eliminate stigma over an action especially if it was done by a woman other women feel energized to do it since it is a woman of the same sex and capacity.

- Elaborate gender indicators for showing impact on women and men (see below).
- Circulate to national gender/women's experts/advocacy groups.

### **Elaboration of studies/research/consultancies to incorporate gender considerations**

- Include gender analysis as a requirement in the Terms of Reference (TORs) for any project assignments that will be conducted as a key component, not just as a highlight.
- Gender specialist of working groups provides inputs.
- Circulate to national gender/women's experts.

### **All policies or related operational documents (national, subnational) must be gender responsive**

- Establish an advocacy group on gender. This will be done by supporting women dominated and led forestry related cooperatives. These will be oriented to work with national grassroots systems especially NWC to embedded messages on participation of women in forestry development and landscape restoration.
- Gender specialist of working groups provides inputs.
- Circulate to national gender/women's experts/advocacy groups (gender focal point at ministries).
- Gender working group provides inputs.
- Advocate for a Sector policy and a gender mainstreaming strategic plan for the environment and forestry.

### **Gender message included in training and awareness events/campaigns**

- National gender focal point and gender working group draft standard gender message with a clear fact sheet on gender and restoration.

### **Data collection**

Collect and analyse sex- and age-disaggregated data. In order to acquire gender disaggregated data for all the project interventions, Annex 3 provides a template that can

be used by implementers to track female access/participation in labour-based works and can be adopted for all project beneficiaries/activities that involve people.

### Collecting Sex disaggregated Data

Gender equality indicators are measures of performance that require the collection and analysis of sex disaggregated information on who participates in and benefits from development activities.

Disaggregating information by sex means that we count males and females separately when gathering information on development activities and benefits. Sex-disaggregated data is important because it helps assess whether an initiative is successful at targeting and benefiting women, men, girls, and boys as planned.

The table below proposes indicators and verification sources and tools.

**Table 77 – Proposed indicators and verification sources and tools.**

Indicator	Sources of verification and tools
Over a set period, an increase of x percent in household incomes from forest-based activities among women-headed households and poor households in program areas	<ul style="list-style-type: none"> <li>- Household surveys</li> <li>- Project management information system</li> <li>- Socioeconomic data from statistics office</li> </ul>
Changes over x-year period of project activities in household nutrition, health, education, vulnerability to violence, and happiness, disaggregated by gender	<ul style="list-style-type: none"> <li>- Household surveys, before and after</li> <li>- Project management information system</li> <li>- School record</li> </ul>
Proportion of annual household income (or consumption) derived from upland farming, agroforestry, or forest activities	Household surveys
Percentage of women and men actively participating in natural resource management committees (including bank account signatory roles)	<ul style="list-style-type: none"> <li>- Bank Records</li> <li>- Committee meeting minutes</li> <li>- Interviews with stakeholders</li> <li>- Local traditional authorities (such as a chief or local council)</li> <li>- Program and project records</li> </ul>

Indicator	Sources of verification and tools
Number of women and men actively involved in management (that is; protection or conservation or production) of protected areas or reserves based on a management framework or plan	<ul style="list-style-type: none"> <li>- Community monitoring committees</li> <li>- Forest management plans</li> </ul>
Percentage of women members of local organizations/decision-making bodies	<ul style="list-style-type: none"> <li>Review of project record</li> <li>Review the structure of participating cooperatives and decision-making bodies into project activities</li> </ul>
Capacity-building support provided for community-based resource management, forest enterprises, and others	<ul style="list-style-type: none"> <li>- Project records</li> <li>- Training records</li> <li>Project records - Training records</li> </ul>
Change in perceptions of men and women regarding importance of forest protection and management, measured before and after activity	<ul style="list-style-type: none"> <li>- Focus groups</li> <li>- Stakeholder interviews</li> </ul>
Percentage of women and men community extension workers and professional forestry extensionists	<ul style="list-style-type: none"> <li>- Forest Department records</li> <li>- Project records</li> </ul>
Percentage of representations and mentions of women and men in training and awareness-raising materials	<ul style="list-style-type: none"> <li>Survey of training and information materials</li> </ul>
Number of women and men actively involved in participatory research and innovations in agroforestry or forestry, before and after project activities	<ul style="list-style-type: none"> <li>- Forestry extension records</li> <li>- Interviews with stakeholders</li> <li>- Observation</li> <li>- Participatory monitoring</li> </ul>
Number of women and men involved in seed collection, propagation, and tree nursery techniques in district, before and after project activities	<ul style="list-style-type: none"> <li>- Forestry department records</li> <li>- Participatory forest management group records</li> <li>- Project records</li> <li>- Stakeholder interviews</li> </ul>
Changes to access rights by women- and men-headed households to common property resources (timber and non-timber) in forests	<ul style="list-style-type: none"> <li>- Case studies</li> <li>- Interviews of local authorities and community leaders</li> <li>- Participatory rapid appraisal</li> </ul>
Perception of women and men whether women are becoming more empowered, and the reasons	<ul style="list-style-type: none"> <li>- Survey</li> <li>- Project records</li> <li>- Best practices</li> </ul>

Indicator	Sources of verification and tools
Changes in time taken to collect firewood daily, before and after project activities	<ul style="list-style-type: none"> <li>- Participatory monitoring</li> <li>- Project records</li> </ul>
Number of conflicts over natural resources access or land ownership per year	<ul style="list-style-type: none"> <li>- Interviews with stakeholders (from all relevant groups in conflicts),</li> <li>- Local traditional authorities (such as a chief or local council)</li> <li>- Program and project records</li> </ul>
Number of women and men from district employed in forest enterprises, annually	Administrative records
Procedures against local and national regulations	<ul style="list-style-type: none"> <li>- Administrative records</li> <li>- Review of procedures against local and national regulations</li> </ul>
Community satisfaction (disaggregated by gender) with changes in forest access and forest resources dispute treatment	<ul style="list-style-type: none"> <li>- Group interviews or focus groups</li> <li>- Interviews, before and after</li> </ul>
Percentage of credit, financial and technical support services received by women/men in forestry related	Review records from Micro financial institutions especially Village Banks such as SACCOs
Enabling monitoring and supervision training provided to project implementing team	Remote supervision by collecting cumulative data

### Consultation and validation

Organize gender-responsive validation and inception workshops Organize a separate validation workshop for women and youth.

### Enabling conditions and barriers

Assess the enabling conditions and barriers in relation to gender and youth participation.

### Annex 3: Participation template sheet

Name of Project:.....

Type of works:.....

Date of Work/ meeting/ training: .....

Venue:..... District ..... Sector:.....

Start time.....End time.....Duration (# hours):.....

#	Names (First and last name)	Sex		Position/type of Job	District	Sector	Phone	Signature
		Female	Male					
1								
2								
3								
4								
5								
6								
7								
8								
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10								
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## Annex 4: Project logframe

Table 78 – Project Logframe.

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
<b>1. Forest restoration plans with institutional and legislative frameworks to guide afforestation, natural resources management and agriculture</b>							
Output 1.1. Legislation and coordination mechanisms in place for effective FLR	<b>Indicator 01:</b> - Thematic group on FLR under the JADF established and functioning	No thematic group established	Thematic group on FLR under the JADF established	Thematic group on FLR under the JADF established and with regular meetings	Thematic group on FLR under the JADF established and with regular meetings	Thematic group on FLR under the JADF established and with regular meetings	Thematic group on FLR under the JADF established and with regular meetings
	<b>Indicator 02:</b> - Definitions of SFM and FLR clarified in the National Forest Policy	No clear definitions at the national level	SFM and FLR definitions prepared	SFM and FLR definitions prepared and approved	SFM and FLR definitions available in an addendum to the National Forest Policy	-	Addendum clarifying SFM and FLR definition part of the National Forest Policy

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
Output 1.2. Four FLR plans ready for implementation, covering 263,270 ha	<b>Indicator 03:</b> - Number of FLR plans guiding restoration at landscape level	0 [zero FLR plans]	0 [zero FLR plans]	1 [one FLR plans], covering at least 40,000 ha	2 [two FLR plans], covering at least 96,000 ha	3 [three FLR plans], covering at least 144,000 ha	4 [four FLR plans], covering at least 263,270 ha

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
<b>2. Enhancement of individual and institutional capacities for planning and implementing gender sensitive forest landscape restoration strategies</b>							
Output 2.1. Training programs implemented for all stakeholders	<b>Indicator 04:</b> - Aggregated Capacity Score using UNDP Capacity Scoring for all stakeholder's groups	Aggregated score is 36.5 (systemic - 41.67; institutional - 31.25; individual - 36.46)	-	-	Baseline plus 12 points in the capacity score for all stakeholder's groups (average per group: national institutions; district institutions; NGOs and community-based institutions)	-	Baseline plus 25 points in the capacity score for all stakeholder's groups (average per group: national institutions; district institutions; NGOs and community-based institutions)
Output 2.2. Institutional capacity for the extension service and community knowledge sharing forums							

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
Output 2.3. Monitoring & evaluation plans, knowledge management and gender mainstreaming strategy in place	<b>Indicator 05:</b> - Participatory and gender inclusive plans	0 [zero related plans]	1 [M&E plan designed with an adequate participatory and gender inclusive process]	-	2 [M&E plan plus Gender Mainstreaming Strategy Plan; approved and in place with an adequate participatory and gender inclusive process]	-	3 [M&E plan plus Knowledge Management Plan and Gender Mainstreaming Strategy Plan; approved and in place with an adequate participatory and gender inclusive process]

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
<b>3. Implementation of Forest Landscape Restoration Plans, increase productivity of agriculture and plantations forests, and reduce wood consumption by at least 25%</b>							
Output 3.1. Enhanced management on 555 ha of high conservation value forest	<b>Indicator 06:</b> - Area of high conservation value forest with enhanced management	0 ha of forest with enhanced management [354 ha of Forest Reserve; no Participatory Forest Management agreements and levels of degradation are high]	[management plan for 354 ha prepared]	[management plan for 354 ha approved; Nomination file for the 354 ha Forest Reserve prepared to upgrade it to PA Category IV status]	354 ha of forest with enhanced management [management plan for 354 ha approved and in place; Nomination file for the 354 ha Forest Reserve completed to upgrade it to PA Category IV status]	354 ha of forest with enhanced management [remaining area (200 ha) with management plan prepared; Nomination file for the 354 ha Forest Reserve completed and submitted to upgrade it to PA Category IV status]	555 ha of forest with enhanced management [management plan for 555 ha approved and in place; Nomination file for the 354 ha Forest Reserve completed and submitted to upgrade it to PA Category IV status]

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
Output 3.2. Buffer zones and hill-tops afforested with a mix of indigenous trees and higher productivity plantations	<b>Indicator 07:</b> - Participatory Forest Management agreements completed and under implementatio n	0 [zero Participatory Forest Management under implementation]	0 [zero Participatory Forest Management under implementation]	2 [two Participatory Forest Management under implementation; at least 50 ha]	5 [five Participatory Forest Management under implementation; at least 120 ha]	7 [seven Participatory Forest Management under implementation; at least 180 ha]	10 [ten Participatory Forest Management under implementation; at least 300 ha]
Output 3.3. SLM/ SFM practices implemented in more than 25,000 ha of agriculture land, including agroforestry on	<b>Indicator 08:</b> - Area of landscapes under sustainable land management in production systems	See Table 21 (specific statistics to be included in first PIR)	-	Additional 6,000 ha with SLM/ SFM practices (under Farmer Fields Schools)	Additional 12,000 ha with SLM/ SFM practices (under Farmer Fields Schools)	Additional 18,000 ha with SLM/ SFM practices (under Farmer Fields Schools)	Additional 25,000 ha with SLM/ SFM practices (under Farmer Fields Schools)

Outcome/ output	Indicators	Baseline (2020)	Milestone 1 2021	Milestone 2 2022	Milestone 3 2023	Milestone 4 2024	Milestone 5 2025 Target
1,000 ha of consolidated land	<b>Indicator 9:</b> - Additional consolidated land with agroforestry	Additional 0 ha of consolidated land with commercial tree crops	Additional 100 ha of consolidated land with commercial tree crops	Additional 200 ha of consolidated land with commercial tree crops	Additional 400 ha of consolidated land with commercial tree crops	Additional 750 ha of consolidated land with commercial tree crops	Additional 1,000 ha of consolidated land with commercial tree crops
Output 3.4. Reduction of wood consumption by 25% by improving household and institutional cooking energy technologies	<b>Indicator 10:</b> - Improved cookstoves distributed	0 improved cookstoves distributed (under the project)	5,000 improved cookstoves distributed (under the project)	10,000 improved cookstoves distributed (under the project)	25,000 improved cookstoves distributed (under the project)	45,000 improved cookstoves distributed (under the project)	60,000 improved cookstoves distributed (under the project)
Outputs 3.1. to 3.4	<b>Indicator 11:</b> - Tons of carbon mitigated	To be determined in year one, reported in the first PIR	-	-	At least 2,060,000 tCO <sub>2e</sub>	-	At least 4,700,825 tCO <sub>2e</sub>

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## Annex 5: Focus Group Discussions questionnaires



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