

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR DESIGN, SUPPLY, AND INSTALLATION OF MEDIUM VOLTAGE AND LOW VOLTAGE LINES, DISTRIBUTION OF TRANSFORMERS FOR DISTRIBUTION NETWORK STRENGTHENING AND UPGRADING THE SINGLE-PHASE LINES TO THREE PHASES IN THE WESTERN PROVINCE OF RWANDA



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EXECUTIVE SUMMARY

Rwanda is experiencing significant socio-economic development, and it is crucial to have facilities that can support the country's ambitions. In this context, the Government is making efforts to improve infrastructure facilities, including ensuring a sustainable supply of electricity in both urban and rural areas to achieve 100% access to electricity nationwide by the year 2024. Under the First National Strategy for Transformation (NST1) for 2017–2024, access to electricity also surged from 34.4% to 78.9 % (MINICOFIN, 2024). Under NST2 (2024-2029), the country intends to scale up of access to electricity and will focus on connecting productive users (such as industries, commercial facilities, schools, health facilities, agro-processing plants, and other facilities) that contribute to socioeconomic development. The ongoing initiatives to provide households with electricity will continue, with the goal of scaling up access from the current level of 78.9% by ensuring that electricity is accessible in all cells and villages of the country.

The Government of Rwanda (GoR) has also shown its ability to carry out large-scale investment programs by pooling funds from various development partners using a 'Sector Wide Approach', particularly in the energy sector. As part of this effort, the Government of Rwanda, in collaboration with Multiple Development Partners (MDPs), initiated Accelerating Sustainable and Clean Energy Access Transformation (ASCENT), under the Rwanda Universal Energy Access Program (RUEAP). The Program Development Objective aims to enhance access to energy and improve the efficiency of energy service delivery to households, businesses, and public institutions in Rwanda. Though proposed activities under ASCENT aims at improving community livelihoods and contribute to economic development, it is anticipated that proposed activities may have negative environmental and social impacts if mitigation measures are not proposed and implemented.

In this regard, Rwanda Energy Group (REG) through its subsidiary Energy Development Corporation Limited (EDCL) has appointed the Bureau for Engineering and Environmental Studies (BESST Ltd) to conduct an Environmental and Social Impact Assessment study related to the project design, supply and installation of new MV and LV lines; design, supply and installation of distribution transformer for distribution network reinforcement; and upgrading the single lines to three phases lines in the Western Province

Purpose of the ESIA study

The purpose of this ESIA is to provide the necessary information on potential E&S risks and impacts of the proposed project activities to guide decisions for the relevant institutions. The ESMP also provides guidelines for the proposed project to be implemented in an environmentally sound manner, consistent with established environmental regulations. This report proposes mitigation measures to potential impacts that have been identified, which are required to be implemented during implementation of the present project.

Project location and description

The ASCENT will be implemented in 27 districts across the country and the city of Kigali with the aim to improve the rate of access to electricity supply countrywide. This ESIA is for the western province covering all 7 districts of western province namely Rubavu, Rutsiro, Karongi, Nyamasheke, Rusizi, Ngororero and Nyabihu. The project is designed as Engineering, Procurement, and Construction (EPC), thus the design is not yet done to provide detailed information that shall be contained in this ESIA. However, the feasibility study indicate that project activities will consist at three complementary scopes: Design, supply and installation of new MV and LV lines; design, supply, installation and distribution of transformers for distribution network reinforcement; and upgrading the single lines to three phases lines.

Specific activities of the project are as follow:

- Construction of MV and LV electrical lines
- Erection of distribution transformers for network reinforcement
- Distribution and installation of transformers
- Upgrading of identified single phases lines to three phases lines;
- Clearing of the line's right-of-way;
- Excavation works and other earthmoving and poles erection;
- Transportation of project materials
- Cable stringing;
- Lines energizing;
- Lines commissioning;
- Maintenance including the clearing of the right-of-way during the operation phase.

Project alternatives

As the project design is not yet completed and the specific location of project implementation sites are not yet known the identification of project alternatives includes the consideration of the project implementing entity 'preferred option', as presented in the preliminary route design and drawings, the environmental and social considerations to ensure anticipated impacts are avoided and eliminated, easy access to facilitate the transportation of project materials etc. Other project alternatives identified included:

- a) Route alignment and/or location of project activities;
- b) Designs of electrical infrastructure and technology proposed;
- c) Use of alternative technology; and
- d) Implementation methods and techniques.

The above aspects are considered, and the alternatives identified for the project are:

- No project option
- Overhead power lines consideration
- Underground power lines consideration
- Alternatives sources of energy generation and
- Construction methods and technologies
- Offsetting or Compensation of the losses generated by the sub-project

The preferred option is "Overhead Power Lines." This option remains cost effective and is a well-established method of distributing electricity in rural areas in Rwanda. It is proposed that the specific routes to be used are mostly in the roads reserve, thus significantly reducing the environmental impacts, as well as those resulting from maintaining the RoW where necessary.

Legal, Regulatory and institution framework

The project implementation is intended to be implemented in full compliance with both national and international regulations related to environmental and social standards. At the national level, environmental regulations start with the Constitution of the Republic of Rwanda which articulates the rights and responsibilities of all citizens and the role of the state in environmental protection. The constitution also recognizes ownership of property and in case the right is taking procedure of public interest, procedures are determined by the law and subject to prior and fair compensation. Other key national policies, laws, orders and strategies relevant to the project include those related to environmental management and protection, land use and management only to mention some. The international treaties and conventions as signed and rectified by the GoR applicable to the project were also consulted as detailed in this report. The environmental and social assessment considered also international policies and standards applied to ASCENT including WB Environmental and Social Standards (ESS) Asian Infrastructure Investment Bank (AIIB) and other Development Partners (DP). The WB ESS applied to the project are:

- ESS1: Assessment and Management of Environmental and Social Risks and Impacts;
- ESS2: Labor and Working Conditions;
- ESS3: Resource Efficiency and Pollution Prevention and Management;
- ESS4: Community Health and Safety;
- ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- ESS8: Cultural Heritage;
- ESS10: Stakeholder Engagement and Information Disclosure.

Stakeholders Engagement

Information collected from the preliminary desk review was completed by information obtained through interviews with key stakeholders. The methodology used for stakeholder consultation consisted of interviews and meetings that were organized at different locations of the project sites. At each site, the consultant used a guiding questionnaire with a topic for discussion to provide information about the project. Discussions allowed participants to provide their opinions, and concerns to the project as well as provide some guidance and recommendations. Telephone calls were also used to gather information and data, especially from REG branches operating in the project areas the attendance list and photo log of the consulted people is available on annex 11 of this Report.

Positive Impacts

Regarding social impacts, the assessment identified that positive social impacts would result from the new (or improved) electricity supply, which allows economic development and improvements in living conditions. The positive social and environmental impacts of during the planning phase are:

- Temporary job opportunities for those who will be working for the project including line surveyors
- Income generation
- Knowledge transfer among them who will be recruited wo works with expert

The positive social and environmental impacts of during the construction phase are:

- Temporally job opportunities to project workers
- Income generation
- the creation of financial income because of the temporary jobs that will be created for local workers;
- the creation of financial income for local traders selling food items along the construction sites
- knowledge transfer

The positive social and environmental impacts of during the operation phase are:

- Value addition to the agricultural products and more reliable services and facilities. This is observed through the availability of grinding mills and other machinery which can process agricultural products that will be set up or operate at a cheaper cost due to the availability of electricity in the project areas. This will provide value addition to the agricultural products produced by the local farmers there by boosting the economy and the farmer's income.
- More reliable services and facilities will be available at the Health Centres, Schools, Trading Centres and other related services along the project area.
- The standard of living within the project area will generally improve. Positive impacts will be observed in health, the water sector, education, security, communication, and economic activities. Enhanced services will provide significant benefits to the population, gradually improving their quality of life due to the availability of electricity.
- Support to Telecommunications infrastructure operations such community radios, internet cafes as well as phone charging will be observed and reliable. With steady electrical power supply from the national grid, the costs of operations of telecommunication companies will significantly reduce, as well as availability of mobile communication will increase. This as well impacts on businesses and social services positively.
- Improvement and extension of the electricity will lead to improved security through better street lighting in the suburban areas and their environs which will contribute to security of residents and investments.
- Setting up of small-scale industries such as welding workshops, maize mills, carpentry workshops and other cottage activities will increase leading to further employment after completion of the project. On a short-term, the project will bring about creation of jobs during the construction phase. people in the project areas are likely provide labour force etc for skilled, semi-skilled and unskilled labor etc.

The positive social and environmental impacts of during the decommissioning phase are:

- Job opportunities and income generation.

Negative Impacts during planning and construction

The predicted negative impacts for the implementation of the present project were assessed by considering different planned activities and are presented in three main project phases: design and planning phase, construction phase and operation phase. For each negative impact identified, mitigation measures were proposed. for instance, there will be a few activities that include but not limited to excavations, soil disturbance, increased traffic around project sites due to delivery of various project construction materials etc. All these are likely to pollute and degrade the local environment, through mudslides, noise, and dust and air pollution. Potential adverse impacts emanating from the project include:

- Lack of qualified environmental and social risks management personnel and Instruments: This ESIA is prepared when the detail design is not yet conducted and there might be changes and addition information once the design is completed. Thus, it is important that resources are allocated for assessment site specific impacts, prepare and implement contractor management Plans. This requires recruitment of qualified personnel at contractor and supervising consultant to ensure that proposed mitigation measures are implemented and monitored.

- Loss of crops and trees along the Right of Way and pole's foundations: The alignment of the distribution lines will to the most extent be restricted to the road reserve, pathways and agriculture lands. However, to some extent, during line route survey and electrical lines construction, there will be destruction and removal of natural vegetation, crops and trees. The community in project areas is mostly involved in crop cultivation and animal rearing at subsistence level. Dominant crops in the project areas include maize, cassava, soya beans, sunflower, sweet potatoes, and fruit trees like oranges among others. The removal of tree species and crops will affect local community and food supply chain and income.
- Labor influx and labour issues, risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA): in the project area: A number of workers will be engaged by the contractor to ensure completion of works as per schedule. The workers could come from the project sites or from the neighbouring areas. Some personnel will be involved in erection of pole with others in conductor stringing and installation activities. Working conditions including wages, working hours, use of child labor, sexual harassment among workers and to the community, and workers' grievances may arise. Further, cases of drunkenness, robbery and insecurity, sexual exploitation, and gender based violence and as well as pressure on existing social infrastructure may also be observed.
- Injuries or fatalities from improper manual handling. The most common injuries or illnesses connect to similar projects because of manual handling are musculoskeletal disorders in various parts of the body (back, neck, shoulders, or other) and include from sprains and strains to damage to muscles, joints, and vessels. Other injuries that may arise include cuts, bruises, lacerations, and fractures due to unexpected events such as accidents caused by manual handling.
- Possible increases of HIV/AIDS and other communicable diseases: Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases (STD) due to the increase of people from outside of the project zone may arise among workers. Though there is no workers camp site planned for this project communicable diseases contamination may be anticipated among workers.
- Health and Safety issues: Accidents including cuts, pricks and bruises; electrocution from naked electrical cables; falling in uncovered manholes and trenches, from raised places and on slippery could occur. accidents may also occur and resulting from lack of supervision and job training, improper handling of machinery and hand tools and inappropriate carrying out of tasks.
- Increased traffic in the project area: This project will be implemented in remote and rural areas where traffic is not intensive. In different areas only observed traffics (during the visits of the project sites) are those temporarily available from outside the project area transporting harvest, and other materials. However, during project implementation period, they will be increased of traffic due to moving vehicles transporting project materials and personnel. Therefore, young people may strike or run over by moving vehicles causing minor to major injuries (fractures, wounds) or, falling from vehicles, causing injuries and to some extent vehicles may hit people especially children playing in roads.
- Impacts on soil and water: The project works will involve excavations of pole sites and later back filling. Excavation may cause loss of soil and erosion leading to siltation of natural drainage systems and water courses. For this reason, impacts will only be limited to the top soils, without significant intrusion to underlying groundwater, bedrock or any geological features. Soils, surface waters and groundwater will be susceptible to contamination from various sources during the poles installation process. Soil erosion could occur as a result of the removal of vegetation and the disturbance of soils by vehicles or equipment in areas where the distribution lines will transverse, particularly the pole sites. Siting of poles also has to take into consideration local drainage patterns and climate variability, particularly changes in rainfall intensity in the targeted areas.
- Generation of Solid waste: During construction, different types of wastes will be generated. These may include the remains of conductors, conductor drums, left over insulators and other remains of the materials used in construction. Cardboards and other packaging are also expected. Solid and hazardous waste can cause a number of impacts on the surrounding environment. Except for the hazardous fraction of construction waste, the remaining material is likely to be mainly inert and does not pose a threat to human health or the environment. other human waste will also be generated by workers of the project.
- Noise and Vibration pollution: Noise and vibrations will result from construction works, including excavations, concrete mixing and compaction at pole spots, and from vehicles transporting materials, equipment and workers. The receptors of the noise and vibrations include project site workers, project nearby users and residential nearby areas in the vicinity of the proposed power distribution line routes.
- Impact on ambient air quality: During construction, the ambient air quality at local receptors may potentially be affected by increased dust, particularly during construction material haulage, vehicle movements on unpaved roads, dust from uncovered stockpiled powdery materials or truckloads, emission and particulates from vehicles,
- Human waste disposal issues: Sanitary waste will be an issue of concern since most of the workers will be carrying out various activities at the site throughout the day. The sensitive receptors are the water sources from which the

local community access water e.g. boreholes, unprotected springs, swamps, Lakes, Rivers and streams. Poor human waste disposal will affect the water sources and soil in the project area.

Negative impacts during operational phase and maintenance

- Theft of equipment and Vandalism of power distribution infrastructure: during the operation phase vandalism might lead to electrocution but the magnitude of the impact will be minor if the local community are sensitized on the negative effects of stealing and vandalizing electrical installations. Vandalism will also deny the local community the benefits of constant power supply due to the resulting disruptions.
- Soil and water pollution from transformer oil spillages: There is potential for accidental spillages from transformer oil at any stage of the project cycle that can be a source of concern i.e. during the preparation, construction stage at the equipment storage yard and during the operation phase when maintaining the transformers. This leakage can pollute soils and water sources. Accidental spills can also be experienced when transporting oil to the sites for purposes of filling transformers that may have leaked their oil during transportation, storage, or installation.
- Fire risk: The risk of fire outbreaks during bad weather e.g. storms, winds etc. cannot be overruled especially if electrical faults occur in the “mini” substations. Also failure to maintain the ROW could cause the overgrowth of nearby trees that could end up crashing on the lines during poor weather and hence cause fire outbreaks of black outs.
- Air pollution: Decommissioning impacts on air quality will be similar to construction impacts due to the presence of construction vehicles and trucks. This is considered to be a moderate negative impact as a result of localized dust.

Mitigation measures

Mitigation measures for each of the adverse impacts anticipated were proposed to an extent that they can be avoided, reduced, limited or eliminated, and manageable. Furthermore, an Environmental and Social Management Plan and an Environmental Monitoring Plan indicating the mitigation measures, the procedure to be followed, monitoring indicators, the responsible institutions and likely cost of implementing each of these mitigation measures have all been detailed in this report.

Land use restrictions is expected within the RoW and will be carried out in accordance with the prevalent laws of Rwanda, The WB ESS guidelines on Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5), which require identification and quantification of any impacts on land-based livelihood, and adequate compensation to landowners and people relying on the land for their livelihood. For this specific project, no land acquisition is planned. The location of transformers will be road reserves and public spaces. For line routes, landowners shall be able to continue to use the land with some restrictions on land use like construction of the houses under electrical lines, planting trees beyond 3 meters, etc as per RURA Guidelines. Fair compensation will be ensured for crops and trees to be affected by the project activities. Where applicable, compensation would be paid before the start of works. Another method to mitigate the impact of land restriction by the project is to allow the continuation of agriculture within the ROW on conditional terms and in compliance with strict vegetation management guidelines. As part of the livelihood restoration, PAPs will be guaranteed jobs during the project implementation.

Environmental and Social Management Plan (ESMP)

Mitigation measures have been identified through considering each impact, especially what can be done about the high and medium negative impacts. The mitigations are synthesized and presented as a final set of mitigation measures in the Environmental and Social Management Plan (ESMP).

Implementation and monitoring arrangement

REG/EDCL is the lead agency in the implementation of the developed ESMP and the overall project monitoring. Its main role will be to implement the recommended mitigation measures for each impact identified. Contractors of the project will also work hand in hand with the districts to implement the provided impact mitigation measures. An Environmental and Social team under EDCL is assigned to formally address environmental and social issues on a routine basis and will have oversight of environmental and social aspects of the construction contracts, including the enforcement of all monitoring provisions, the location of temporary storage sites for poles and other materials, the resolution of any complaint arising from PAPs, etc.

Conclusion

Given the nature, location and, planned project works, the consultant has identified impacts pertaining to the project and has recommended their mitigation measures with a detailed Environmental and Social Management Plan (ESMP) that

provides a way forward for their implementation. Project benefits are found to be far outweighed the negative impacts and for which a mitigation plan has been prepared. To this extent, the consultant is the view that the project be implemented with careful implementation of proposed measures. Taking into consideration that detailed design is not yet available to assess site specific impacts, it is recommended that the contractor's contracts include the provisions to prepare and implement a detailed contractor's Environmental and Social Management Plan (C-ESMPs) once the detailed design is finalized. Further, it is recommended to prepare a Resettlement Plan for crops and trees to be affected in the right of way and where poles will be installed. The estimated amount for the implementation of proposed mitigation measures is estimated at **559,100 US\$** including compensation funds estimated at **284,100 US\$** and will be updated based on the final detailed design and C-ESMPs.

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ACRONYMS

7YGP	: 7-Year Government Program
AIIB	: Asian Infrastructure Investment Bank
ASCENT	: Accelerating Sustainable and Clean Energy Access Transformation
BESST	: Bureau for Engineering and Environmental Studies CO ₂ : Carbon Dioxide
CFR	: Critical Forest Reserves
EAC	: East Africa Community
EDCL	: Energy Development Corporation Limited
EIA	: Environmental Impact Assessment
ESIA	: Environmental and Social Impact Assessment
ESMF	: Environmental and Social Management Framework
ESMP	: Environmental and Social Management Plan
ESS	: Environmental and Social Standards
ESSP	: Energy Sector Strategic Plan
EUCL	: Energy Utility Corporation Limited
GOR	: Government of Rwanda
ICT	: Information & Communication Technology
LMP	: Labour Management Procedures
LV	: Low Voltage
MINECOFIN	: Ministry of Finance
MININFRA	: Ministry of Infrastructure
MoE	: Ministry of Environment
MV	: Medium Voltage
MW	: Mega Watts
NGOs	: Non-Governmental Organizations
NST2	: National Transformation Strategy – Phase 2
OHS	: Occupational Health and Safety
OS	: Operational Standards
RDB	: Rwanda Development Board
REG	: Rwanda Energy Group
REMA	: Rwanda Environment Management Authority
RoW	: Right-of-Way
RPF	: Resettlement Policy Framework,
RSSB	: Rwanda Social Security Board
RUEAP	: Rwanda Universal Energy Access Program
RURA	: Rwanda Utility Regulatory Agency
SDGs	: Sustainable Development Goals
SEP	: Stakeholder Engagement Plan
WB	: World Bank

1. INTRODUCTION

Rwanda is undergoing significant socio-economic development, and it is imperative to have facilities that can support the country's ambitions. In this framework, the Government is making effort to increase infrastructure facilities including the sustainable supply of electricity in both urban and rural areas with the target of achieving a 100% access to electricity by the year 2024 countrywide. Under the First National Strategy for Transformation (NST1) for 2017–2024, Access to electricity also surged from 34.4% to 78.9 % (MINICOFIN, 2024). Under NST2(2025-2029), the country intends to scale up of access to electricity and will focus on connecting productive users (such as industries, commercial facilities, schools, health facilities, agro-processing plants, and other facilities) that contribute to socioeconomic development. The ongoing initiatives to provide households with electricity will continue, with the goal of scaling access up from the current level of 78.9% by ensuring that electricity is accessible in all cells of the country.

The NST2 aims to lay the foundation for achieving upper-middle-income country status by 2035 and high-income status by 2050. It is guided by the Sustainable Development Goals (SDGs), the Africa Union Agenda 2063 and its first 10-Year Implementation Plan 2014–2023, and the East African Community (EAC) Vision 2050. The Government of Rwanda (GoR) has also demonstrated its ability to implement large-scale investment programs that pool funds from multiple development partners under a 'Sector Wide Approach', including in the energy sector. To achieve the above objective, the Government of Rwanda in collaboration with multi-Donor partners (MDPs) designed the Rwanda Universal Energy Access Program (RUEAP) which has the main objective of improving access to energy and efficiency of energy service delivery to households, businesses, and public institutions in Rwanda. Under NST2, the country will focus on scaling up access to electricity (on-grid/ off-grid) to productive users (industries, health facilities, schools, agro-processing plans among others) and rolling out access to electricity in all cells of the country to facilitate household connections, Increase energy generation capacity to meet demand projection and maintain the spinning reserve and Increase the share of renewable energy in power generation mix.

1.1. ASCENT Project description

The ASCENT is a large energy sector investment financing project to support the Government of Rwanda's energy access objectives to achieve energy sector targets. Project would have a total volume of an estimated US\$ 400 million. The total IDA investment would be US\$300 million and US\$ 100 million investments from AIIB, spread across four components of i) increasing access to grid electricity, ii) enhancing the efficiency of electricity service, iii) increasing access to off-grid electricity and clean cooking solutions, and iv) Institutional Capacity Building, Technical Assistance and Implementation Support for energy access acceleration. The grid-related and technical assistance components will be implemented by the ASCENT Project implementation Unit (PIU). It will use Energy Access and Quality Improvement Project (EAQIP) staff, a project in Energy Development Corporation Limited (EDCL), which is the continuity of Energy Access Roll out Program (EARP) that has demonstrated its effectiveness under the Electricity Access Scale-up and Sector Wide Approach (SWAp) Development Project (EASSDP) project (IDA16). The Component 3 "Increasing Access to Off-Grid Electricity, Clean Cooking Solutions, and Productive Uses of Energy (PUE)" - more specifically sub-components 3a, 3b, 3c and 3d - will be implemented by the Development Bank of Rwanda (BRD) which will administer and disburse the funds to the service providers while EDCL will be the technical counterpart focusing on the implementation of sub-component 3e which is about Increasing access to clean cooking for public Institutions.

The World Bank and AIIB funds will be used to connect about 420,000 households (including 79,000 fill-in connections). The districts to be covered under the project are Gisagara, Huye, Muhanga, Nyamagabe, Nyanza, Nyaruguru, Ruhango, Bugesera, Gatsibo, Kayanza, Kirehe, Ngoma, Nyagatare, and Rwamagana. Other districts can be considered during project implementation. The financing will help these districts to reach 75 percent electrification, as well as support fill-in connections in areas with existing grid connectivity. Fill-in connections will be done in the Musanze, Rubavu, Nyagatare, Rwamagana, Gatsibo, Ruhango, Bugesera, Kamonyi, Muhanga, and Nyanza districts, and potentially other districts identified during implementation. Project implementation will commence in areas with no ongoing electrification projects and will commence in a phase-wise manner in areas with ongoing electrification projects

This ESIA report focuses on the design, supply and installation of new MV and LV lines; design, supply and installation of distribution transformer for distribution network reinforcement; in all districts of the western Province namely Rubavu, Karongi, Nyabihu, Nyamasheke, Ngororero, Rusizi and Rutsiro. The map below indicates the administrative District allocation of each development partner whereby the co-financing has the same colour as shown below:

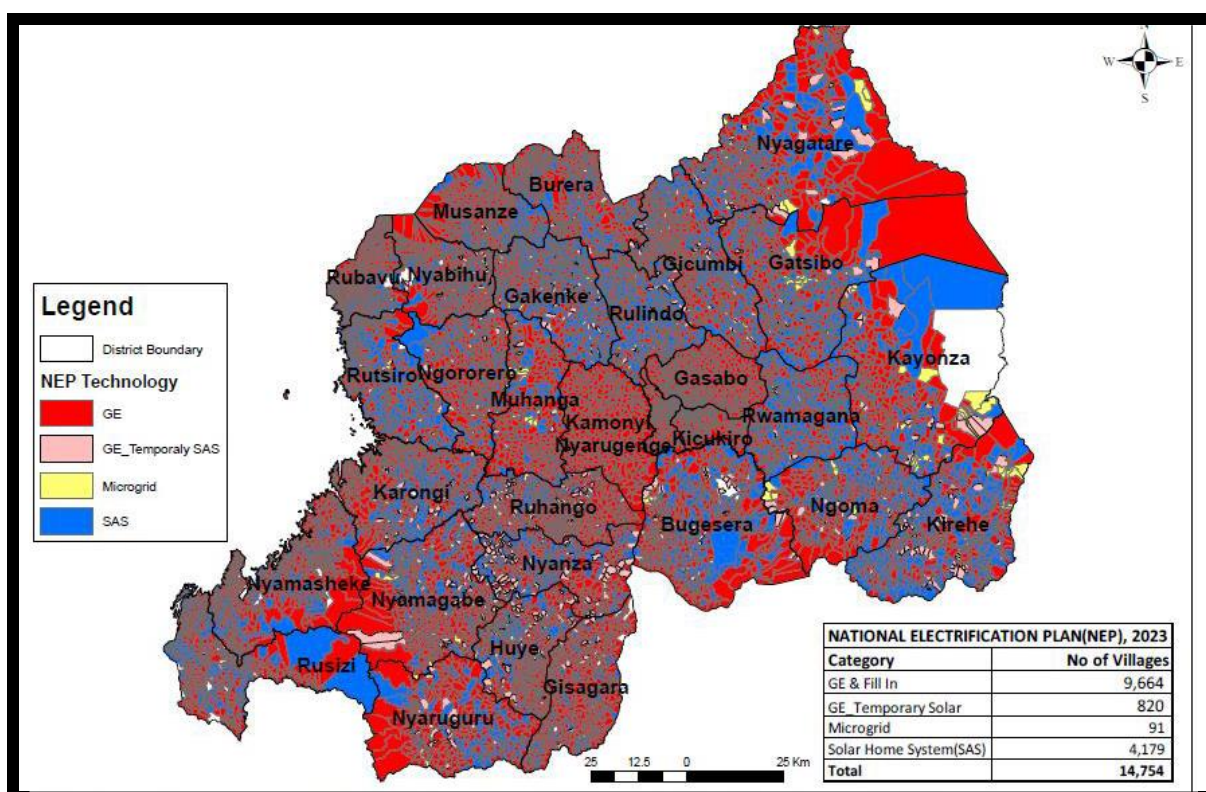


Figure 1: Proposed map indicating the project location and scope

Source: REG-EDCL, 2024

Table 1: Summary ASCENT Project components

Project Components		Link to MPA Program Pillars	IDA US\$ (m)	AIIB US\$(m)	Total US\$(m)
1	Increasing Access to Grid Electricity	Pillar 2: Expanding Grid Electrification through investments in grid network expansion and reinforcement	207.75	69.25	277
2	Enhancing the Efficiency of Electricity Services		54.75	18.25	73
3	Increasing Access to Off-Grid Electricity and Clean Cooking	Pillar 3: Scaling Distributed Renewables and Clean Cooking through financing of off-grid solar and clean cooking solutions, including through private sector mobilization	22.5	7.5	30
4	Institutional Capacity Building, Technical Assistance and Implementation Support for Energy Access Acceleration	Pillar 1: Platform to accelerate energy access through development of institutional capacity and mobilization of funding, including scaling up climate funding	15	5	20
Total financing			300	100	400

Source: RUEAP, ESMF-ASCENT, 2024.

1.2. ESIA consultant

The present ESIA report was prepared by the Bureau for Engineering and Environmental Studies (BESST Ltd). BESST Ltd is a private company registered with the Rwanda Development Board (RDB) and is a certified EA firm of expertise under the Rwanda Association of Environmental Professional Practitioners (RAPEP/EA/071). It has its headquarters in Kigali Rwanda, Gasabo district, KG 182 St, Martin Plaza, second Floor. The company is specialized in Environmental Studies, Social Studies, Feasibility and Engineering design studies, social assessment, Involuntary Resettlement, Climate Change risk assessment, socio-economic assessment, baseline surveys, waste management, water and sanitation, and advisory services in sectors ranging from Agriculture, energy development, Infrastructure and housing development, transport, and water supply.

1.3. Project Implementing entity

The present project will be implemented by the Rwanda Energy Group (REG). REG has established a Project Implementation Unit (PIU) in its subsidiary, EDCL, to provide the leadership that will run the project in coordination with the departments within EDCL. The PIU is responsible for ESMF development and approval and control over its implementation and advice to EDCL and the Contractor on compliance with WB Environmental and Social Standards, and national laws in the field of environmental and social protection during all project activities. The PIU will carefully analyze the project scope, their availability to the project activities and their capacity for the successful implementation of the project. If need be, they can suggest additional supporting staff for the project and ESMF/ESIA implementation.

The project will utilize the implementation arrangements of the on-going EAQIP (P172594) and Renewable Energy Fund (REF; P160699) and will be jointly implemented by EDCL. As under EAQIP, EDCL will cover all grid-related components (components 1 and 2), the institutional clean cooking program (subcomponent 3e), and the overall program coordination. Using the same implementation arrangements that are efficiently working under EAQIP will eliminate duplication of effort and transaction costs for the GoR, enhance the efficiency of implementation, strengthen the capacity of the Government institutions, and help streamline development partner coordination of the program. The project will utilize the existing PCU that was created for the implementation of the RUEAP program, under which the EAQIP project is being implemented

1.4. Objectives of the ESIA study

The overall objective of the assignment is to develop an Environmental and Social Impacts Assessment (ESIA) and Environmental and Social Management Plan (ESMP) to ensure that the project is implemented in an environmentally and socially sustainable manner and full compliance with Rwandan and other international environmental and social policies and regulations/standards. These include the World Bank and AIIB Environmental and Social Standards triggered by the project. The ESIA shall also comply with all provisions included in the framework documents including the Environmental and Social Management Framework (ESMF), Resettlement Policy Framework (RPF), Labour Management Procedures (LMP) and Stakeholder Engagement Plan (SEP).

The specific objectives are to:

- Contribute to the environmental and social design of the project;
- Establish a baseline for biophysical, climatic conditions and socio-economic data of the project areas of intervention;
- Identify all potential adverse environmental and social impacts of the project and recommend mitigation measures;
- Develop a comprehensive Environmental and Social Management Plan (ESMP), which will include costs for mitigation;
- Identify appropriate measures for mitigating the potential negative impacts of the project.
- Facilitate informed decision-making, including setting environmental terms and conditions for implementing the project;
- Prepare an ESIA Report for submission to the Rwanda Development Board (RDB) for project approval and EIA Certificate issuance.

1.5. Scope of the study

Scoping of the study was conducted to collect relevant information to ensure that the ESIA is prepared in compliance with national and international guidelines and procedures. The study covered the impacts of the projects of design, supply and installation of new MV and LV lines; design, supply and installation of distribution transformer for distribution network reinforcement; and upgrading the single lines to three phases lines in the western province. Both environmental and social impacts were covered from the planning phase, construction, and operational phases and considered the site selected and its surroundings mainly this ESIA covers component one under ASCENT project. The scope involved to:

- Identify which legislation, and policies (both local and international) are likely to influence this project and how the project will comply with these regulations. Both national and internal were reviewed
- Develop an overview of the baseline environment of the project intervention area. i.e. study area description, physical, biological, and social- economic-environment etc.
- Develop an overview of likely impacts (both positive and negative) that could be caused by the project in its all phases.

- Propose mitigation measures against the predicted adverse impacts.
- Propose an Environmental and Social Management Plan (ESMP) on how these mitigation measures can be implemented.
- Propose an Environmental and Social Monitoring Plan with measurable indicators and parameters for these mitigation measures to ensure the sustainability of the project.

1.6. Approach and methodology

The methodology used to conduct this environmental and social impact assessment was drawn from the general guidelines for conducting ESIA in Rwanda, the terms of references provided by the client and as approved by the Rwanda Development Board, the consultant's technical proposal, and the best practices drawn from international environmental and social policies to conduct such studies. It involves several stages from scoping to understanding and establishing boundaries of the study, the desk review, field visits, review, consultations with stakeholders and local residents existing data analysis (secondary and primary data), prediction of positive and negative impacts, analysis of alternatives, and proposal of mitigation measures leading to the preparation of an Environmental and Social Management Plan and Monitoring Plan. Given that the project is an EPC and detailed design is not yet conducted, the environmental and social Impact assessment was based on available information in the preliminary feasibility study, specifications included in tender documents and information collected during field visits in sample location in districts of western Province of Rwanda namely Rubavu, Karongi, Rutsiro, Nyamasheke, Rusizi, Ngororero, and Nyabihu. And focuses on the design, supply and installation of new MV and LV lines; design, supply and installation of distribution transformer for distribution network reinforcement; and upgrading the single lines to three phases lines in the above-mentioned districts. The stakeholders were consulted during the preparation of this ESIA report and the annex 3 indicates the contacted stakeholders and their concerns or suggestions have been considered as part of this ESIA Report.

1.6.1 Documents review

A desk work was done concentrating on existing institutional legislation, policies, and laws that are likely to influence the project development. Among the key reviewed documents, they include:

- Environmental and Social Management Framework for (ESMF) ASCENT
- Resettlement Policy Framework (RPF) for ASCENT
- Environmental and Social Commitment Plan (ESCP)
- Fifth Population and Housing Census – 2023
- Stakeholder engagement Plan (SEP) for ASCENT, World Bank Environmental and Social standards
- District development strategies (DDSs)
- World Bank ESF

1.6.2 Socio-Economic baseline data collection

Socio-economic baseline data used were collected in different project areas of intervention through a survey and interviews with local resident. Primary data were collected during the sites visit which were conducted in this region from the 29th January up to 5th February 2024. Data collection used interviews, key informants and focus group discussions. The collected data were completed by data generated from the 5th Population and Housing Census conducted by the National Institution of Statistics (NISR) as published in 2023. The presented data covers the Western province and only indicators related to the project were selected. Used data provided are dependent on the information generated for the thematic report of the census, the details on baseline socio-economic is found in chapter 4 of this ESIA Report.

1.6.3 Physical and biological baseline survey

The physical and biological data were collected from literature review for each district and the information gained was enriched during the filed surveys and included those reported by residents of the project areas that were collected during interviews. Information collected during the field surveys includes those related to the fauna and flora of the project sites. Data were collected using a check list that was developed prior to site survey. Photo using camera was also used to collect enough data that were analysed in return after the survey. For assessing the conservation status of each species, we used the IUCN Red List of Threatened Species, version 2020-2 (IUCN, 2020). In addition, the ministerial order No 007/2008 of 15/08/2008 establishing the list of protected animal and plant species was consulted to identify plant and animal species protected in Rwanda. It is most important to note that there were no endangered or listed species on the IUCN red list or any species protected in Rwanda that were recorded to be affected by the

project activities. This is mostly due the fact that in the project areas as most of the line routes will be passing along the existing buffer zones of the roads of the project areas whereby vegetation is almost cleared and only bushes and shrubs are noted. In the districts with National parks such as Nyungwe and Mukura –Gishwati, the project will not affect any of them since it will not pass in any of these protected and conserved areas. The list of typical surveyed flora and fauna and collected from interviews with local residents is provided in annex 13 of this report.

1.6.4 Stakeholders' consultations

Information collected from the preliminary desk review was completed by information obtained through interviews with key different stakeholders. The methodology used for stakeholder consultation consisted of interviews and meetings that were organized at different locations of the project sites. At each site, the consultant used a guiding questionnaire with a topic for discussion to provide information about the project. Discussions allowed participants to provide their opinions, and concerns to the project as well as provide some guidance and recommendations. Telephone calls were also used to gather information and data, especially from REG branches operating in the project areas. the attendance list and photolog of the consulted people is available on annex 3 of this Report.

2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The project's Environmental and Social Impact assessment is conducted to ensure that the proposed project is aligned with and contributes to national and international sustainable development. Thus, the process includes the identification and description of relevant laws, regulations, and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, etc.

In Rwanda, the national development objectives and environmental management targets are well established in both long-term and short-term strategic plans. This is noted in the Vision 2050 aspirations that provide national targets by 2050 in terms of developments and environmental sustainability as well as the National Transformation Strategy (NST1, 2018-2024) that breaks down the long-term targets into medium-term targets. To this extent, policies, laws, regulations, and institutional framework that will oversee the implementation of the present project and the implementation of proposed mitigation measures are provided in this chapter.

2.1 National Legal and Regulatory Framework

2.1.1 National Policies relevant to this sub-project implementation in Western Province

✓ **Constitution of the Republic of Rwanda, 2023**

In consideration of the constitution of the Republic of Rwanda of 2023, article 53 on Protection of the environment, states that everyone must protect, safeguard, and promote the environment. The State ensures the protection of the environment. A law determines modalities for protecting, conserving, and promoting the environment.

✓ **Energy Policy (2015)**

The national policy objective for the development of the energy sector is to provide input in the development process by establishing efficient energy production, procurement, transportation, distribution, and end-user systems in an environmentally sound manner.

Specifically, the energy policy takes into consideration the need to:

- a) Have affordable and reliable energy supplies countrywide;
- b) Reform the market for energy services and establish an adequate institutional framework, that facilitates investment, expansion of services, efficient pricing mechanisms, and other financial incentives;
- c) Enhance the development and utilization of indigenous and renewable energy sources and technologies,
- d) Adequately consider environmental considerations for all energy activities,
- e) Increase energy efficiency and conservation in all sectors; and
- f) Increase energy education and build gender-balanced capacity in energy planning, implementation, and monitoring.

✓ **National Land Policy (2019)**

Currently, the land tenure system in Rwanda operates in a dual legal system: On one hand, there is customary law, which governs almost all the rural land and promotes the excessive parcelling out of plots through the successive father-to-son inheritance system. On the other, there is the written law, which mostly governs land in urban districts and some rural lands managed by churches and other natural and legal persons. This law confers several land tenure rights to individuals such as land tenancy, long-term lease, and title deeds (particularly in towns).

✓ **National Strategy for Transformation (NST2)**

Building on the solid foundations laid by NST1, the five-year strategy seeks to transform Rwanda into a prosperous, inclusive and resilient nation based on five key priorities: creating decent and productive jobs, boosting exports, improving education quality, reducing stunting and malnutrition, and enhancing public service delivery.

Among 14 key objectives on the NST2 include Universal Access to Clean Water and Electricity: By 2029, NST2 aims to ensure that every household, school, and health facility in Rwanda has access to clean water, sanitation, hygiene services, and reliable electricity. This commitment to universal access to electricity will transform lives, improve health, and empower communities across the nation. Under the NST1, Access to electricity also surged from 34.4% to 78.9 % (MINICOFIN, 2024) and under NST2(2024-2029), the country intends to scale up of access to electricity and will focus on connecting productive users (such as industries, commercial facilities, schools, health facilities, agro-processing plants, and other facilities) that contribute to socioeconomic development. The ongoing initiatives to provide

households with electricity will continue, with the goal of scaling access up from the current level of 78.9% by ensuring that electricity is accessible in all cells of the country.

✓ **National Environment and Climate Change Policy (2019)**

The Environment and Climate Change Policy reaffirms the government's commitment to address climate change and its resolve to lessen the potential hardships that climate change may pose to the sustainable development of the country. The policy seeks to provide strategic direction on environment and climate change in Rwanda, bearing in mind its linkages with the country's socio-economic development. The National Environment and Climate Change Policy provides strategic direction and responses to emerging issues and critical challenges in environmental management and climate change adaptation and mitigation. The key issues and challenges identified include high population density, water, air, and soil pollution, land degradation, fossil-fuel dependency, high-carbon transport systems, irrational exploitation of natural ecosystems, lack of low-carbon materials for housing and green infrastructure development, inadequate waste treatment for both solid and liquid waste, increase of electronic, hazardous chemicals and materials waste, among others.

It is evident that the energy component, particularly the production and promotion of clean energy and making it accessible to the citizens is central to the policy, especially implicitly implied in strategic objectives (1) Greening economic transformation; and (4) Promoting climate change adaptation, mitigation, and response. The ESIA is a key instrument to ensure environmental sustainability and hence an element toward the realization of the policy's goals and objectives.

✓ **National Strategy for Climate Change and Low Carbon Development (2022)**

Rwanda's Green Growth and Climate Resilience vision and Vision 2050 are for Rwanda to be a developed, climate-resilient, and carbon neutral economy by 2050.

In achieving this vision there are three Strategic Objectives:

- To achieve Energy Security and Low Carbon Energy Supply that supports the development of Green Industry and Services and avoids deforestation.
- To achieve Sustainable Land Use and Water Resource Management that results in Food Security, appropriate Urban Development, and preservation of Biodiversity and Ecosystem Services.
- To ensure Social Protection, Improved Health, and Disaster Risk Reduction that reduces vulnerability to climate change impacts.

Together these refer to the elements upon which Vision 2050 is built, namely the infrastructure and systems that enable low-carbon growth and sustainable resource use, the natural capital and associated spatial development that ensure sustainable development, and the human capital and inclusion that build resilience of the Rwandan people. The purpose of the Strategy is threefold:

- To guide national policy and planning in an integrated way, ensuring alignment with other key documents
- To mainstream climate change into all sectors of the economy, and
- To position Rwanda to access international funding to achieve climate resilience
- and low carbon development

The Strategy calls upon national planners to chart a new development pathway for integrated sector planning that focuses on balancing cross-cutting issues of resource management. The Strategy is the first step in a continuous process, geared to set Rwanda on a course to identify, describe and monitor its current and future vulnerabilities, and take self-determined actions towards building a robust economy. In the next 5 to 10 years the priority is to increase electricity generating capacity and increase connections to the main grid. Small and medium scale hydro-electric plants will be delivered to ensure as electricity generation increases to power households and industries it does so exploiting green technologies as much as possible. The share of households connected to the main grid will progressively increase once the universal access target (of which 52% connected to the grid) is reached in 2024, and a major priority to build on this progress will focus on generating green energy to power productive economic sectors

✓ **Energy Sector Strategic Plan (2018/19 – 2023/24)**

Energy is central to Rwanda's economy and development plans. It supports all other sectors, including housing and urbanization, manufacturing, agro-processing, mining, tourism, and IT services. As such, a well-functioning, efficient energy sector is a prerequisite for achieving the country's national goals. The ESSP will ensure the effective delivery of the targets for the energy sector as set out under the National Strategy for Transformation (NST-1) and guide the implementation of the National Energy Policy (REP). The ESSP thus functions as a plan that serves to translate policy directives and principles into concrete measures necessary to reach medium-term targets, reflecting current resource

constraints and risk and uncertainties. This Strategy takes stock of the previously existing policies, strategies, and laws about Energy sector in Rwanda. The project aims at the realization of this Strategy's objectives.

✓ **Rwanda Rural Electrification Strategy (2016)**

The Government of Rwanda recognizes the vital role that electricity access plays in accelerating economic development through improving health and standards of living. Energy and particularly access to electricity is the Government's key priority. This is why significant investments have been made and progress registered leading to over 24% of households getting access to electricity. More efforts need to be made for the Government to achieve the set targets of 70% by 2017/18 and 100% by 2020. The Government developed this strategy to ensure that Rwanda's households have access to electricity through the most cost-effective means by developing programs that will facilitate both the end users to access less costly technologies and increase private sector participation in the provision of these solutions.

✓ **National Biodiversity Policy (2011) and Strategy (2020)**

The National Biodiversity Policy recognizes that Rwanda's viability is dependent on the conservation of its biological resources as these resources contribute significantly to livelihoods, food sovereignty, health, the environment, cultural diversity, and the economy. Yet despite the high richness of the Rwanda's biological diversity, the latter continues to reduce worryingly due to population pressure and development needs. This Policy's goal is therefore:

To conserve Rwanda's biological diversity, to sustain the integrity, health, and productivity of its ecosystems and ecological processes, whilst providing lasting development benefits to the nation through the ecologically sustainable, socially equitable, and economically efficient use of biological resources. The Purpose of this policy is to: provide an overarching framework for the conservation, sustainable utilization, access to biodiversity resources, and fair and equitable sharing of benefits derived from the resources.

Therefore, this policy provides for the establishment of a System of Protected Areas whose protection and management are guaranteed by law. In this regard, no activity can be undertaken within the limit of these Protected Areas without the specific authorization of the concerned authorities. The ESIA will endeavour to identify which elements of the biodiversity could be affected by the project and establish the relevant mitigation measures.

✓ **National Forest Policy (2018)**

The National Forest Policy is concerned with issues related to forests, but also to the ecological and economic safety of trees, bush research, forestry under any form, and capacity building. The purpose of that policy consists in making forestry one of the pillars of the national economy and ecological viability.

The ESIA will endeavour to assess if forests and individual trees could be affected during project implementation, through clearing for right of way. Adequate compensation will be implemented accordingly. Restoration of affected trees will be done through repletion of the same affected tree species.

✓ **Revised National Gender Policy (2021)**

The 2021 gender policy emphasizes on effective engagement of men and boys and accelerating gender mainstreaming in the private sector – the engine of Rwanda's economy. The vision of this National Gender Policy is for Rwanda to become a nation that enjoys gender equality and equity toward national and sustainable transformation. The policy requires that institutions devise mechanisms and programs to ensure shared responsibility between men and women over domestic work/unpaid work as well as the use of time and energy saving investments by securing alternative energy sources for cooking.

Furthermore, the policy strengthens existing community structures such as Umugoroba w'Imiryango, Inshuti z'Umuryango to prevent and eradicate Gender Violence (GBV) and child abuse. These will include capacity enhancement of these structures, provision of incentives to care for workers, and provision of clear guidelines for the operationalization of these. It also enhances accountability and access to justice for victims of GBV both men and women, boys and girls. In the framework of implementing this policy, the role of every actor is defined in the light of the decentralization policy, where the implementation role is passed on from the central government to local governments. As part of the implementation of this project, through ESMP, the contractor will make sure to promote recruitment procedures and a working environment that considers gender differences and inequalities.

2.1.2 National Regulations

✓ **Law n°48/2018 of 13/08/2018 on environment**

The law on environment regulates the protection of the environment in Rwanda and sets out the general legal framework for environmental protection. The law requires to preparation and implementation of environmental management instruments and get required permits before any construction. **Article 30** stipulates that the list of projects that must undergo an environmental impact assessment before they obtain authorization for their implementation is established by an Order of the Minister. An Order of the Minister also issues instructions and procedures for conducting environmental impact assessment. **Article 33** of this law stipulates that the environmental impact assessment, environmental audit, and strategic environmental assessment must be approved by the Authority, or another State organ authorized in writing to do so by the Authority. If the approval is made by an authorized organ, such an organ does so on behalf of the Authority which is also responsible for its audit. **Article 46** stipulates that any person who does not carry out environmental impact assessment before launching any project that may have harmful effects on the environment while it is required, is punished by suspension of his/her activities or closure of his/her association and ordered to rehabilitate the damage to environment, persons, and property. He/she also pays an administrative fine of two percent (2%) of the total cost of the project.

The project will comply with the requirements of the law to get the environmental instruments and get required permits before the project starts. The ESIA process responds to obligations under this law and will ensure that the key principles, as well as the relevant provisions of this law, are fully complied with.

✓ **Law n° 32/2015 of 11/06/2015 relating to expropriation in the public interest.**

The Law determines the procedures relating to expropriation in the public interest. **Article 3** of this law notes that 'No person shall hinder the implementation of the program of expropriation in the public interest on the pretext of self-centred interests. **Article 17** states that after the publication of a decision on expropriation in the public interest, complete with a list of holders of rights registered on land titles and property incorporated on land, landowners shall not develop any long-term activities on the land, otherwise such activities shall not be compensable during expropriation. In terms of valuation, **Article 22** states that land values and prices for property consistent with the prevailing market rates shall be established by the Institute of Real Property Valuers in Rwanda.

According to **Article 26** land titles must be produced as evidence of ownership and evidence of marital status as applicable. Any persons dispossessed of land, unlawfully occupying land, or having developed activities prohibited after the enactment of relevant laws shall receive no compensation. **Article 27** reaffirms that compensation for land must include any improvements on the land and compensation for disruption associated with expropriation. The compensation for disruption caused by expropriation to be paid to the expropriated person shall be equivalent to five percent (5%) of the total value of his/her property expropriated.

Article 32 refers to a sign-off by the owner once he/she is satisfied with the valuation. **Article 33** allows for any person not satisfied with the valuation to contest in writing within seven days. Any person contesting the assessed value must engage the services of a valuer or a valuation firm recognized by the Institute of Real Property Valuer in Rwanda, at their own expense, to carry out a counter-assessment of the value. Under **Article 34** if unsatisfied the matter may be referred to the courts. However, the compensation will be paid pending the court's decision so as not to delay expropriation. In terms of payment of compensation, **Article 35** notes that, 'fair compensation can be paid in monetary form in the Rwandan currency, or any other form mutually agreed upon by the expropriator and the person to be expropriated'. **Article 36** notes that compensation must be paid within 120 days of approval by the Ministry, or otherwise becomes null and void, unless mutually agreed otherwise.

✓ **Law No 27/2021 of 10/06/2021 governing land in Rwanda**

Article 34 stipulates that the landowner shall enjoy full rights to exploit his/her land by the provisions of this Law and other laws. The State recognizes the right to freely own land and shall protect the landowner from being dispossessed of the land whether totally or partially, except in case of expropriation due to public interest. The project implementation will consider the ownership and use of land, specifically taking note of land tenure and related compensation matters. The ESIA will provide an avenue for compliance with this law, while its provisions are to be addressed through the Compensation schemes.

✓ **Law No 52/2018 of 13/08/2018 governing electricity in Rwanda**

This Law governs activities of electric power production, transmission, distribution, and trading within or outside the

national territory of the Republic of Rwanda. Under this law, there is an establishment of a Universal Access Fund whose main purpose is to optimize access to electricity in all areas of the country through cost-effective means and minimized support. A Presidential Order determines the functioning of the Universal Access Fund.

With regards to the Right of Way, Art 47 provides for authorization to operate in a public or a private domain to be granted for electricity transmission or distribution license holder. However, Art 48 provides for an Expropriation of the right of way for the public interest. The right of way is necessary for the operators in the production, transmission, distribution, and supply of electricity. It shall be exercised by the standards set by the regulatory agency. Expropriation shall be conducted by the Law governing expropriation for public interest.

✓ **Law N° 70/2013 of 02/09/2013 Governing Biodiversity in Rwanda**

The purpose of this Law is to determine modalities for the management and conservation of biological diversity within Rwanda. Under this Law, Art 14 stipulates that an Order of the Minister shall set out a national list of ecosystems that are threatened and in need of protection and their location, which shall refer to:

- critically endangered ecosystems;
- endangered ecosystems;
- vulnerable ecosystems;
- Other ecosystems with high conservation value or of high national importance.

Art 17 precises that activities involving species or specimens included on the list of endangered or protected species are prohibited unless authorized by the Minister.

The ESIA will determine sensitive and protected ecosystems to be affected by the project and devise alternative or mitigation measures.

✓ **Law N° 66/2018 of 30/08/2018 regulating labor in Rwanda and its amendment of 18/05/2023**

Labor law is fundamental in creating and maintaining employee relations, high productivity, and a conducive work environment. Rwanda repealed the labour law in 2018 to align it with international best practices. The new labour law distinguishes between collective and individual labour disputes. By this law, an employer is responsible for maintaining the health and safety of the workers at the workplace. The employer is required to keep the workplace in a common state of cleanliness and presentation of hygiene & safety necessary for the health and safety of workers.

✓ **Law N° 064/2021 of 14/10/2021 Governing biological diversity in Rwanda**

The purpose of this Law is to conserve, manage, protect and promote biological diversity. Under this Law, Art 13 stipulates that Every person has the duty to defend, protect, conserve and promote the biological diversity. The article 15 stipulates that a Ministerial Order establishes the list of invasive species and this list is reviewed every five (5) years and whenever necessary. Art 16 highlights that activities involving species or specimens included on the list of endangered or protected species as annexed to the law are prohibited unless authorized by the Minister.

It is important to note that there was no sensitive and/ or protected biological diversity as established on the list that has been identified of expected to be affected by the project.

✓ **Ministerial order No 001/2019 of 15/04/2019 on EIA**

This order determines the list of projects that must undergo environmental impact assessment, instructions, requirements, and procedures to conduct environmental impact assessment. Its article 3, Annex 1 gives the list of works, activities, and projects that have to be subject to a full environmental impact assessment before being granted authorization to commence. Number 12 of this annex puts this project on the list of projects that must undergo the full EIA. It stipulates that project of construction of hydro-dams, hydropower plants, and electrical lines of high and medium voltage must undergo the full EIA before the commencement of the Works.

✓ **Ministerial Order No. 007/2008 of 15/08/2008**

According to this Ministerial Order, the species of protected animals are classified into: Mammals, birds, and reptiles (Art 1) and are listed in Appendix I of this Ministerial Order. These animals should not be hunted except when there is prior authorization from competent authorities (Art 2). This list comprises:

Annex 1: - Mammals: 18 species

- Birds: 15 species

- Reptiles: 4 species

Annex II: - Plants: 27 species

The ESIA will determine sensitive and protected species to be affected by the project and devise alternative or mitigation measures.

✓ **Environmental Impact Assessment Guidelines 2006**

REMA has developed the EIA regulations which provide a guide and requirements for EIA in Rwanda. According to these regulations, Article 1 makes it mandatory for all the projects listed under Schedule I to be subjected to a full-scale EIA.

The Article further states that no environmental authorization shall be granted by the Authority for any project in Schedule I to these Regulations if no environmental impact assessment has been submitted to the Authority by the provisions of these Regulations. The Article states that any project listed under Impact Level III of Schedule I to these Regulations shall require a full environmental impact assessment by preparation of an environmental impact report, unless the Authority refuses permission.

2.2 National Institutional Framework

2.2.1. Institution framework for energy and environmental management

The next table provide key institutions involved in environmental and social risks management as well as energy sector in Rwanda including key roles and responsibilities.

Table 2: National Institutional Framework

Institution	Objective/ Vision	Roles/ Responsibilities
Ministry of Infrastructure (MININFRA)	The Ministry of Infrastructure (MININFRA) is responsible for four sectors: transport, energy, water and sanitation, urbanization-human settlements, and housing. For the energy sector, MININFRA oversees the formulation, monitoring, and assessment of policies and programs. Its mission is also to ensure the existence of a proper power generation capacity producing cost-effective energy and to initiate programs to increase access to affordable energy and services	The ministry is not directly involved in activities involved under ASCENT but projects activities are designed and implemented in compliance with policies and strategies established by the ministry.
Rwanda Energy Group Ltd (REG)	REG's vision is "to be the most efficient and customer-centric utility company in the region". It aims to transform the industry, its dynamic and performance, and to reinforce its customer-centred operations in order "to provide sufficient and quality electricity to our customers at affordable and sustainable rates that support the socio-economic development of the country." Since REG Ltd has taken over the energy operations formerly under EWSA, the Group is composed of two subsidiaries, namely Energy Utility Corporation Limited (EUCL) and Energy Development Corporation Limited (EDCL).	REG works closely with both EUCL and EDCL in the implementation of ASCENT activities.
Energy Utility Corporation Limited (EUCL)	EUCL is the subsidiary utility in charge of the day-to-day operation of generation facilities, transmission and distribution networks, and the sale of electricity. EUCL plans the transmissions and distribution grids. Its current focus is geared toward consumer satisfaction, demand side management, technical and non-technical loss reduction and energy efficiency. As the sole power off-taker in the country, EUCL is also responsible for negotiations and entering into Power Purchase Agreements with Independent Power Producers.	EUCL is responsible for electricity distribution network and work closely with EDCL in the implementation of ASCENT activities
Energy Development Company Limited (EDCL)	EDCL is the subsidiary in charge of developing new generation, transmission, and energy access development projects. EDCL's mission is to develop new energy resources locally, bolster investment and develop projects in this field. It is also responsible for reviewing the power master plan and defining a least-cost power development plan. EDCL is therefore also in charge of regional power integration with neighboring countries and power pools. EDCL works closely with MININFRA	EDCL is the direct implementation Entity for ASCENT activities and associated Safeguards instruments.
Ministry of Environment (MoE)	MoE was established to ensure the protection and conservation of the environment and ensure optimal and rational utilization of Water Resources, Lands and Forests for sustainable national development. MoE is responsible for the development of environmental policies and procedures (including impact assessments), protection of natural resources (water, land, flora, and fauna), environmental legislation, biodiversity, and other environmental aspects.	The MoE will monitor and ensure that the project is implemented in a sustainable manner and in line with the existing environmental protection and conservation policies, laws and other legal requirements. In the case

Institution	Objective/ Vision	Roles/ Responsibilities
		that EIA certificate is not issued, project developer may make an appeal to the Ministry of Environment.
Rwanda Environmental Management Authority (REMA)	REMA was established to implement the environment matters pertinent to the environment and climate change. REMA acts as implementation organ of environment related policies and laws in Rwanda. Key responsibilities of REMA are: - Advise the Government on policies, strategies and legislation related to the management of the environment as well as the implementation of environment related international conventions, whenever deemed necessary; - Conduct thorough inspection of environmental management to prepare a report on the status of environment in Rwanda that shall be published every two (2) years; - Put in place measures designed to prevent climate change and cope with its impacts; - Conduct studies, research, investigations, and other relevant activities in the field of environment and publish the findings; - Closely monitor and assess development programs to ensure compliance with the laws on environment during their preparation and implementation; - Participate in the preparation of activities strategies designed to prevent risks and other phenomena which may cause environmental degradation and propose remedial measures; - Provide, where it is necessary, advice and technical support to individuals or entities engaged in natural resources management and environmental conservation; - Prepare, publish and disseminate education materials relating to guidelines and laws relating to environmental management and protection and reduce environmental degradation risks; - Monitor and supervise impact assessment, environmental audit, strategic environmental assessment, and any other environmental study. REMA may authorize in writing, any other person to analyze and approve these studies. The EIA review has been delegated to Rwanda Development Board.	REMA will be responsible for the environmental audits and project implementation environmental compliance.
Rwanda Utilities Regulatory Agency (RURA)	RURA has the mandate to regulate Telecommunications, information technology, broadcasting, and converging electronic technologies including the internet and any other audio-visual information and communication technology; Postal services; Renewable and non-renewable energy, industrial gases, pipelines and storage facilities; Water; Sanitation; Transport of persons and goods; Radiation Protection; and other public utilities, if deemed necessary.	RURA carries out investigations including inspections at service delivery sites; imposing administrative sanctions in case of a violation of laws and regulations; facilitating settlement of disputes related to regulated services; issuing directives to the regulated service provider as well as regulating tariffs.
Rwanda National Land Authority (NLA)	NLA is responsible for putting in place and operationalizing an efficient system of land administration, use and management that secures land ownership, promotes investment in land for socio-economic development and poverty reduction. Responsibilities of NLA are: - Put in place mechanisms which procure security of land tenure for the promotion of investments in land. - Promote proper allocation of land, and proper use of land resources, according to their potential. - Avoid the splitting up of plots and promote their regrouping to bring about optimum production. - Establish mechanisms which facilitate an optimum exploitation of land, targeting the social-economic development of the country. - Orient land management towards a more profitable and sustainable production, by making good choices among methods of land development.	The role of NLA in this project is to guarantee the wise use of the land allocated for the project and will play key roles in land re-adjustment and registration as well as the land transfer process (where necessary).

Institution	Objective/ Vision	Roles/ Responsibilities
	- Develop methods that protect land resources from various types of land degradation. - Establish institutional frameworks, which enable land to become more valuable in the economy or at the market. - Promote research as well as the education of the public on all aspects concerning land tenure, management, and transactions. - Establish order and discipline in the allocation of land, as well as in land transactions to control the pressure on land, inappropriate development, speculation and trafficking of land. - Involve and sensitize the public at all levels to ensure protection of the environment and good management of the land. - Ensure the sustainable use of wetlands	
Rwanda Development Board (RDB)	RDB was created by Organic Law N° 53/2008 of 02/09/2008 and has mission of improving the well-being of all Rwandans by fast-tracking development, catalysing sustainable economic growth, and creating prosperity for all. This a one stop institution bringing together several government bodies in Rwanda focused at promoting investment in Rwanda. Initially the responsibility for reviewing and approving ESIA reports was entrusted to REMA, this duty has now been transferred to RDB. Key responsibility of ESIA department under One Stop centre in RDB is to: - Receive and register ESIA Applications (Project Briefs) submitted by developers; - Identify relevant Lead Agencies to review Project Briefs and provide necessary input during screening, - Review Project Briefs and determine project classification at screening stage, - Transmit Project Briefs to relevant Lead Agencies and concerned Local Governments to provide input on Terms of Reference (ToRs), - Publicize Project Briefs and collect public comments during development of ToRs, - Receive ESIA documents submitted by a developer and verify that they are complete, - Transmit copy of ESIA Reports to relevant Lead Agencies, Local Governments and Communities to review and make comments, - Review ESIA reports and make decision on approval, organize, and conduct public hearings, appoint an officer from Authority to chair public hearings, receive public comments and compile public hearing reports, - Appoint the Technical Committee and its representative to the Technical Committee, - Forward ESIA Documents (ESIA Report, Environment Monitoring Plan and Public Hearing Report) to the Technical Committee, - Chair the Executive Committee which makes final decision on approval of a project, - Communicate decision on whether a proposed project is approved, - Issue developers ESIA Certificate of Authorization if their projects are approved.	RDB in this project is a key partner as it will be responsible for reviewing the ESIA report and issuing the EIA certificate before project implementation.
Districts and their decentralized entities	As per the Article 61 of the law on environmental, Districts and decentralized entities are responsible for the implementation of laws, policies, strategies, objectives, and programs relating to protection, conservation, and promotion of the environment in Rwanda. decentralized entities are particularly responsible for: - ensuring activities related to better management of land, especially controlling soil erosion and tap rainwater; - afforestation, protection, and proper management of forests; - efficient management of rivers, lakes, sources of water and underground water; - efficient management and effective use of swamps; - Protection and proper management of reserved areas, historical sites, endangered animal and plant species.	Districts and local decentralized entities especially the sectors and cells of the project area will play key and different roles through all phases of the project implementation. Both districts are also implementing entity of Resettlement Measures.

2.2.2. Institution framework related to social protection, child protection, gender based protection and labor management

In addition to institutions dealing with energy, environment and social risks, there also institutions dealing with other areas such as social protection, child protection, and gender-based protection and labour management which will play a role in the project implementation but also in the implementation of project environmental and social impacts. These institutions are presented in the next table.

Table 3: National institutions for child protection, social and gender-based protection and labour management

Institution	Mission	Role/ Responsibilities
Ministry of Gender and Family Promotion (MIGEPROF)	To promote gender equality, family stability, and children's rights.	The ministry will Ensure gender equality is mainstreamed in all project activities and will Monitor and evaluate that gender-based violence and family welfare programs. And implemented through the project.
National Commission for Children (NCC)	To promote and safeguard children's rights in Rwanda.	The commission will play roles in ensuring the protection of all children in all form of the project implementation No child employment will be allowed on the project. .
Rwanda National Police (Child Protection Unit)	To prevent and combat child abuse and exploitation, ensure the safety and security of children.	The unit will play role in handling cases related to child abuse, neglect, and exploitation, investigate cases of child abuse, protect children from abuse and exploitation and collaborate with other institutions for child protection.
Ministry of Public Service and Labour (MIFOTRA)	To ensure productive employment, effective labour administration, and social protection in the labour sector.	The ministry will play roles related to Protect workers' rights and promote decent employment opportunities, ensure social security for workers. Enforce labour laws and standards and ensure the implementation of social protection policies during the project implementation.
Rwanda Social Security Board (RSSB)	To manage social security benefits for Rwandans, including pensions, health insurance, and occupational hazards.	Ensure social protection for all project workers, Provide financial support in case of occupational risks. Manage project worker's health insurance, and occupational risk schemes and will Monitor compliance with social security laws during the project implementation.
Rwanda Investigation Bureau (RIB)	To investigate and prevent crimes related to child abuse, labour exploitation, and gender-based violence.	RIB will play roles to Investigate cases of child abuse and gender-based violence. Collaborate with other institutions for crime prevention and fight crimes related to child exploitation, and abuse etc. RIB works with Isange one stop center and GBV task forces to address gender based violence and Sexual exploitation cases.
Gender Monitoring Office (GMO)	To promote gender equality and fight gender-based violence through monitoring and advocacy.	The office will play roles in Ensuring gender equality in all phases of the project implementation, and combat gender-based violence and discrimination
National Women's Council (NWC)	To promote women's participation in the country's socio-economic development and decision-making processes.	The council will among other advocate for women's right, Support capacity building and leadership development for women and empower women and enhance their socio-economic status
National Commission for Human Rights (NCHR)	To promote and protect human rights in Rwanda, with a focus on gender equality and social justice.	The commission will play roles in monitoring and reporting on human rights violations, investigate cases of labor exploitation, child abuse, and gender-based violence and will among other protect vulnerable groups, including children and women during all phases of the project.

2.3 World Bank's Environmental and Social requirements applicable to the project

The present project implementation is funded by the World Bank and Asian Infrastructure Investment Bank (AIIB). As the World Bank is the lead co-financier, both financiers agreed that the project needs to comply with the WB's Environmental and Social Framework and related ES Standards. The next table summarizes standards relevant to the project and borrows requirements.

Table 4: World Bank's Environmental and Social Standards applicable to the project

SN	World Bank ESS	Objectives	Borrower Requirements
1	ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Identify, evaluate, and manage the environmental and social risks and impacts of the project in a manner consistent with the ESS1; Adopt a mitigation hierarchy approach to avoid, minimize (reduce), mitigate, and compensate(offset) Utilize national	Use and strengthening of the Borrower's environmental and social framework for the assessment, development, and implementation of World Bank-financed projects as appropriate.

SN	World Bank ESS	Objectives	Borrower Requirements
		environmental and social institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate.	
2	ESS2: Labor and Working Conditions	Promote safety and health at work; Promote the fair treatment, non-discrimination, and equal opportunity of project workers; Protect project workers, including vulnerable workers such as women, persons with vulnerability, children (of working age, by this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate; Prevent the use of all forms of forced labor and child labor; Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law; Provide project workers with accessible means to raise workplace concerns.	Prepare and adopt labor management procedures with provisions on the treatment of direct, contracted, community, and primary supply workers, and government civil servants; Terms and conditions of work, non-discrimination and equal opportunity and workers organizations: prevention of Child labor and forced labour, ensuring occupational Health and Safety, in keeping with the World Bank Group's Environmental, Health, and Safety Guidelines (EHSG).
3	ESS3: Resource Efficiency and Pollution Prevention and Management	Promoting sustainable use of resources, including energy, water, and raw materials; Avoiding or minimizing adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; Avoiding or minimizing project-related emissions of short and long-lived climate pollutants; Avoiding or minimizing generation of hazardous and non-hazardous waste	the borrower should prepare a plan for compliance with ESS3: Resource Efficiency and Pollution Prevention and Management should that includes a structured approach to minimizing resource use, reducing pollution, and ensuring sustainable environmental practices. The plan shall include but not limited to (i) Resource Efficiency Plan; (ii) Pollution Prevention and Management Plan; (iii) Greenhouse Gas (GHG) Emissions Management; (iv) Sustainable Management of Chemicals and Hazardous Materials; (v) Emergency Preparedness and Response Plan; and (vi); Stakeholder Engagement and Community Involvement.
4	ESS4: Community Health and Safety	Anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances; Avoid or minimize community exposure to project-related traffic and road safety risks, and hazardous materials; Have in place effective measures to address emergency events; Ensure that the safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.	Implement requirements for community health and safety regarding infrastructure, and climate change, and apply the concept of universal access, where technically and financially feasible. Prepare and implement disease prevention and risk management plan, implement requirements for traffic and road safety, including road safety assessments and monitoring. Address risks arising from impacts on provisioning and regulating ecosystem services. Measures to avoid or minimize, water-related, communicable, and non communicable diseases identify and manage risks related to labor influx on communities (SEA/SH, noise and air pollution ...).
5	ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives.; Avoid forced eviction; Mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use; Improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure; Conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced	Ensure that the acquisition on land happens only after payment of compensation and resettlement has occurred and implement livelihood restoration plans for PAPs. Implement community engagement and consultation, disclosure of information, and put in place a grievance mechanism.

SN	World Bank ESS	Objectives	Borrower Requirements
		persons to benefit directly from the project, as the nature of the project may warrant; Ensure that resettlement activities are planned and implemented with appropriate disclosure.	
6	ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Protect and conserve biodiversity and habitats; Apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity; Promote the sustainable management of living natural resources; Support livelihoods of local communities, through the adoption of practices that integrate conservation needs and development priorities.	Implement requirements relating to primary suppliers, where a project is purchasing natural resource commodities, including food, timber, and stones, water etc..
7	ESS8: Cultural Heritage	Protect cultural heritage from the adverse impacts of project activities and support its preservation; Address cultural heritage as an integral aspect of sustainable development; Promote meaningful consultation with stakeholders regarding cultural heritage; Promote the equitable sharing of benefits from the use of cultural heritage.	Put in place a chance-finds procedure. Ensure people's continued access to culturally important sites, as well as the need for confidentiality when revealing information about cultural heritage that would compromise or jeopardize their safety or integrity. Put in place a mechanism for fair and equitable sharing of benefits from commercial use of cultural resources. Establish provisions for archaeological sites and materials, built heritage, natural features with cultural significance, and moveable cultural heritage.
8	ESS10: Stakeholder Engagement and Information Disclosure	Establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, particular project-affected parties; Assess the level of stakeholder interest and support for the project and enable stakeholders' views to be taken into account in project design and environmental and social performance; Ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format; Provide project-affected parties with accessible and inclusive means to raise issues and grievances and allow Borrowers to respond to and manage such grievances.	Preparation and implementation of a Stakeholder Engagement Plan (SEP). The SEP involves early identification of stakeholders, both project-affected parties and other interested parties, and clarification on how effective engagement takes place. Stakeholder engagement is to be conducted in a manner proportionate to the nature, scale, risks, and impacts of the project, and appropriate to stakeholders' interests. Specifies what is required for information disclosure and to achieve meaningful consultation and GRM establishment and operationalization as well.

2.4 World Bank's Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission and Distribution

The World Bank's Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission and Distribution provide comprehensive recommendations to mitigate environmental and health risks associated with the construction and operation of electrical lines. Below is a summarized table highlighting key guidelines and their relevance to electrical line construction that would be applied during the implementation of the present project.

Table 5: World Bank's EHS guidelines for electric power transmission and distribution

Guideline	Summary	Relevance to the project
Terrestrial Habitat Alteration	Avoid critical habitats by utilizing existing corridors and roads; install lines above existing vegetation to minimize clearing; schedule construction to avoid breeding seasons; revegetate disturbed areas with native species.	Minimizes ecological disruption and maintains biodiversity during construction activities.
Right-of-Way Maintenance	Implement integrated vegetation management; selectively remove tall-growing species; encourage low-growing vegetation; remove invasive species; schedule maintenance to avoid sensitive periods for wildlife.	Ensures safe operation of transmission lines while preserving local ecosystems and preventing habitat fragmentation.
Aquatic Habitat	Avoid clearing in riparian zones; minimize machinery use	Protects water quality and aquatic

Protection	near watercourses; implement erosion and sediment control measures; maintain buffer zones of natural vegetation along water bodies.	ecosystems from sedimentation and pollution during construction.
Electric and Magnetic Fields (EMF)	Design transmission lines to meet international EMF exposure guidelines; maintain appropriate distances from residential areas; conduct public consultations to address EMF concerns.	Reduces potential health risks to nearby communities and addresses public concerns regarding EMF exposure.
Hazardous Materials Management	Develop procedures for handling and storing hazardous materials; train workers in spill prevention and response; dispose of waste materials according to regulatory requirements.	Prevents environmental contamination and ensures worker safety during the handling of hazardous substances.
Occupational Health and Safety	Provide workers with personal protective equipment (PPE); implement fall protection measures; establish emergency response plans; conduct regular safety training sessions.	Enhances worker safety and reduces the risk of accidents and injuries during construction activities.
Community Health and Safety	Inform communities about construction schedules and potential hazards; implement traffic safety measures; establish grievance mechanisms for community concerns.	Minimizes disruptions and health risks to local communities, fostering good relations and cooperation.

Adhering to these guidelines ensures that the construction of electrical lines is conducted in an environmentally responsible manner, safeguarding both ecosystems and human health.

2.5 Other World Bank's Environmental, Health, and Safety Guidelines applied to the project

The implementation of the present project should adhere to several of the World Bank's Environmental, Health, and Safety (EHS) Guidelines specifically the General EHSs and the EHSs for Power Transmission and Distribution in order to ensure sustainable and safe implementation. Below is a table summarizing the relevant guidelines, their summaries, and their relevance to the project.

Table 6: World Bank's Environmental Health and Safety Guidelines applied to the project

EHS Guideline	Summary	Relevance
Occupational Health and Safety	Addresses worker safety, PPE usage, fall protection, electrical hazards, and training requirements.	Ensures safe working conditions during pole erection, line stringing, and equipment installation.
Community Health and Safety	Involves preventing risks to communities such as electrocution, traffic accidents, and unauthorized access to sites.	Helps reduce risks to people living near construction sites or power lines in rural areas.
Waste Management	Encourages proper management of construction waste such as packaging, used materials, and oily waste.	Ensures proper disposal of poles, conductors, insulators, and associated waste to protect the environment.
Noise and Vibration	Recommends limiting construction noise through timing, equipment maintenance, and community notification.	Helps prevent noise disturbance in quiet rural environments during construction activities.
Air Emissions and Dust Control	Suggests minimizing dust and vehicle emissions via watering, covering loads, and equipment maintenance.	Relevant for rural roads and dry areas where dust levels can become a nuisance or health issue.
Soil Erosion and Sediment Control	Provides methods to control soil disturbance and runoff during excavation or pole setting.	Protects farmland and sensitive habitats from degradation during line construction.
Biodiversity Conservation	Aims to prevent disturbance to natural habitats and endangered species.	Important when lines pass through or near forests, wetlands, or protected areas in Rwanda.
Use of Pesticides and PCBs	Avoids use of hazardous substances like PCBs in transformers and recommends proper disposal.	Ensures new installations avoid legacy pollution and hazardous materials.
Electric and Magnetic Fields (EMF)	Suggests design practices to limit exposure to EMF and comply with international exposure limits.	Important for long-term health of residents and workers near transmission lines.
Emergency Preparedness and Response	Requires planning for fire, electrical incidents, and natural hazards with trained response teams.	Critical for managing accidents or natural events like lightning strikes or storms during operations.
Visual Impacts and Land Use	Recommends minimizing visual disruption and negotiating land access with communities.	Helps maintain aesthetics of rural landscapes and avoids conflict over land acquisition.
Worker Accommodation	Sets standards for worker housing, hygiene,	Important if camps are set up in isolated

EHS Guideline	Summary	Relevance
and Welfare	and medical care on remote construction sites.	rural locations during construction.
Traffic Management	Provides guidance for vehicle movement and road safety near construction zones.	Reduces risk of accidents on narrow or unpaved rural roads.

2.6 International Conventions

Rwanda has signed and ratified different environmental international conventions which are to some extent in line with this project. The following are conventions connected to the project implementation:

- The International Convention on Biological Diversity and its Habitat was signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 017/01 of 18 March 1995;
- The CARTAGENA protocol on biodiversity to the Convention on Biological Biodiversity signed in NAIROBI from May 15, to 26, 2000, and in NEW YORK from June 5, 2000, to June 4, 2001, as authorized to be ratified by Law No 38/2003 of 29 December 2003;
- The United Nations Framework Convention on Climate Change, signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 021/01 of 30 May 1995;
- The Kyoto Protocol to the framework on climate change adopted at Kyoto on March 6, 1998, as authorized to be ratified by Law No 36/2003 of December 2003;
- The RAMSAR International Convention of February 2, 1971, on Wetlands of International importance, especially as water flows habitats as authorized to be ratified by Law No 37/2003 of 29 December 2003;
- The STOCKHOLM Convention on Persistent Organic Pollutants, signed in STOCKHOLM on 22 May 2001, as approved by Presidential Order No 78/01 of 8 July 2002;
- The ROTTERDAM International Convention on the establishment of the international procedures agreed by states on commercial transactions of agricultural pesticides and other poisonous products, signed in ROTTERDAM on 11 September 1998 and in New York from 12 November 1998 to 10 September 1999 as approved by Presidential Order No 28/01 of August 2003 approving the membership of Rwanda;
- The Basel Convention on the Control of Transboundary Movements of Hazardous wastes and their disposal as adopted at Basel on 22 March 1989, and approved by Presidential Order No 29/01 of 24 August 2003 approving the membership of Rwanda;
- The Montreal International Conventional on Substances that Deplete the Ozone Layer, signed in London (1990), Copenhagen (1992), Montreal (1997), and BEIJING (1999), especially in its article 2 of London amendments and Article 3 of Copenhagen, Montreal, and Beijing amendments as approved by Presidential Order no 30/01 of 24 August 2003 related to the membership of Rwanda;
- The Bonn Convention opened for signature on June 23, 1979, on conservation of migratory species of wild animals as authorized to be ratified by Law No 35/2003 of 29 December 2003;
- The Washington agreement of March 3, 1973, on international trade in endangered species of Wild Flora and Fauna as authorized to be ratified by presidential Order No 211 of 25 June 1980.

2.7 International agreements

The following table indicates different agreements connected to environmental protection which Rwanda is a signatory:

Table 7: Environmental assessment-related agreements

No	Agreement	Date signature of	Date ratification of
1	Agreement on the Biological Diversity	10/06/1992	18/03/1995
2	Agreement Context of the United Nations on climate changes	10/06/1992	18/08/1998
3	Agreement related to the fight against Desertification	10/06/1992	22/10/1998
4	The agreement in Vienna on the protection of the ozone layer	22/03/1985	6/12/2002
5	Agreement of Ramsar related to humid zones of international importance, particularly the wild housing	02/02/1971	6/6/2003
6	International Agreement for the trade of the species in the process of disappearance (IATSPD)	20/10/1980	18/01/1981
7	Conservation Agreement of the animals of the migrating wild species (CMS)	23/06/1979	06/06/2003
8	African Agreement on nature conservation and natural resources	15/09/1968	20/05/1975

These treaties and international agreements are relevant for the protection and conservation of the environment and biodiversity in Rwanda and shall guide the implementation of the present project.

2.8 Gap Analysis between Rwandan regulations and World Bank Environmental and Social Standards

Rwanda has developed and enacted different regulations governing environmental management and protection as well as regulations related to land acquisition and expropriation. Despite the effort made to improve the national regulations and align them with international standards, there is a number of gaps identified between the World Bank Environmental and Social Standards (ESSs) and national regulations, especially in terms on Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5). The table below summarizes similarities and gaps between Rwanda regulations on environmental and social considerations and the World Bank Environmental and Social Standards.

Table 8: Differences between Rwanda regulations and World Bank Environmental and Social Framework/Standards/ESF/ESSs

ESF requirements	National Legal requirements	Gaps	Recommended Actions
Standard 1: Assessment and Management of Environmental and Social Risks and Impacts			
(i) To identify, evaluate and manage the environment and social risks and impacts of the project in a manner consistent with the ESSs.	The Law 48/2018 of 13/08/2018 suggests a systematic process of identifying environmental, social and economic impacts of a project before a decision of its acceptance is made;	The difference lies between the Project Classification according to levels of impacts while WB classifies into 4 categories (High, Substantial, Moderate and Low Risk), While the ministerial order No 001/2019 OF 15/04/2019 classifies projects in three categories after screening. (Project that must undergo full EIA, Partial EIA and no EIA for the project not listed in the Annex 1 and 2. Further, ESF classification is risk based while national classification is mainly size based.	All sub-projects would be screened as there might be some projects forgotten, but which have adverse environmental impacts
(ii) To adopt a mitigation hierarchy approach	The Rwandan Regulation does not specify the use of hierarchy, but it suggests that the mitigation measures should aim at preventing, eliminating or reducing the adverse effects on human health, natural resources and environment.	Although current national legislative framework seeks to avoid and mitigate social risks, there is no explicit directive to minimize impacts or to promote the adoption of a clearly defined mitigation hierarchy approach to managing social risks. In addition, the current system emphasizes cash compensation as a mitigation measure and hence does not address other losses.	The ESS of the World Bank will be adopted during project implementation.
(iii) To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable,	The Constitution of Rwanda approves that the State has also the duty, within the limits of its means, to undertake special actions aimed at the welfare of the indigent, the elderly and other	The National Social Protection Policy defines a vulnerable individual or household who, for whatever	The vulnerability will be assessed based on country context and best practices and special attention will

ESF requirements	National Legal requirements	Gaps	Recommended Actions
and they are not disadvantaged in sharing development benefits and opportunities resulting from the project.	vulnerable groups.	reason, is less able to withstand socio-economic shocks and is therefore at an elevated risk of experience declines in welfare and or other forms of social deprivation. In the context of this strategy key vulnerable groups in Rwanda include low income and/or labour-constrained individuals or households such as older people, people with vulnerability, female-headed households etc.	be provided to those identified as vulnerable
(iv)To utilize national environmental and social Institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate.	There are various institutions systems, laws and regulations for the Environmental and Social management in the country	The mandated institutions have limited resources for the effective environmental and social implementation and with some exceptions, monitoring and compliance assessment is inadequate or absent.	The ESS1 will be applied during project implementation to address this gap.
(v)To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity	The Law suggests training and improving the capacity of the workforce while ensuring the protection of workers' rights in accordance with laws and international conventions ratified by Rwanda;	The law does not clearly define how they should be trained.	The ESS1 will be applied during project implementation to address this gap.
Standard 2: Labour and Working Conditions			
(i)To promote safety and health at work.	Ministerial order N°2 of 17/05/2012 determining conditions for occupational and health safety aims to improve health, safety, and general wellbeing of workers and workplaces by promoting occupational health and safe practices in order to eliminate occupational accidents and diseases, hence achieve better productivity in the workplaces.	The similarity is evident.	The ESS shall be given priority during project implementation
(ii)To promote the fair treatment, non-discrimination and equal opportunity of project workers.	The working conditions in Rwanda are governed by the Law N° 66/2018 of 30/08/2018 regulating Labour and its implementing orders. This Law applies all aspect of labour be it formal and informal sectors and provides guidelines related to relationship between an employee and his/her employer in regard to: contract, wages and others benefits, working environment, working hours and different types of allowed leaves which the employee is entitled to. This law also sets standards in terms of employment age and prohibits all form	The similarity is evident.	The implementation of the project will apply the ESS2

ESF requirements	National Legal requirements	Gaps	Recommended Actions
	of forced labour, discrimination, and sexual harassment.		
(iii) To protect project workers, including vulnerable workers.	The law requires the protection of workers during employment	The enforcement is lacking, in part due to lack of budgeting and staffing, as well as the high unemployment in the country, which facilitates the exploitation of workers.	With the budgeting allocated for this project, harmony will be sought for both the ESS and the national requirements
(iv) To prevent the use of all forms of forced labour and child labour.	As (ii) in this section 2	As (ii) in this section 2	The ESS shall be given priority during project implementation
(v) To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law.	Article 39 of Rwandan Constitution as revised in 2015 suggests that the right to freedom of association is guaranteed and does not require prior authorization. This right is exercised under conditions determined by law.	The casual nature of employment affects unionization, as employees paid per day are unable to make the monthly check off in support of union activities.	The World Bank ESS2 that is stronger in terms of supporting the freedom of association will be adopted
Standard 3: Resource Efficiency and Pollution Prevention and Management			
(i) To promote the sustainable use of resources, including energy, water and raw materials.	The Law on the environment promote the sustainable use of the resources where in its Article 4 of Principle of environmental sustainability emphasizes that present and future generations enjoy equal opportunities. The right to development must be achieved in consideration of the needs of present and future generations.	The similarities are evident.	National regulations will be employed and any gaps with ESS3 will be filled with appropriate mitigation measures.
(ii) To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.	The Law on Environment in its Article 15 of Protection and conservation of the atmosphere suggests that any installation likely to create risks or cause pollution, vehicles and engine driven machines, commercial, craft or agricultural activities must be conducted in accordance with technical principles established by competent authorities in order to protect and preserve the atmosphere.	The National requirements are reinforced by the labour Law	The World Bank ESS3 will be employed as with most Bank funded projects for effectiveness of ESS 3.
(iii) To avoid or minimize project-related emissions of short and long-lived climate pollutants.	The article 26 of the Law on Environment orders to take necessary measures to protect and respect the obligations stipulated in international agreements which it signed; to prohibit any activity carried out on its behalf or in its capacity that may degrade the environment in another country or in regions beyond its national jurisdiction; to co-operate with other states in taking decisions to fight trans-boundary pollution; to protect, conserve and manage properly the environment using appropriate measures; while in its Article 50 establishes punishments.	The National requirements are reinforced by the Law	National regulations will be employed and any gaps with ESS3 will be filled with appropriate mitigation measures.

ESF requirements	National Legal requirements	Gaps	Recommended Actions
(iv) To avoid or minimize generation of hazardous and non-hazardous waste.	Article 19: Management of hazardous and toxic waste Any waste, especially from hospitals, health centres and clinics, research centres equipped with laboratories, industries and any other hazardous or toxic waste must be collected, treated and changed in a manner that does not degrade the environment in order to prevent, eliminate or reduce their adverse effects on human health, natural resources and environment. Management, disposal and trans-boundary movements of hazardous or toxic waste are governed by an order of the Minister.	The Law is enforced and the management to oversee that all kind of waste are well managed falls under RURA's responsibility while the management to restrict their entry fraudulently is taken care of by RSB (Rwanda Standards Board)	National regulations will be employed and any gaps with ESS3 will be filled with appropriate mitigation measures.
Standard 4: Community Health and Safety			
(i) To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances.	In Rwanda there is no specific law on community health and safety. Some provisions are included in environment law(2018) and Expropriation law(2015)	Project impacts on hosting community is not well articulated in national regulations. Only impacts on properties is granted.	The ESS4 that is more comprehensive standard will be applied regarding the anticipation and avoidance of adverse impacts on the health and safety of project-affected communities
Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement			
Compensation should be provided to all Affected persons who: a) Have formal legal rights to land or assets; b) Do not have formal legal rights to land or assets, but have a claim to land or assets that is recognized or recognizable under national law; or c) Have no recognizable legal right or claim to the land or assets they occupy or use.	National regulations recognize Affected people who have land titles and documentary evidence that he/she is the owner of property incorporated on land. A person dispossessed of land or unlawfully occupying land or having developed activities on land on which such activities are prohibited after the enactment of relevant laws shall receive no compensation.	The Bank diverges with the Rwanda Law whereas the law in Rwanda refuses to recognize illegal landowners and does not provide any Compensation	ESS5 will apply and the compensation and resettlement measures should be provided to all affected person including those with no land title and tenants. Those who don't have legal right on the land will be compensated for crops and trees established on the land
The ESS5 requires the borrower to consider feasible alternative project designs to avoid or minimize land acquisition or restrictions on land use,	The national law on environment and ESIA procedures requires the developer to explore project alternatives but is silent about avoiding or minimizing involuntary resettlement.	While ESS5 requires the borrower to explore alternatives that avoid or minimize resettlement impacts, the national regulations only requires the provision of compensation	ESS5 will apply
When land acquisition or restrictions on land use (whether permanent or temporary) cannot be avoided, the ESS5 requires Borrower to offer affected persons compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their	The national Regulations (expropriation law, art 27) defines properties subject to valuation for the payment of fair compensation due to expropriation in the public interest are land, activities carried out on land for its efficient management or rational use and compensations for disruption caused by expropriation.	Loss of income is not covered under national regulations and regulations are silent on livelihood measures or assistance to vulnerable people	ESS5 will apply

ESF requirements	National Legal requirements	Gaps	Recommended Actions
standards of living or livelihoods.			
ESS5 requires that the Borrower takes possession of acquired land and related assets only after compensation in accordance with this ESS has been made available and, where applicable, displaced people have been resettled and moving allowances have been provided to the displaced persons in addition to compensation. In addition, livelihood restoration and improvement programs will commence in a timely fashion to ensure that affected persons are sufficiently prepared to take advantage of alternative livelihood opportunities as the need to do so arises.	Article 36 of the Expropriation law (2015) state that approved fair compensation shall be paid within a period not exceeding one hundred and twenty (120) days from the day of its approval. Subsequent to receiving fair compensation, the expropriated person shall have a period not exceeding one hundred and twenty (120) days to relocate.	The ESS5 requires providing compensation measures before land take while the national Regulations allows the project developer to take the land even before the compensation as long as the compensation is made in 120 days.	Compensation and provision of resettlement measures will be given prior land take and any construction works.
ESS5 requires the Borrower to engage with affected communities, including host communities, through the process of stakeholder engagement described in ESS10. Decision-making processes related to resettlement and livelihood restoration will include options and alternatives from which affected persons may choose.	Article 24 of expropriation law requires the District or City of Kigali administration or the relevant Ministry to inform the persons to be expropriated in the public interest of the expected start date of measurement of land and inventory of property incorporated thereon.	While the ESS5 requires consultation with affected communities and other stakeholders, the national regulations require only communication to the affected people.	ESS5 will apply and the RPF and RAP, if needed, will include requirements for stakeholder consultation and engagement
ESS5 requires borrowers to ensure that a grievance mechanism for the project is in place, in accordance with ESS10 as early as possible in project development to address specific concerns about compensation, relocation or livelihood restoration measures raised by displaced persons (or others) in a timely fashion.	Article 33 of expropriation law state that within seven (7) days after the approval of the valuation report by the expropriator, any person to be expropriated who is not satisfied with the assessed value of his/her land and property incorporated thereon shall indicate in writing grounds for his/her dissatisfaction with the valuation report. Any person contesting the assessed value shall, at his/her own expense, engage the services of a valuer or a valuation firm recognized by the Institute of Real Property Valuers in Rwanda to carry out a counter-assessment of the value.	While ESS5 requires the establishment of Grievance Redress mechanism for the proposed project, National regulations provide only steps and timeframe for contesting valuation report	Grievance redress mechanism will be established at project level, district level and site level
Where land acquisition or restrictions on land use are unavoidable, the Borrower will, as part of the environmental and social assessment, conduct a census to identify the persons who will be affected by the project, to establish an inventory of land and assets to be affected, to determine who will be eligible for compensation and	Article 10 of expropriation law requires the project developer to only prepare application that shall indicate: 1° the nature of the project; 2° the indication that the project aims at the public interest; 3° the master plan of land where the project will be carried out; 4° the document indicating that the project has no detrimental effect on the environment;	The measure gap in terms of planning and implementation is the absence of socio-economic assessment of project affected people and inventory of affected assets in the application report.	The socio-economic assessment of project affected people and inventory of affected crops and trees will be part of the Resettlement Plan.

ESF requirements	National Legal requirements	Gaps	Recommended Actions
assistance, and to discourage ineligible persons, such as opportunistic settlers, from claiming benefits.	5° the document confirming the availability of funds for fair compensation; 6° the explanatory note detailing that such land or place suits the project; 7° the minutes indicating that the concerned population was sensitized about the project and its importance;		
The social assessment will also address the claims of communities or groups who, for valid reasons, may not be present in the project area during the time of the census, such as seasonal resource users.	The social assessment is part of Environmental Impact assessment.	Regulations on land acquisition does not require social assessment.	Social assessment will be part of Resettlement Plan.
The Borrower will establish a cut-off date for eligibility.	The District or City of Kigali administration or the relevant Ministry must inform the persons to be expropriated in the public interest of the expected start date of measurement of land and inventory of property incorporated thereon.	The only gap identified is that the national regulations does not include warnings to the persons settling in the project area after the cut-off date may be subject to removal.	The cut-off date will be established and communicated to all affected people.
In the case of projects affecting livelihoods or income generation, the Borrower's plan will include measures to allow affected persons to improve, or at least restore, their incomes or livelihoods.	National Regulation are silent about economic displacement and does not provide any livelihood restoration program	Livelihood restoration and economic displacement are not considered under national regulations	Both physical and economic displacement will be considered and livelihood plan prepared as appropriate.
The Borrower will establish means of collaboration between the agency or entity responsible for project implementation and any other governmental agencies, subnational jurisdictions or entities that are responsible for any aspects of land acquisition, resettlement planning, or provision of necessary assistance.	Section one of the expropriation law provides the implementation arrangements for land acquisition from approving, implementation and implementation of decisions. Further, the land law of 2013 defines roles and responsibility of various stakeholders involved in land administration and expropriation.	No major gap identified apart from technical capacity of local entities that needs to be enhanced	ESIA and RAP to be prepared will provide implementation arrangement from national level to local level and the Resettlement plan will include a section on implementation arrangement
Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
(i) To protect and conserve biodiversity and habitats.	The article 28 on the Biodiversity conservation of the Law 48/2018 of 13/8/2018 on Environment emphasizes that the state has the responsibility to establish the list of species of animals and plants that must be protected depending on their role in ecosystems, their scarcity, their aesthetic value, their threat to extinction and their economic, cultural and scientific role; and to identify areas to be protected for conservation or rehabilitation of ecosystems, forests, woodlands, species of biodiversity and protected zones, monuments, historical sites and landscapes.	No major gap	National regulations will be employed and any gaps with ESS6 will be filled with appropriate mitigation measures.

ESF requirements	National Legal requirements	Gaps	Recommended Actions
(ii) Where biodiversity impacts are likely, apply mitigation hierarchy and precautionary approach in project design & implementation	The National Regulations do not emphasize the hierarchy.	Though the laws do not emphasize on the hierarchy, they agree on the principle of preventing any harm to biodiversity.	The ESS6 will be adopted to assess and manage Risks and Impacts on biodiversity under this project
(iii) To promote the sustainable management of living natural resources.	The chapter III regarding the conservation and protection of the environment of the Law on the environment above emphasizes that all natural resources should be protected from all kinds of degradation, and they must be used in a sustainable manner in accordance with relevant laws.	The implementation is highly variable as some implementers do not involve a multidisciplinary team to assess and adequately manage impacts.	National Regulations will be complemented by ESS6 will be adopted
(iv) To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities	National Regulation are silent about economic displacement and does not provide any livelihood restoration program	Livelihood restoration and economic displacement are not considered under national regulations	The ESS6 will be applied
Standard 8: Cultural Heritage			
(i) To protect cultural heritage from the adverse impacts of project activities and support its preservation.	The protection and preservation of culture heritage is governed by the Law N° 28/2016 of 22/7/2016 on The Preservation of Cultural Heritage and Traditional Knowledge The Article 15 of this law on Restrictions on classified heritage requires that, apart from routine tasks of maintaining cultural heritage, no person shall destroy, move, repair or modify in any way classified cultural heritage without prior written approval of the Minister within sixty (60) days from the date of receipt of the complete file. In case the Minister fails to reply within the prescribed period, the application is deemed accepted. No person shall affix texts, images or install advertising signs on a historical monument or in its neighboring area.	Chance finds procedures are not included in national regulations	ESS8 will apply and chance finds procedure.
Standard 10: Stakeholder Engagement and Information Disclosure Consultants			
To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties.	The Law 48/2018 of 13/08/2018 on environment requires public hearings and consultation during Environmental studies.	The lack of legislation to guide the consultation of people on matters that affect them remains a big loophole in ensuring planning and budgeting of meaningful consultations. The Consultations required would be insufficient for the effective management of social risks on a project with significant impacts since it considers mainly	The ESS10 will be employed during project implementation.

ESF requirements	National Legal requirements	Gaps	Recommended Actions
		environmental risks.	
To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance.	MO 001 of 15/04/2019 in its article 10 on public participation to express views on the environmental impact assessment report requires that the stakeholders may comment on the environmental impact assessment report and express views on the impacts of the proposed project. The authorized organ covers all costs of the public hearing process. The stakeholders' views are considered when selecting the best alternative of the project to be implemented.	The similarities are evident though the ESS10 provide more clarity.	National regulations will be employed and any gaps with ESS10 will be filled with appropriate mitigation measures.
(iii) To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them.	The Expropriation law in public interest of 2015 in its article 6 requires that the initiator of an act aimed at the implementation of land use and development master plans shall first negotiate with owners of assets that are affected by the project. In case negotiations fail, formalities related to expropriation in the public interest shall be followed upon request of the expropriator and the initiator of the project, considering the interests of the person to be expropriated. The price or value of assets affected by the project shall be paid by the initiator of the project before any commencement of activities.	During the project implementation Project affected People are engaged and the Grievance Redress Mechanism is established together with the committees at cell, sector, and district level. However, the implementation is hampered by the poor training and lack of means to help the committees to carry out the regular meetings and visits.	The ESS10 will be applied to promote effective inclusion of project affected parties in the implementation
(iv) To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.	Though the studies are disclosed, the law is silent about the disclosure of the Safeguards document.	No clear process for information disclosure in national environmental and social regulations	ESS10 will apply and public disclosure of all safeguard's instruments will be disclosed

Source: Consultant assessment based on WB ESF/ESS and national regulations

2. PROJECT JUSTIFICATION AND DESCRIPTION

Energy is increasingly proving to be a basic essential without which true development is not possible. Access to energy is an essential driver for development due to its effect on poverty and hunger, health, education, improving living conditions, and reducing the exodus from the countryside and on the environment. Making electricity available in homes reduces the use of batteries and the often, excessive use of biomass. The use of electricity of hydroelectric origin also makes it possible to prevent the production of greenhouse gases such as CO₂ caused by the burning of wood cooking and lighting.

3.1 Project location

The present project of design, supply and installation of new MV and LV lines; design, supply and installation of distribution transformer for distribution network reinforcement; and upgrading the single lines to three phases lines will be implemented in different sectors, cells and villages making the districts of the Western Province of Rwanda. The districts of intervention are respectively Rubavu, Rutsiro, Karongi, Nyamasheke, Rusizi, Ngororero and Nyabihu. Maps showing the sectors of the project area of intervention are provided in annexure 2 of this report and the sectors of the project intervention are detailed in the chapter of the baseline data. The electrical lines will mostly be passing along the existing earth roads connecting different centres of areas of intervention. The buffer zones of the existing roads connecting different area will be used as line routes and to facilitate easy transportation of project materials, allow easy connection of houses, reduce vegetation clearance in the RoW, facilitate easy maintenance, and reduce maintenance costs related to vegetation control in the ROW. However, where not possible to follow the existing roads, in some areas the lines will pass in agricultural land to reduce the length of the lines.

3.2 Project justification

The government of Rwanda recognizes the vital role that electricity access plays in accelerating economic development through improving health and standards of living. Energy and particularly access to electricity is the Government's key priority. This is why significant investments have been made and why the government has set the target of Universal Electrification (100% access) for the year 2029. The installed energy capacity is envisaged to grow at a 15% rate per annum to reach an installed energy capacity of 554MW by 2024. In the end of 2023, 51% of Rwandan households had access to electricity, connected to the national grid (37%) or through off-grid systems (14%). As the target is 100% access to electricity, a national electrification plan has been elaborated to ensure that this target is reached in 7 years (by 2029).

As the Government of Rwanda is promoting alternative sources of electricity such as solar home systems, a parallel policy has been approved to encourage people to make productive use of the power on the national grid, to bridge the demand-supply imbalance, while making economic sense of future energy investments. The construction of the transmission lines in the Western province of Rwanda will therefore be a driving force for the economic and social development of the country, by improving and increasing electric energy availability. The planned project will help to improve the quality of electricity supply and strengthen the backbone of the transmission network, thus providing additional capacity to cope with the growth of demand, under conditions of safety and quality in line with the requirements of the public electricity service.

3.3 Benefits of access to electric power

Power being today a major drive of development, the increase in the rate of access to electric power will certainly contribute to the achievement of the NST1 and other Development Plans of Rwanda as well as the Sustainable Development Goals (SDGs) as defined by the UN, particularly the SDG 7 aiming at ensuring access to affordable, reliable, sustainable, and modern energy for all. Indeed, power appears more and more to be a basic good without which true development is not possible. Thus, access to energy, and particularly electricity, is a major lever of development. Among key benefits that the project will provide in project areas include only to mention some:

a. Reduced poverty and hunger

Access to electric power allows for a longer working day, access to light, and time and money saved (easier access to energy and water). Moreover, the use of electric equipment makes possible to increase handicraft and agricultural productivity. The availability of energy is also an economic development factor because it allows the development of small and medium enterprises as well as the automation of processing activities for agricultural products and their

conservation (refrigeration).

b. Health benefits

The availability of electricity in health centres allows the storage of medicines (refrigeration) and increased safety at night during delivery. In addition, access to communication means (TV, radio, Internet) facilitates the transfer of knowledge on basic topics such as protection against HIV- AIDS and malaria as well as telemedicine. Access to electric light also decreases indoor pollution due to the use of wood, candles, and kerosene lamps for lighting, which reduces the risks of respiratory problems. At last, access to electricity in health centres in rural areas by improving the living and working conditions of nurses and doctors will incite them to remain in villages.

c. Benefits to education

Energy and access to electric lighting make easier for pupils to study at night in good conditions. Availability of electricity allows for access to the Internet and tele-education, which thus increases access to knowledge. The availability of electricity also prompts teachers to remain in rural areas and not migrate to towns. Furthermore, access to electricity and water helps improve teaching conditions and the organization of night classes for adults.

d. Decrease of rural exodus

The improvement of living conditions of rural households and local job creation increases economic development and helps reduce the need for rural exodus.

e. Benefits to the environment

Access to electricity reduces the need for batteries, but also biomass that is often overexploited. The use of hydropower energy also helps avoid the production of greenhouse gases such as CO₂ coming from the combustion of wood and charcoal for heating and cooking.

f. Benefits On the improvement of living conditions, particularly for women

Within the household, women often perform most of the domestic tasks. Access to electricity and the elongation of the duration of a working day help women organize in a more flexible way their day and above all practice an income-generating activity. Thus, they have enough personal income that ensure that they are more and more autonomous and have a better quality of life. In addition, access to media (TV, radio, Internet) helps to make progress in the image of women in traditional societies.

3.4 Project Components

The main component of the present project is the construction of electrical distribution networks in different sectors of the districts of the Western province. The focus is to connect households and public institutions (schools, administration offices, health centers, etc) and productive users (small industries where applicable). Key main components of the project in western province are summarized in the table below:

Table 9: Project key main components

S/N	Item	Data
1	Capacity of the MV	• 30kV
2	Capacity of the LV lines	• 0.4 kV
3	The height of the wooden/concrete poles to be used for stringing conductors,	• Height of LV poles is 9m • Height of MV wooden poles is 12m • Height of MV concrete and steel poles is 14m
4	Land area required for the installation of a single pole	• Required land area for pole installation is 0.5 m ² for LV lines and 1m ² for MV lines
5	The distance to be maintained between two poles	• Distance between two poles is 35m for LV lines and 70m for MV lines
6	The vertical and horizontal clearance requirements for MV and LV lines	• Horizontal clearance is 12m • Vertical clearance is 3m
7	The type of transformers to be installed	• Only poles mounted transformers will be installed

Source: REG_EDCL

The length of the lines to be upgraded from single phase to three phase in the western province is 30.9 km of MV lines and 86.2 km of LV lines. The length of Medium Voltage (MV) and Low Voltage (LV) lines to be constructed in the western province, along with the number of transformers to be installed per district are also provided in the table below:

Table 10: Length of the MV and LV lines to be constructed and number of transformers to be installed

Sn	District	Planned mv	Planned lv	Transformers	Customers
1	Nyabihu	3.6	12	6	4,763
2	Rubavu	3.54	32.57	7	26,832
3	Karongi	49.6	108	50	30,361
4	Ngororero	14	88.2	20	10,987
5	Nyamasheke	11	53	14	3,774
6	Rusizi	13	33.6	10	9,739
	Total	94.74	327.37	107	86456

Source; REG-EDCL

3.5 Project activities

During the implementation of the present project, different activities will be done, and these are divided into 4 phases: (i) Design and Planning phase, (ii) Construction Phase, (iii) Commissioning Phase, and (iv) Operation Phase. The main project activities will include but not limited to

- pegging out works and bush clearing and line surveying, excavation, rock-filled backfilling and concrete foundations;
- supply and installation of LV poles both wooden and concrete poles of different length and dimensions;
- LV structure assemblies (excluding poles only) including all bolts, nuts, washers, crimp joints, etc;
- MV structure assemblies (excluding poles only) for 30kv including all brackets, bolts, nuts, washers, crimp joints, etc;
- overhead conductor installation
- Transformers installation
- Service connections

3.5.1 Project activities during the design and planning phase

During the design and planning phase, it will be a process of survey and mapping for new transmission and distribution line routes, and site selection of transformers locations to avoid harming sensitive ecosystems. There is no land acquisition for MV and LV lines as these will be passing in land for agriculture forest, pasture and/ or in the buffer zones of the existing roads of the project area. Maximum effort will be made to avoid passing over the residential plots and other sensitive areas. However, there will be some restrictions in the Right of way for medium voltage such as establishment of residential building or planting height trees under the electrical lines.

3.5.2 Project activities during the construction phase

a. Clearance of the ROW

During the construction phase, it will be the process of clearing the Right of Way (ROW) as the initial activity that will occur during the construction phase. This is done to create the vertical and horizontal clearance required when constructing power lines. The clearance will be done on 12 meters large (6 m each side from the center line). Only trees and crops that can grow to more than 3 meters in height will be cleared on 12 meters. The valuation of affected trees and crops will be done to 12 meters and will cover all trees and crops on that surface. In any case, a residential house found within the 6 m will be relocated and fair compensation will be done. However, maximum efforts will be made during the line re-route design and construction to avoid houses under the RoW.

b. Foundation excavation and poles erection

Foundation excavations and erection of poles will consist of creating the foundations for poles. Concrete and wooden poles are planned to be used by the project. The general outlines of the poles may be varied but the general dimensions, phase spacing, clearances, and the configuration of the conductors and earth wire are those applied to similar projects being implemented countrywide for similar electrical distribution project. The general outlines of the poles may be varied but the general dimensions, phase spacing, clearances, and the configuration of the conductors and earth wire are those applied to similar projects being implemented countrywide. The design study will define the type and size of poles foundation based on standards established by REG as presented in the next table.

Table 11: Standard Pole Sizes

Application	Pole length	Min Diam. at 1.5m from Butt (mm)	Min Diam. at Pole Top (mm)	Planting Depth	Construction	Comment
LV light use	9m	200	150	1.5m	ABC	Intermediate poles
LV medium	9m	230	170	1.5m	ABC	Angle poles - supported
LV Stout	9m	285	190	1.5m	ABC	Angle pole - unsupported
LV and Street Lights	10m	210	150	1.6m	ABC	Road clearance and Street Lights
MV light use	12m	240	180	1.8m	Vertical	Rural lines, no LV under
MV medium	12m	260	195	1.8m	Vertical	Angle poles - supported
MV Stout	12m	320	200	1.8m	Vertical	Unsupported angle
Special use	14m	240	210	2.2m	Vertical	Special, long span
H-Pole	12m	240	195	1.8m	Horizontal	Special, Extra-long span
H-Pole	14m	260	220	2.2m	Horizontal	Special, Extra-long span

Source: REG, 2020

c. Installation of distribution transformers.

MV/LV transformers will be installed at different sites along the transmission lines to supply electricity to neighbouring houses and public facilities. These transformers will play the role of stepping down the electricity from MV to LV before distribution to consumers. According to REG standards the distribution transformers:

- Are mounted on a two-pole structure made of steel or concrete poles. However, transformers up to 15 kVA can be mounted on a single pole structure if the limit state design has proven it is possible.
- Transformer voltage ratings (No-load): 30kV/400/230V and 15kV/400/230V
- The standard vector group: Dyn11 and

Off load 5 position tap changer: 95%-97.5%-100%-102.5%-105%. Up to 25 kVA transformers, 3 positions tap changer may be used.

3.5.3 Activities of the project during the operation phase

During the operation phase, project activities will be mainly the operation and maintenance of the transformers and the electrical lines that will have been installed during the construction phase. It is important to note that both EDCL EUCL are no longer use transformers containing PCBs (as commonly used in old equipment) which are harmful to the environment and humans.

a. Maintenance of the RoW

The transmission line requires clearing a permanent ROW. Its width generally is 12 m wide. Trees along the ROW must also be cleared for the safety of the lines. The regular maintenance of the ROW will be done to maintain clearance, among poles, conductors, and all the vegetation. Those maintenance operations will normally take place twice a year but may vary according to the local conditions of the project areas.

b. Maintenance of the transformers

As for the line, maintenance for the transformers is required. It must provide for the regular replacement of coolants and lubricants for transformers. However, this is not frequently done unless where it is required to be.

3.5.4 Decommissioning phase

During the decommissioning phase, project activities will be dismantling and removing all the structures from project construction sites, dismantling the supporting infrastructures and all those structures that were associated with the project implementation. The project also will rehabilitate the damaged sites to their former status or near what they were before the project was commissioned. This will include but not limited to the stores demolition, returning the remainder materials to EDCL Stores, revegetation of the soil where the poles and other materials were stored etc.

3. PROJECT ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

The description of the current baseline state provides the context from which to consider the environmental and social impacts of the proposed project. The detailed baseline characteristics described under this section include both physical, biological, and socio-economic indicators.

4.1 General overview of the western province

Rwanda's administrative structure comprises 4 Provinces (Eastern, Western, Northern and Southern Provinces) and City of Kigali all subdivided into 30 districts. The topography of Rwanda is ascending western ward from 1000 m to 4507 m where eastern plains are lying on 1,000 m to 1,500 m and the central plateau region extend between 1,500 m and 2,000 m. The Congo-Nile Ridge and volcanic chains of Birunga have height varying between 1,800 m and 4,507 m (on the top of Kalisimbi Volcano) while the regions around Kivu Lake and Bugarama plains are sitting on 900 m to 1800 m.



Figure 2: Topographical and typical vegetation characteristics of the western province

Source: Field survey, April 2024

4.2 Rubavu district

3.2.1. Physical environment

a. Location

Rubavu District is one of the 30 districts of Rwanda and one of the 7 districts comprising the country's western province. It has a total surface area of 388.3 Km². It is bordered in the east by Nyabihu District, west and north by the Democratic Republic of Congo and south by Rutsiro district and is 152 km from Kigali City, Rwanda's capital. This geographic location and related features such as lake Kivu helps the district to be a business (especially through cross border trade) and tourism hub. The District of Rubavu is composed of 12 administrative sectors, 80 Cells and 525 Villages (Imidugudu). The sectors of the project areas of intervention are described in the next sections of this report.

b. Topography

Rubavu District, located in the Western Province of Rwanda, features a diverse topography characterized by its position along the Great Rift Valley. The district includes the scenic Lake Kivu shoreline and the surrounding hills and mountains. Notably, the area is home to the prominent Rubavu (Gisenyi) town, which lies at an altitude of approximately 1,500 meters above sea level. The terrain is a mix of flat lowlands near the lake and rugged highlands as you move inland, with elevations reaching up to 2,900 meters in the volcanic region of the Virunga mountains. This variation in altitude contributes to a range of microclimates, with fertile volcanic soils supporting agriculture. The district's landscape is marked by rolling hills, deep valleys, and a network of rivers and streams, making it a region of striking natural beauty and significant ecological diversity.

c. Climate and Rainfall

Rubavu district enjoys a subequatorial temperate climate, with an average temperature of around 22°C and average lows around 16°C on the lake shores (the absolute minimum stays around 11°C). Night time temperatures can drop to 6°C up to 20°C at borders of Lake Kivu. The average annual rainfall of the district is around 1,300 mm. The climate of the district is marked by a long rainy season from mid-February to mid-May, and a long dry season from June to August. The rest of the year is characterized by alternating sunny and rainy weather patterns which are particularly favorable to the vegetation stability.

d. Geology and Soils

The geology of Rubavu District, is dominated by volcanic rocks, lava, gap/breach and tuffs created during both tectonic and volcanic activities. The soil is predominated by lava stones, which are porous and thus, permitting movement of fluids or gas through them by ways of pores. More attention would be paid on storage and disposal of waste materials containing hazardous substances that may negatively affect the soil, ground and surface water and human health. The Land of Northwest part of the District has a very rich soil, but shallow, volcanic ash and lava decomposed, while land in the south east has deep soils but poor, often acidic, sandy clay and leached by high erosion.

e. Hydrography

Rubavu District, located in the Western Province of Rwanda, has several notable hydrological characteristics:

Lake Kivu: One of the most significant hydrological features of Rubavu District is Lake Kivu, which forms a natural boundary between Rwanda and the Democratic Republic of Congo. The lake is one of the African Great Lakes and is known for its deep waters and unique methane gas reserves. It is a major source of freshwater for the district and supports various economic activities, including fishing and tourism.

Rivers: Several rivers flow through Rubavu District, contributing to its hydrological network. These rivers play a crucial role in agriculture, providing water for irrigation and supporting the local ecosystems. Some of the key rivers include Sebeya, and Pfunda.

Wetlands: The district has various wetlands that are essential for biodiversity and act as natural water filtration systems. These wetlands also support agriculture and provide habitat for various species of flora and fauna.

Springs: The district is known for its numerous natural springs, which are important sources of water for the local population and mostly used in small-scale irrigation.

3.2.2. Ecological environment

Rubavu district has a rich and diverse biodiversity due to its unique ecological features, including its proximity to Lake Kivu, the Virunga volcanic region, and its moderate to high rainfall. The district's ecosystem comprises wetlands, montane forests, and cultivated lands, supporting a variety of flora and fauna.

- Flora

The vegetation of Rubavu District is influenced by its tropical montane climate, the presence of fertile volcanic soils, and the proximity to Virunga National Park. The dominant flora of the district includes:

a) Indigenous tree species

these include: *Entandrophragma excelsum* (African mahogany) – Found in montane and gallery forests, this large tree provides habitat for various birds and primates; *Polyscias fulva* – A native tree species commonly found in forested areas especially near Lake Kivu; *Dombeya torrida* – A high-altitude tree that thrives in moist conditions and is an important source of nectar for bees; *Erythrina abyssinica* (Flame Tree) – Recognized for its bright red flowers, it is important for nitrogen fixation in soils.

b) Bamboo and shrub species

these include *Arundinaria alpina* (African Alpine Bamboo) – Common in montane ecosystems, particularly in protected and high-altitude areas of the district; *Maesa lanceolata* – A small tree/shrub found in moist forest edges and riverbanks.

c) Wetland and riparian vegetation

including *Typha domingensis* – A dominant wetland reed species found along the shores of Lake Kivu and in local marshlands; *Cyperus papyrus* (Papyrus) – A tall grass species forming dense swamps that provide habitat for birds and aquatic organisms.

d) Cultivated and agroforestry species

these include *Grevillea robusta* – A commonly planted agroforestry tree used for soil conservation and firewood; *Persea americana* (Avocado) – Cultivated in farmlands, contributing to both economic and ecological functions; *Eucalyptus* spp. – Widely grown for timber and firewood but has some negative ecological impacts on water resources.

- Fauna

The Rubavu district's fauna is influenced by its diverse ecosystems, including forests, wetlands, and agricultural landscapes. The most dominant species area:

a) Mammals

These include *Cercopithecus mitis kandti* (Golden Monkey) – Found in the high-altitude forests of the Virunga region, this primate is an endangered subspecies unique to the Albertine Rift; *Papio anubis* (Olive Baboon) – Commonly found in forested and semi-forested areas of Rubavu, often near human settlements; *Atilax paludinosus* (Marsh Mongoose) – Found in wetland and riparian zones, particularly near Lake Kivu; *Hystrix cristata* (Crested Porcupine) – Inhabits the district's wooded and rocky areas.

b) Birds (Avifauna)

Rubavu District is a crucial habitat for various bird species, particularly in Lake Kivu wetlands and forested zones. Notable species include: *Bubulcus ibis* (Cattle Egret) – Frequently seen in agricultural lands and along wetland areas; *Haliaeetus vocifer* (African Fish Eagle) – A top predator near Lake Kivu, feeding on fish and aquatic prey; *Cisticola* spp. – Small warblers found in grasslands and agricultural fields; *Ploceus cucullatus* (Village Weaver) – Often nests in colonies around wetlands and human settlements; *Merops apiaster* (European Bee-eater) – A migratory species that visits during seasonal movements.

c) Amphibians and reptiles

The district's wetlands and lakeshores support various amphibians and reptiles, including: *Xenopus laevis* (African Clawed Frog) – Found in lakes, rivers, and wetlands; *Bitis arietans* (Puff Adder) – A venomous snake found in grasslands and forested areas; *Agama agama* (Red-Headed Rock Agama) – A common lizard species found in rocky and open areas.

3.2.3. Socio-economic environment

a. Population

The 5th housing and population census enumerates 546,683 residents in Rubavu district, and the population share is 18.9% of the total population of Western province. The population of Rubavu district is predominantly female: 279,384 are women corresponding to 51.1 % of its the total population. The table below indicates the number of the population of Rubavu district by sector, by sex, the percentage of female and their shares across sectors to the total population of Rubavu district. Females are predominant in eleven out of 12 sectors of the district except Nyakiriba sector with 43.4% of total population of this above said sector. Rubavu (80,107 population) and Rugerero (66,926 population) are the most populated sectors. They represent 14.7% and 12.2% of the total population of Rubavu district, respectively. The two less populated sectors are Kanzenze (23,127 inhabitants) and Mudende (32,077 inhabitants). They represent 4.2% and 5.9% of the total resident population of Rubavu district, respectively.

Table 12: Population of Rubavu District by Sector and sex

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Rubavu district	546,683	267,299	279,384	100	48.9	51.1	100
Bugeshi	33,892	16,256	17,636	100	48.0	52.0	6.2
Busasamana	40,542	19,399	21,143	100	47.8	52.2	7.4
Cyanzarwe	38,977	18,662	20,315	100	47.9	52.1	7.1
Gisenyi	51,594	25,456	26,138	100	49.3	50.7	9.4
Kanama	37,584	17,738	19,846	100	47.2	52.8	6.9
Kanzenze	23,127	10,821	12,306	100	46.8	53.2	4.2
Mudende	32,077	15,253	16,824	100	47.6	52.4	5.9
Nyakiriba	50,834	28,756	22,078	100	56.6	43.4	9.3
Nyamyumba	48,718	23,728	24,990	100	48.7	51.3	8.9
Nyundo	42,305	20,062	22,243	100	47.4	52.6	7.7
Rubavu	80,107	38,764	41,343	100	48.4	51.6	14.7
Rugerero	66,926	32,404	34,522	100	48.4	51.6	12.2

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

b. Number of households and size of household

The results of 5th RPHC 2022 indicate the total of 3,312,743 households in Rwanda, 671,506 in the Western province and 124,080 in Rubavu district. The average household size in Rubavu district is 4.3 persons per household. At the Sector level, the highest sizes are found in Cyanzarwe (4.6 persons/household), Nyamyumba and Nyundo (4.5

persons/household each). The smallest household sizes are found in Gisenyi (3.9 persons/household each). The results of 5th RPHC 2022 revealed that nationally 28.9% of private households are headed by women. In Rubavu district, private households headed by females are 28.2%. At sector level, the highest percentages of households headed by women are found in Kanzenze sector (35.7%) and Cyanzarwe sector (29.4%) while the lowest is found in Nyamyumba sector (26.3%).

Table 13: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western province	671,506	2,871,195	4.3	70.4	29.6
Rubavu District	124,080	535,825	4.3	71.8	28.2
Bugeshi	7,853	33,233	4.2	71.4	28.6
Busasamana	9,158	40,089	4.4	72.4	27.6
Cyanzarwe	8,505	38,964	4.6	70.6	29.4
Gisenyi	13,229	51,433	3.9	71.8	28.2
Kanama	8,496	37,549	4.4	71.2	28.8
Kanzenze	5,299	22,891	4.3	64.3	35.7
Mudende	7,460	31,845	4.3	71.2	28.8
Nyakiriba	9,525	42,082	4.4	72.1	27.9
Nyamyumba	10,892	48,668	4.5	73.7	26.3
Nyundo	9,468	42,198	4.5	73.6	26.4
Rubavu	18,486	80,025	4.3	72.3	27.7
Rugerero	15,709	66,848	4.3	71.8	28.2

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western province the predominant type of habitat is planned rural settlement (Umudugudu) housing (70.5%) and dispersed/ isolated housing (18.3%). The most common type of habitat in Rubavu district is planned rural settlement (Umudugudu) housing (70.7%) followed by spontaneous/squatter housing (11.5%) and old settlement (6.7%). The type of habitat varies across sectors. Spontaneous/squatter housing is most prevalent in Busasamana (51.2%) and Kanama (20.9%) and low in Bugeshi (0.1%) and Mudende (0.1%). The sectors with the high percentages of dispersed/isolated housing units are Nyundo (11.9%) and Kanzenze (11.9%).

Table 14: Distribution of households in Rubavu District by type of habitat

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu (Planned rural settlement)	Integrated model village	Old settlement	Dispersed/isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Rwanda	3,312,743	100	65.4	0.8	2.3	14.9	6.9	8.9	0.8	0.0
Western province	671,506	100	70.5	0.9	3.7	18.3	1.2	4.6	0.8	0.0
Rubavu district	124,080	100	70.7	0.5	6.7	4.9	5.4	11.5	0.3	0.0
Rubavu urban	69,462	100	72.8	0.5	2.2	1.6	9.6	12.9	0.4	0.0
Rubavu rural	54,618	100	68.1	0.4	12.4	9.0	0.1	9.8	0.3	0.0
Bugeshi	7,853	100	53.7	0.1	36.4	9.5	0.0	0.1	0.0	0.2
Busasamana	9,158	100	36.9	0.7	3.4	7.7	0.1	51.2	0.0	0.0
Cyanzarwe	8,505	100	88.7	0.0	6.9	2.7	0.0	1.5	0.2	0.0
Gisenyi	13,229	100	46.8	0.7	0.6	0.1	45.0	6.4	0.4	0.0
Kanama	8,496	100	62.4	0.2	7.2	9.3	0.0	20.9	0.0	0.0
Kanzenze	5,299	100	70.5	0.2	3.5	11.9	1.4	12.2	0.3	0.0
Mudende	7,460	100	87.5	3.0	2.1	7.2	0.1	0.1	0.0	0.0
Nyakiriba	9,525	100	61.7	0.3	10.9	7.4	2.3	16.6	0.8	0.0
Nyamyumba	10,892	100	91.9	0.2	3.7	3.8	0.0	0.4	0.0	0.0

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu(Planned rural settlement)	Integrated model village	Old settlement	Dispersed/Isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Nyundo	9,468	100	76.6	0.5	8.2	11.5	0.4	0.8	2.0	0.0
Rubavu	18,486	100	80.3	0.3	2.9	0.8	1.4	14.1	0.2	0.0
Rugerero	15,709	100	82.0	0.3	4.6	0.4	0.7	12.0	0.1	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The type of habitat in Rubavu district varies according to the area of residence. In urban areas, the predominant type is planned rural settlement housing (72.8%) and spontaneous/squatter housing (12.9%). In rural areas, the predominant type is planned rural settlement housing (68.1%) followed by old settlement (12.4%).

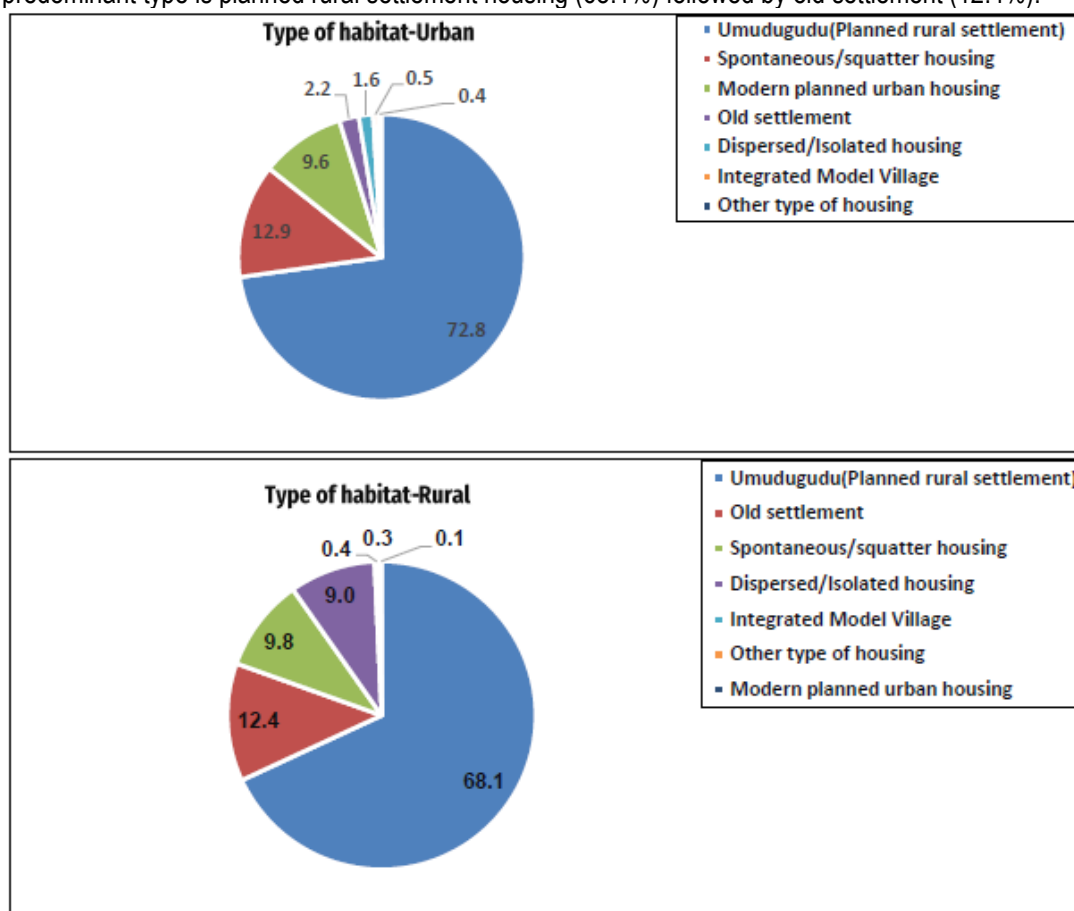


Figure 3: Distribution of households in Rubavu district by type of habitat and by area of residence.

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5th RPHC 2022 indicate that the ownership of housing in the Western province represents 80.5% and tenant represent 13.5%. In Rubavu district, 67.2% are occupied by their owners while 27.3% of housing units are occupied by tenants. At the sector level, the percentage of owners of household's units is high in Bugeshi (86.8%), Busasamana (86.7%) and Mudende (86.2%) and low in Gisenyi (32.9%), Rubavu (54.2%), and Rugerero (59.4%). The percentage of tenants of housing units is high in Gisenyi (61.4%) and Rubavu (40.7%) and low in Mudende (9.1%) and Busasamana (7.4%). In Rubavu district, 3 types of tenure of housing units (owners, tenants and free lodging) predominate in urban area as well as in rural area and their percentages vary substantially according to the area of residence. The percentage of owners of housing units is 53.9% in urban areas to 84.0% in rural areas, the percentage of tenants of housing units is 40.6% in urban areas to 10.5% in rural areas. The percentage of free lodging is 4.4% in urban areas to 4.9% in rural areas.

Table 15: Distribution of households of Rubavu District by tenure of the housing units

Sectors	Total Numbers of	Percentage							
		Total	Owner	Tenant	Hire purchase	Free lodging	Staff housing	Temporary camp or settlement	Other
Rwanda	3,312,743	100	71.6	22.2	0.1	4.4	0.8	0.5	0.2
Western province	671,506	100	80.5	13.5	0.1	4.9	0.4	0.4	0.2
Rubavu	124,080	100	67.2	27.3	0.1	4.6	0.6	0.0	0.2
Rubavu Urban	69,462	100	53.9	40.6	0.1	4.4	0.8	0.0	0.3
Rubavu Rural	54,618	100	84.0	10.5	0.1	4.9	0.4	0.0	0.2
Bugeshi	7,853	100	86.8	8.4	0.1	4.3	0.3	0.0	0.1
Busasamana	9,158	100	86.7	7.4	0.1	5.6	0.2	0.0	0.1
Cyanzarwe	8,505	100	81.6	13.5	0.1	4.2	0.5	0.0	0.1
Gisenyi	13,229	100	32.9	61.4	0.1	4.0	1.2	0.0	0.4
Kanama	8,496	100	71.7	23.8	0.0	4.0	0.3	0.0	0.2
Kanzenze	5,299	100	71.6	23.8	0.2	3.8	0.5	0.0	0.2
Mudende	7,460	100	86.2	9.1	0.0	4.2	0.4	0.0	0.1
Nyakiriba	9,525	100	63.6	31.9	0.1	3.9	0.4	0.0	0.1
Nyamyumba	10,892	100	75.3	18.4	0.1	5.4	0.5	0.0	0.2
Nyundo	9,468	100	77.8	15.8	0.0	5.4	0.6	0.0	0.3
Rubavu	18,486	100	54.2	40.7	0.1	4.0	0.8	0.0	0.2
Rugerero	15,709	100	59.4	33.4	0.1	5.9	0.8	0.0	0.4

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

d. Education

In Rubavu District, 22.9% of the population has never attended school, while 2.2% have attended nursery, and 52.8% have attended primary school. Other education levels include 0.2% for INGOBOKA/Vocational, 9.4% for lower secondary, 8.2% for upper secondary and 4.0% for university. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Busasamana has a higher percentage (32.5%) of individuals who have never attended school compared to other sectors, while Gisenyi has a higher percentage (18.4%) of individuals attended University. Each sector has its own unique distribution of education levels attended by the population.

Table 16: Distribution of the resident population of Rubavu District by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Rubavu District	497,934	100	22.9	2.2	52.8	0.4	9.4	8.2	4.0	0.0
Bugeshi	31,365	100	24.4	1.6	53.7	0.2	10.4	8.1	1.6	0.0
Busasamana	36,713	100	32.5	1.4	54.9	0.2	5.8	4.3	0.9	0.0
Cyanzarwe	35,337	100	32.0	2.1	56.4	0.4	5.5	3.1	0.5	0.0
Gisenyi	48,094	100	8.1	3.7	33.9	0.6	14.1	21.1	18.4	0.1
Kanama	34,360	100	29.5	1.8	53.2	0.3	7.6	5.6	2.1	0.0
Kanzenze	21,078	100	26.0	2.4	50.7	0.2	10.5	8.3	2.0	0.0
Mudende	29,141	100	30.2	1.8	54.4	0.2	7.6	4.5	1.3	0.0
Nyakiriba	46,830	100	22.3	2.4	52.4	0.4	9.3	9.1	4.2	0.0
Nyamyumba	44,402	100	20.7	2.0	58.5	0.6	9.9	6.8	1.6	0.0
Nyundo	37,534	100	21.1	1.7	61.4	0.6	7.2	5.4	2.5	0.0
Rubavu	72,736	100	21.5	2.7	52.5	0.3	11.1	8.5	3.4	0.0
Rugerero	60,344	100	19.2	2.4	55.1	0.6	10.5	8.5	3.8	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Nationally, 2,280,854 of private households (68.9%) are engaged in agriculture, among them 62.6% are engaged in crop farming and 50.4% are engaged in Livestock husbandry. Rubavu district is the one of districts of the Western province where crop farming and animal husbandry are practiced. In Rubavu district, Agricultural households occupy (45.9%) with 34.0% of households engaged in crop farming and 29.9% Households engaged in Livestock husbandry. Rubavu district has sectors located in rural areas where the agriculture activities are applied, Cyanzarwe sector has a high proportion of Households engaged in crop farming 49.3%) and Bugeshi with households engaged in livestock husbandry (50.6%).

It was also revealed that the employment to population ratio is 48.5 percent among people residing in Rubavu districts, it is higher in rural areas of Rubavu (49.5%) than in urban areas (47.7%). The employment to population ratio among males as well as females increases from age group 16-19 to 35-44 and starts decreasing from age group 45-49 to 85 years and above as people starts getting very older and retire. It was observed that in district of Rubavu, the highest employment to population ratio among males stands at 75.2% and was observed in age group 35-39, On the other side the highest employment to population among females is 56.8% and was observed in the age group 40-44. The lowest employment to population ratio is observed among people aged 85 years and above where males stands at 7.8% and 4.0% for female.

Table 17: Distribution of household engaged in livestock husbandry in Rubavu district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Private Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Rubavu district	124,080	56,974	45.9	42,225	34.0	37,093	29.9
Bugeshi	7,853	5,223	66.5	3,729	47.5	3,975	50.6
Busasamana	9,158	5,732	62.6	4,670	51.0	3,246	35.4
Cyanzarwe	8,505	5,419	63.7	4,192	49.3	3,550	41.7
Gisenyi	13,229	1,574	11.9	753	5.7	1,144	8.6
Kanama	8,496	4,940	58.2	4,074	48.0	3,104	36.5
Kanzenze	5,299	2,729	51.5	1,959	37.0	1,745	32.9
Mudende	7,460	4,697	63.0	3,220	43.2	3,392	45.5
Nyakiriba	9,525	4,147	43.5	3,272	34.4	2,354	24.7
Nyamyumba	10,892	5,954	54.7	4,756	43.7	3,599	33.0
Nyundo	9,468	5,785	61.1	4,506	47.6	4,000	42.2
Rubavu	18,486	5,289	28.6	3,311	17.9	3,533	19.1
Rugerero	15,709	5,485	34.9	3,783	24.1	3,451	22.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, Water supply and Sanitation facilities

In Rubavu District 92.7% are using Mutuelle as main health insurance, 4.1% using RSSB or RAMA, 0.7% using private insurance, 0.2% using school insurance, 0.2% using NGOs insurance and 2% using employer insurance.

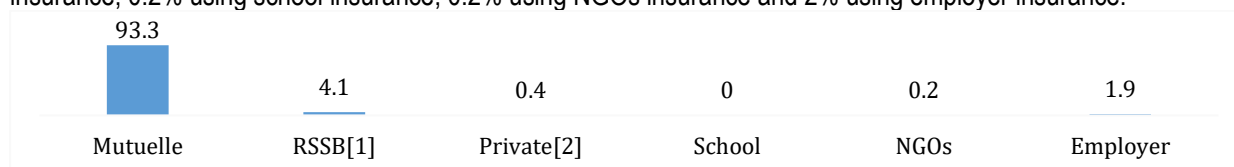


Figure 4: Population who have a medical insurance by main type of insurance

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Rubavu district, 93.5% of private households use improved drinking water sources. At the sector level, the percentage of the private households using drinking water from improved sources is highest in Busasamana (100.0%), and the lowest in Nyundo (75.7%).

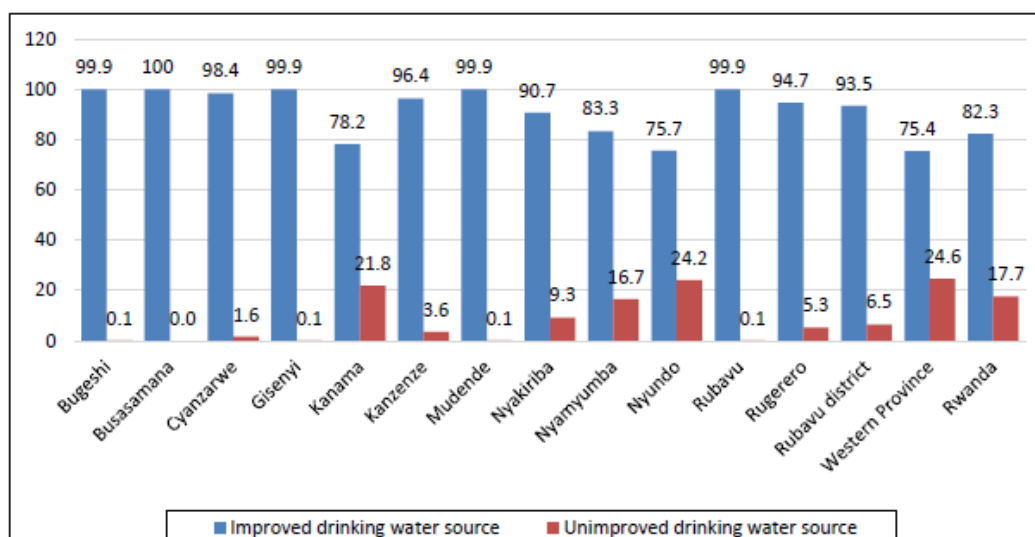


Figure 5: Percentage of households of Rubavu District by main source of drinking water
Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In Rubavu district, both urban and rural areas, private households use mainly improved source of water (97.8% in urban and 88.1% in rural). The percentage of private households using unimproved source of water is higher in rural (11.9%) than in urban (2.2%).

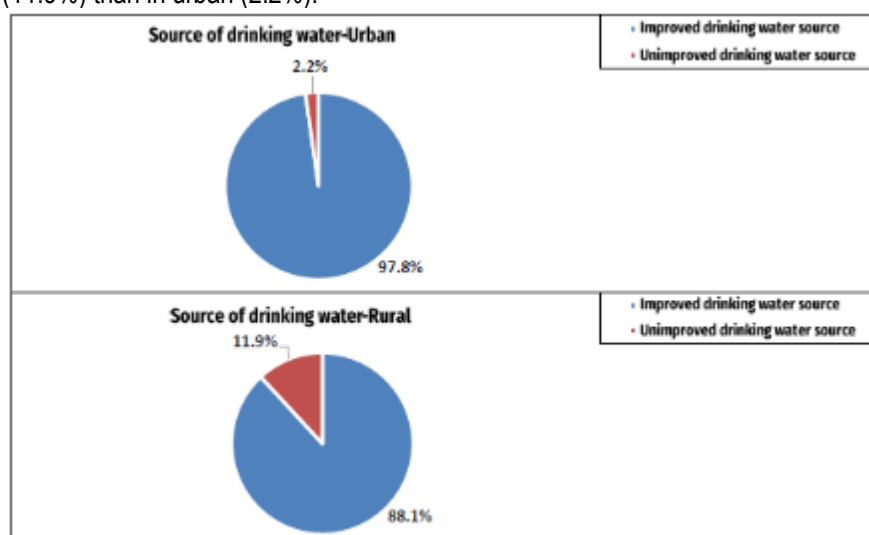


Figure 6: Distribution of the private households of Rubavu District by main source of water and by area of residence

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

g. Appliance and assets ownership

At the district level, 81.2% of private households possess a radio, 79.3% a mobile phone, 25.4% a smartphone, 17.2% a TV and 4.3% a computer. The percentage of private households possessing a radio is high in Gisenyi (97.0%) and Rubavu (87.3%). It is low in Busasamana (66.4%). The percentage of private households possessing a television is high in Gisenyi (54.5%) and Rubavu (24.9%) while it is low in Mudende (4.1%) and Kanzenze (5.1%). Mobile phone is mostly possessed by private households of Gisenyi (93.0%), Rubavu (79.3%) and Rugerero (75.8%). The sectors with high percentage of households with smartphone are Gisenyi (95.4) and Rubavu (86.1%) while the percentage of households possessing this asset is low in Cyanzarwe and Busasamana (5.0% each). The computer is mostly possessed in Gisenyi (20.1%), other sectors are below 5.0%.

Table 18: Percentage of private households of Rubavu District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone ¹	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Rubavu district	124,080	81.2	17.2	79.3	25.4	4.3
Rubavu urban	69,462	88.6	26.7	87.3	38.8	7.2
Rubavu rural	54,618	71.8	5.0	69.2	8.3	0.7
Bugeshi	7,853	75.5	5.3	74.0	11.7	1.1
Busasamana	9,158	66.4	5.6	4.3	7.2	0.8
Cyanzarwe	8,505	69.3	5.9	66.9	7.7	0.6
Gisenyi	13,229	97.0	54.5	95.4	72.5	20.1
Kanama	8,496	76.8	7.1	74.2	16.4	1.7
Kanzenze	5,299	80.6	5.1	79.7	21.0	2.1
Mudende	7,460	73.4	4.1	71.6	8.0	0.4
Nyakiriba	9,525	83.1	15.9	81.7	30.1	4.6
Nyamyumba	10,892	81.8	13.1	79.5	19.4	1.7
Nyundo	9,468	77.6	9.0	74.7	15.8	2.2
Rubavu	18,486	87.3	24.9	86.1	30.5	3.9
Rugerero	15,709	85.3	19.6	83.5	28.4	4.2

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

h. Access to energy for lighting and cooking

In Rubavu district, the main source of energy for lighting used by households is electricity (71.4%). At the sector level, the percentage of households using electricity for lighting is high in Gisenyi (97.7%) and Rubavu (85.8%) the sector with low percentage of private households using electricity for lighting is Mudende (38.6%). The flashlight/phone flashlight takes the second spot in terms of lighting which is dominant source of lighting in Mudende (35.2%) and Bugeshi (32.5%). According to the area of residence, the main source of energy for lighting is electricity (84.5%), followed by candles (5.8%) and flashlight/phone flashlight (5.6%). In rural areas, 54.7% of private households use electricity as main source of energy for lighting while 21.9% use flashlight and 12.3% use firewood.

Table 19: Distribution of households of Rubavu District by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Other source of energy for Lighting	Not stated
Rwanda	3,312,743	100	61.0	1.6	0.0	2.9	4.2	1.1	28.4	0.1	0.5	0.0
Western province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.0
Rubavu district	124,080	100	71.4	0.4	0.0	6.7	6.5	0.2	12.7	0.0	1.5	0.0
Rubavu urban	69,462	100	37.1	0.0	0.2	0.9	0.2	0.0	5.5	55.7	0.2	0.0
Rubavu rural	54,618	100	84.2	0.3	0.2	2.9	0.1	0.1	0.1	12.1	0.1	0.0
Bugeshi	7,853	100	42.4	0.3	0.0	10.7	11.6	0.5	32.5	0.1	1.6	0.0
Busasamana	9,158	100	53.3	0.1	0.0	8.8	13.1	1.2	21.7	0.1	0.9	0.0
Cyanzarwe	8,505	100	64.1	0.4	0.0	8.1	7.9	0.1	16.7	0.1	2.2	0.0
Gisenyi	13,229	100	97.7	0.2	0.0	1.5	0.0	0.0	0.3	0.0	0.1	0.0
Kanama	8,496	100	61.7	0.6	0.1	5.7	12.0	0.4	17.3	0.1	1.5	0.0
Kanzenze	5,299	100	61.8	0.4	0.1	8.0	5.0	0.2	21.7	0.1	1.9	0.0
Mudende	7,460	100	38.6	0.1	0.1	8.9	13.3	0.2	35.2	0.0	1.4	0.0
Nyakiriba	9,525	100	77.2	0.3	0.0	4.1	7.8	0.0	9.1	0.0	0.8	0.0
Nyamyumba	10,892	100	80.3	0.3	0.0	7.9	3.5	0.2	6.1	0.0	1.3	0.0
Nyundo	9,468	100	57.9	0.3	0.0	6.1	14.1	0.1	19.4	0.1	1.7	0.0
Rubavu	18,486	100	85.8	0.7	0.0	6.0	1.1	0.0	3.4	0.0	2.6	0.0

¹ Mobile phones include all type of mobile phone and smart phones

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Other source of energy for Lighting	Not stated
Rugerero	15,709	100	84.0	0.5	0.0	7.7	2.2	0.1	3.5	0.0	1.9	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (56.3%) followed by charcoal (38.9%) and gas (4.0%). At the sector level, firewood is the most used source of cooking energy by private households in Bugeshi (89.1%) and Mudende (88.4%) followed by Busasamana (85.9%) and Cyanzarwe (83.7%). Sectors with the high percentage of private households using charcoal as main source of cooking energy are Gisenyi (66.5%), Rubavu (68.6%) and Rugerero (58.2%). Sector with the highest percentages of private households using gas as main source of cooking energy is Gisenyi (26.8%) while other sectors are below 5%.

By area of residence, private households use mostly firewood (88.3%) and charcoal (11.0%) in rural areas. In urban areas, private households use charcoal (60.6%) and firewood (31.1%).

i. Vulnerability

Rubavu district the vulnerability prevalence rate is 3.1%. At sector level, the highest prevalence rates of the resident population with vulnerability are in Cyanzarwe (4.7 %) and while the lowest is in Gisenyi (2.1%).

Table 20: Number and share of persons with vulnerability of Rubavu District

Sectors of residence	Total resident population	Person's with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Rubavu district	470,176	14,446	6,455	7,991	3.1
Bugeshi	29,747	861	396	465	2.9
Busasamana	34,516	946	431	515	2.7
Cyanzarwe	33,140	1,570	637	933	4.7
Gisenyi	45,931	968	459	509	2.1
Kanama	32,170	1,122	482	640	3.5
Kanzenze	19,929	528	211	317	2.6
Mudende	27,592	918	412	506	3.3
Nyakiriba	44,410	1,183	606	577	2.7
Nyamyumba	41,898	1,459	719	740	3.5
Nyundo	36,046	1,441	631	810	4
Rubavu	67,795	1,703	771	932	2.5
Rugerero	57,002	1,747	700	1,047	3.1

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

4.3 Rutsiro district

4.3.1 Physical environment

Rutsiro District is one of the seven Districts that make up the Western Province, others being; Nyamasheke, Rusizi, Karongi, Ngorerero, Nyabihu and Rubavu. The district is strategically located along Kivu belt Road connecting southern Districts of Rusizi, Nyamasheke and Karongi to Rubavu in the North western part and linking these Districts to DRC Cong through Rubavu and Rusizi borders. Rutsiro District being “a land of Agro mining industry and Tourism”. Have most touristic destinations of Mount Crete Congo-Nile and Lake Kivu coastal areas and its beautiful islands which are potential for tourism. The district has 13 administrative Sectors, 62 Cells and 483 Villages with an estimated total area of 1,157.3 km².

a. Topography

Rutsiro District, located in the Western Province of Rwanda, is characterized by a diverse and rugged topography. The district is predominantly hilly, with altitudes ranging from approximately 1,500 to 2,600 meters above sea level. The terrain features numerous steep hills and deep valleys, contributing to its scenic landscapes. The highest elevations are found in the northern part of the district, while the southern areas are relatively lower. This varied topography influences the local climate, hydrology, and land use patterns, making it suitable for various agricultural activities, particularly tea and coffee cultivation on the higher slopes and food crops in the valleys. The district also encompasses part of the Congo-Nile Divide, a significant geographical feature that separates the watersheds of the Congo and Nile rivers.

b. Climate and Rainfall

District Rutsiro has a tropical climate characterized by a succession of rainy seasons and droughts with the average temperature between 20 ° and 24 ° C. Rainfall increases gradually as we approach the mountains chain of the Congo-Nile covered by Gishwati forest. The district has four seasons in a year which runs as follows: The small rainy season that runs from September to December; the short dry season that runs from December to March the long rainy season that runs from March to June and the long dry season that runs from June to September. However, some fluctuations can be observed along the seasons.

c. Geology and Soils

The relief of Rutsiro District is characterized by a chain of mountains and plateaus with an average altitude of 2,000 m and 1,600 m. The relief of the district is further characterized by the Congo Nile Mountains hosting Gishwati natural forest. Rutsiro soils are basaltic, generally permeable and rich in iron. It is an acid soil pH with an average content of clay group karyokinesis. In some places along Lake Kivu, there are sometimes derived soils phyllodes, clay, hard, containing quartz crystals and semi - strongly leached quartz which are very susceptible to erosion and therefore less fertile.

d. Hydrography

Rutsiro District has significant water reservoirs dominated by Lake Kivu in the west and other several rivers which some head to the Congo basin and others flow to the Nile basin. The most important of these rivers which flow to Congo basin are Muregeya, Koko, Nyangore, Gashashi Kimbili, Nyamwenda, Bihongora, Bikeneko and Sebeya. The rivers that flow to Nile basin include Satinsyi, Nyamwotsi and Kiguhu. The water resource in Rutsiro is threatened by the high erosion risks due to high and steep slopes with arable lands, high mining activities also causes sedimentation into rivers.

4.3.2 Ecological environment

Rutsiro District has a rich and diverse ecological landscape, characterized by montane forests, savanna-like vegetation, and wetland ecosystems. The biodiversity in this region is largely influenced by the district's proximity to Gishwati-Mukura National Park and Lake Kivu. It is important to note that the project is not envisaged to pass in any of the proximities of the Gishwati-Mukura National park nor within the Kivu lakeshores.

- Flora species

The vegetation in Rutsiro District is mainly composed of montane forests, riverine forests, and savanna-like landscapes. The dominant plant species include:

a) Montane forest species

these include the *Entandrophragma excelsum* (African mahogany) – A large tree species found in high-altitude forests; *Podocarpus latifolius* (Broad-leaved yellowwood) – A slow-growing conifer found in montane regions; *Polyscias fulva* – Common in humid forests, providing habitat for birds and insects; *Macaranga kilimandscharica* – A fast-growing tree species that plays a role in forest regeneration.

b) Bamboo forests and grasslands

these include *Arundinaria alpina* (African alpine bamboo) – A dominant species in certain elevated areas, providing shelter and food for primates; *Hyparrhenia* spp. – A dominant grass species in open landscapes, contributing to soil conservation.

c) Wetland and riparian vegetation

including *Cyperus papyrus* (Papyrus reed) – Thrives in wetland areas near water bodies such as Lake Kivu; *Typha domingensis* (Cattail) – Found in swampy regions and along riverbanks.

- Fauna species

The fauna in Rutsiro District is diverse, ranging from large mammals to a variety of bird species and aquatic life due to the district's proximity to Lake Kivu and Gishwati-Mukura National Park. The dominant species of the district are:

a) Mammals

These include the *Pan troglodytes schweinfurthii* (Eastern chimpanzee) – Found in the nearby Gishwati-Mukura National Park, an important conservation zone for primates; *Cercopithecus mitis* (Blue monkey) – Common in montane and riverine forests; *Colobus angolensis ruwenzorii* (Ruwenzori black-and-white colobus) – A species dependent on dense forest cover; *Hystrix cristata* (Crested porcupine) – Found in forested and rocky areas; *Atilax paludinosus* (Marsh mongoose) – Common in wetlands and near water sources.

b) Birds

These include the *Tauraco johnstoni* (Ruwenzori turaco) – A colorful bird endemic to the Albertine Rift forests; *Bostrychia hagedash* (Hadada ibis) – Found in both forest edges and wetland areas; *Cossypha archeri* (Archer's robin-chat) – A forest-dependent species; *Bradypterus graueri* (Grauer's swamp warbler) – Found in swampy vegetation.

c) Reptiles and Amphibians

These include *Naja melanoleuca* (Forest cobra) – Found in dense forests and open grasslands; *Leptopelis kivuensis* (Kivu tree frog) – Common in moist forest habitats; *Xenopus laevis* (African clawed frog) – Found in freshwater streams and wetlands.

d) Aquatic Life (Lake Kivu Ecosystem)

These including the *Limnothrissa miodon* (Lake Tanganyika sardine) – A key fish species supporting the local fishing industry; *Oreochromis niloticus* (Nile tilapia) – An economically significant fish species; and *Clarias gariepinus* (African catfish) – Found in rivers and wetland ecosystems.

4.3.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census (PHC5) has enumerated 369,180 residents in Rutsiro district, which represent 12.7% of the total population of the Western province (2,896,484 residents). The population of Rutsiro district is predominantly female: 192,682 are women corresponding to 52.2 % of the total population Rutsiro district. The results indicate that; the population share of Rutsiro district is 12.7 % of the total Western province population. Females are predominant in twelve out of 13 sectors of the district (Gihango (52.5%), Kigeyo (52.9%), Kivumu (53.1 %), Manihira (52.4%), Mukura (53%), Murunda (51.7%), Musasa 52.1%), Mushonyi (53%), Mushubati (52.4%), Nyabirasi (53.1%), Ruhango (53%), and Rusebeya (53.8%). Boneza has more male than female (54.6% male versus 45.4% female).

Rutsiro district population is predominantly by rural area 94.4% while urban area represents 5.6%. The sectors of Rutsiro district which are entirely rural area are Boneza, Kigeyo, Manihira, Mukura, Murunda, Mushubati, Nyabirasi, and Rusebeya while urban area are represented in (Gihango: 11.3%), (Kivumu:28.7%), (Musasa: 4.1%), Mushonyi (15.8%), and (Ruhango: 8. 5%).The most populated sectors are Mukura sector has (38, 627 Population), Kivumu (35,027 Population) and Nyabirasi (33,304 Population). They represent 10.5%, 9.5% and 9.0%of the total population of Rutsiro district, respectively. The two less populated sectors are Manihira (19,386 inhabitants) and Murunda (23,401 inhabitants). They represent 5.3% and 6.3% of the total resident population of Rutsiro district, respectively. The table below indicates the number of the population of Rutsiro district by sector, by sex and their shares across sectors to the total population of Rutsiro district.

Table 21: Population of Rutsiro District by Sector and sex

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	
Rutsiro district	369,180	176,498	192,682	100	47.8	52.2	100.0
Boneza	29,206	15,958	13,248	100	54.6	45.4	7.9

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Gihango	27,481	13,042	14,439	100	47.5	52.5	7.4
Kigeyo	24,308	11,455	12,853	100	47.1	52.9	6.6
Kivumu	35,027	16,415	18,612	100	46.9	53.1	9.5
Manihira	19,386	9,235	10,151	100	47.6	52.4	5.3
Mukura	38,627	18,167	20,460	100	47.0	53.0	10.5
Murunda	23,401	11,306	12,095	100	48.3	51.7	6.3
Musasa	25,716	12,321	13,395	100	47.9	52.1	7.0
Mushonyi	24,085	11,331	12,754	100	47.0	53.0	6.5
Mushubati	31,539	15,002	16,537	100	47.6	52.4	8.5
Nyabirasi	33,304	15,630	17,674	100	46.9	53.1	9.0
Ruhango	30,452	14,314	16,138	100	47.0	53.0	8.2
Rusebeya	26,648	12,322	14,326	100	46.2	53.8	7.2

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

b. Number of households and size of household

The results of the 5th RPHC 2022 indicate the total of 3,312,743 private households in Rwanda. The western province has 671,506 households and Rutsiro district has 86,802 households. The average household size in Rutsiro District is 4.2 persons per household. At the Sector level, the highest sizes are found in Nyabirasi (4.5 persons/household). The smallest household sizes are found in Musasa (4.0 persons/household). The results of the 5th RPHC 2022 revealed that 28.9% of private households are headed by women at national level. In Rutsiro district, private households headed by females are 28.7%. At sector level, the highest percentages of households headed by women are found in Mukura (30.8%) and Ruhango (30.5%) while the lowest are found in Boneza (24.9%).

Table 22: Number of households and their corresponding population

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western Province	671,506	2,871,195	4.3	70.4	29.6
Rutsiro district	86,802	365,096	4.2	71.3	28.7
Boneza	5,875	25,679	4.4	75.1	24.9
Gihango	6,683	27,394	4.1	70.8	29.2
Kigeyo	5,841	24,301	4.2	72.7	27.3
Kivumu	8,153	34,961	4.3	70.8	29.2
Manihira	4,703	19,379	4.1	73.3	26.7
Mukura	9,144	38,590	4.2	69.2	30.8
Murunda	5,473	23,236	4.2	70.5	29.5
Musasa	6,383	25,703	4.0	73.3	26.7
Mushonyi	5,926	24,014	4.1	72.1	27.9
Mushubati	7,624	31,510	4.1	70.1	29.9
Nyabirasi	7,427	33,291	4.5	71.2	28.8
Ruhango	7,085	30,407	4.3	69.5	30.5
Rusebeya	6,485	26,631	4.1	70.4	29.6

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western Province the predominant type of habitat is Umudugudu (Planned rural settlement) with 70.5% and Dispersed/ Isolated housing (18.5%). It is in same as in Rutsiro district as one of districts of the Western Province. The most common type of habitat in Rutsiro district is Umudugudu (Planned rural settlement) with 80.5% followed by Dispersed/ Isolated housing (15.1%). The type of habitat varies across sectors. Umudugudu (Planned rural settlement) is most prevalent in Musasa (95.7%), Kivumu (93.7%) and Mushonyi (93.6%) while the low percentages are in Mushubati (41.7%) and Rusebeya (57.0%). The sectors with the high percentages of dispersed/isolated housing units are Mushubati (39.4%) and Rusebeya (35.1%).

Table 23: Distribution of households in Rutsiro District by type of habitat

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu(Planned rural settlement)	Integrated model village	Old settlement	Dispersed/Isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Rwanda	3,312,743	100	65.4	0.8	2.3	14.9	6.9	8.9	0.8	0.0
Western Province	671,506	100	70.5	0.9	3.7	18.3	1.2	4.6	0.8	0.0
Rutsiro district	86,802	100	80.5	0.5	2.2	15.1	0.0	1.2	0.4	0.0
Rutsiro-Urban	4,951	100	97.3	0.5	0.2	1.4	0.0	0.2	0.4	0.0
Rutsiro-Rural	81,851	100	79.5	0.5	2.3	15.9	0.0	1.3	0.4	0.0
Boneza	5,875	100	90.7	0.1	0.1	8.7	0.0	0.1	0.3	0.0
Gihango	6,683	100	92.1	0.2	0.3	6.4	0.0	0.2	0.7	-
Kigeyo	5,841	100	85.6	2.7	5.5	5.1	-	0.9	0.3	-
Kivumu	8,153	100	93.7	0.5	1.4	4.3	-	-	0.1	-
Manihira	4,703	100	83.0	0.1	1.3	12.0	0.0	3.4	0.1	0.0
Mukura	9,144	100	73.8	0.1	2.1	23.4	0.0	0.1	0.5	-
Murunda	5,473	100	67.4	-	0.2	32.0	0.0	0.3	0.1	0.0
Musasa	6,383	100	95.7	1.2	0.6	2.2	-	0.1	0.2	-
Mushonyi	5,926	100	93.6	0.3	0.4	5.4	-	0.1	0.2	-
Mushubati	7,624	100	41.7	0.9	13.1	39.4	0.1	3.6	1.1	-
Nyabirasi	7,427	100	86.4	0.8	0.0	11.9	-	0.7	0.3	-
Ruhango	7,085	100	91.8	0.1	0.1	6.2	0.0	1.5	0.2	-
Rusebeya	6,485	100	57.0	0.4	1.1	35.1	-	5.3	1.1	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR) The type of habitat in

Rutsiro district are the same in both urban and rural areas but at the different percentages: the predominant types are umudugudu/Planned rural settlement (97.3% in urban areas against 79.5% in rural areas), followed by dispersed/isolated housing (1.4% in urban areas against 15.9% in rural areas).

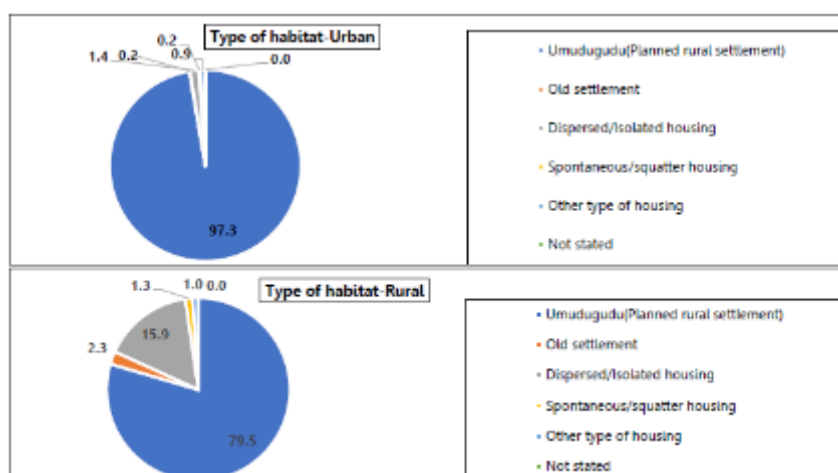


Figure 7: Distribution of households in Rutsiro District by type of habitat and by area of residence.

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5th RPHC 2022 indicate that the ownership of housing in the Western Province represents 80.5%, tenants represent 13.5% and free lodging represents 4.9%. In Rutsiro district, 85.8% of housing units are occupied by owner while 9.4% are occupied by Tenants and 4.3% by free lodging. At the sector level, the percentage of owners of households' units is high in Musasa (89.8%), Mukura (88.4%) and Manihira (88.2%) and low in Ruhango (82.9%), Kivumu (84.1%), and Gihango (84.5%). The percentage of tenants of housing units is high in Ruhango (13.0%), Gihango (11.2%), Murunda (10.8%) and Kivumu (10.2%) and low in Mukura (6.9%) and Musasa (7.1%). The high percentages of free lodging are found in Mushubati (5.5%), Kivumu (5.3%) and Boneza (5.1%).

In Rutsiro district, 3 types of tenure of housing units (owners, tenants, and free lodging) predominate in urban areas as well as in rural area and their percentages vary substantially according to the area of residence. The percentage of

owners of housing units is 77.8% in urban areas against 86.2 % in rural areas, the percentage of tenants of housing units is 16.9 % in urban areas against 8.9 % in rural areas. The percentage of free lodging is 4.4 % in urban areas against 4.3 % in rural areas.

Table 24: Distribution of households of Rutsiro District by tenure of the housing units

Sectors	Total Numbers of	Percentage							
		Total	Owner	Tenant	Hire purchase	Free lodging	Staff housing	Temporary camp or settlement	Other
Rwanda	3,312,743	100	71.6	22.2	0.1	4.4	0.8	0.5	0.2
Western Province	671,506	100	80.5	13.5	0.1	4.9	0.4	0.4	0.2
Rutsiro	86,802	100	85.8	9.4	0.1	4.3	0.2	0.0	0.2
Rutsiro-Urban	4,951	100	77.8	16.9	0.2	4.4	0.3	-	0.4
Rutsiro-Rural	81,851	100	86.3	8.9	0.1	4.3	0.2	0.0	0.2
Boneza	5,875	100	84.5	9.8	0.1	5.1	0.2	-	0.3
Gihango	6,683	100	84.5	11.2	0.2	3.4	0.3	-	0.4
Kigeyo	5,841	100	85.9	9.9	0.1	3.8	0.2	-	0.1
Kivumu	8,153	100	84.1	10.2	0.2	5.3	0.1	-	0.2
Manihira	4,703	100	88.2	7.8	0.2	3.2	0.4	-	0.2
Mukura	9,144	100	88.4	6.9	0.1	4.4	0.1	-	0.1
Murunda	5,473	100	84.5	10.8	0.1	3.9	0.5	-	0.1
Musasa	6,383	100	89.8	7.1	0.0	2.8	0.2	-	0.1
Mushonyi	5,926	100	87.0	8.4	0.1	4.2	0.1	0.0	0.2
Mushubati	7,624	100	84.9	8.6	0.2	5.5	0.6	-	0.2
Nyabirasi	7,427	100	85.1	9.9	0.0	4.8	0.2	-	0.0
Ruhango	7,085	100	82.9	13.0	0.1	3.9	0.1	-	0.1
Rusebeya	6,485	100	86.1	8.7	0.1	4.7	0.2	-	0.1

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

d. Education

In Rutsiro District, 21.0% of the population has never attended school, while 1.9% have attended nursery, and 62.9% have attended primary school. Other education levels include 0.4 % for INGOBOKA/Vocational, 7.9% for lower secondary, 4.7 % for upper secondary, 1.1% for university, and a small proportion less than 0.0% have not stated their highest level of education attended. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Nyabirasi has a higher percentage (33.0%) of individuals who have never attended school compared to other sectors, while Gihango has a higher percentage (67.8%) of individuals attended primary school, the high percentage of individuals who have attended lower secondary school is found in Mushonyi (10.2%). Boneza has a high percentage of individuals who have attended university level (2.1%).

Table 25: Distribution of the resident population of Rutsiro district by highest level of school attended

Sectors	Count	Percentage								
	Total(count s)	Total	Never attended school	Nursery	Primary	INGOBOKA/ Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Rutsiro District	333,658	100	21.0	1.9	62.9	0.4	7.9	4.7	1.1	0.0
Boneza	26,513	100	12.0	1.9	66.5	0.5	11.2	5.8	2.1	0.0
Gihango	24,834	100	15.2	2.2	67.8	0.5	7.7	5.0	1.7	0.0
Kigeyo	22,172	100	19.5	2.4	61.8	0.2	8.2	6.8	1.1	-
Kivumu	31,942	100	20.3	1.6	61.5	0.6	8.6	6.3	1.1	0.0
Manihira	17,715	100	21.8	1.7	66.5	0.3	6.2	2.8	0.8	0.0
Mukura	35,073	100	24.3	1.9	62.3	0.5	6.9	3.3	0.7	-
Murunda	20,921	100	23.1	1.6	64.0	0.4	5.9	3.7	1.3	0.0
Musasa	23,333	100	17.1	1.4	65.9	0.3	9.6	4.7	0.9	0.0

Sectors	Count	Percentage								
	Total(count s)	Total	Never attended school	Nursery	Primary	INGOBOKA/ Vocational	Lower secondary	Upper secondary	University	Not stated
Mushonyi	21,627	100	18.6	1.8	61.8	0.3	10.2	6.0	1.2	0.0
Mushubati	28,619	100	16.1	2.7	64.1	0.9	9.5	5.0	1.6	0.0
Nyabirasi	29,671	100	33.0	1.0	55.5	0.1	6.0	3.9	0.5	-
Ruhango	27,098	100	23.1	2.4	62.1	0.4	6.8	4.0	1.1	-
Rusebeya	24,140	100	26.3	1.7	61.2	0.3	6.1	3.9	0.5	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Nationally, 2,280,854 of private households (68.9%) are engaged in agriculture, among them 62.6% are engaged in crop farming and 50.4% are engaged in Livestock husbandry. In Rutsiro district, Agricultural households represent 68.9% with 77.2% of households engaged in crop farming and 63.0% Households engaged in Livestock husbandry. At the sector level, the highest percentages of agricultural households are found in Mukura (91.3%) and Mushubati (89.1%) where crop farming are more represented with percentage of 87.0% and 85.6%. The high proportions of Households engaged in Livestock husbandry are in Mukura (73.3%) and Musasa (67.7%).

It was also revealed that the employment to population ratio is 44.2% percent among people residing in Rutsiro district, it is higher in urban areas of Rutsiro (49.6 %) than in rural areas (43.9%). The employment to population ratio among males as well as females increases from age group 16-19 to 30-34 and starts decreasing from age group 35-39 to 85 years and above as people starts getting very older and retire. It was observed that in district of Rutsiro, the highest employment to population ratio among males stands at 64.8% and was observed in age group 30-34, On the other side the highest employment to population among females is 50.6% and was observed in the age group 30-34. The lowest employment to population ratio among males stands at 5% and was observed among males in the age group 80-84, the lowest employment to population ratio among females is 7.3 % and was observed among females in the age group 85+.

Table 26: Distribution of household engaged in livestock husbandry in Rutsiro District

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Private Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Rutsiro district	86,802	73,034	84.1	67,036	77.2	54,722	63.0
Boneza	5,875	4,993	85.0	4,657	79.3	3,804	64.7
Gihango	6,683	5,815	87.0	5,481	82.0	4,509	67.5
Kigeyo	5,841	4,705	80.6	4,061	69.5	3,480	59.6
Kivumu	8,153	6,415	78.7	5,887	72.2	4,043	49.6
Manihira	4,703	3,821	81.3	3,504	74.5	2,940	62.5
Mukura	9,144	8,350	91.3	7,957	87.0	6,704	73.3
Murunda	5,473	4,512	82.5	4,140	75.6	3,383	61.8
Musasa	6,383	5,576	87.4	5,264	82.5	4,322	67.7
Mushonyi	5,926	4,965	83.8	4,073	68.7	3,985	67.2
Mushubati	7,624	6,791	89.1	6,524	85.6	4,914	64.5
Nyabirasi	7,427	6,040	81.3	5,541	74.6	4,088	55.0
Ruhango	7,085	5,531	78.1	4,909	69.3	4,216	59.5
Rusebeya	6,485	5,520	85.1	5,038	77.7	4,334	66.8

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, Water supply and Sanitation facilities

In Rutsiro District 96.9% are using Mutuelle as main health insurance, 2.6% using RSSB or RAMA, 0.2% using private insurance, 0.0% using school insurance, 0.0% using NGOs insurance and 0.4% using employer insurance.

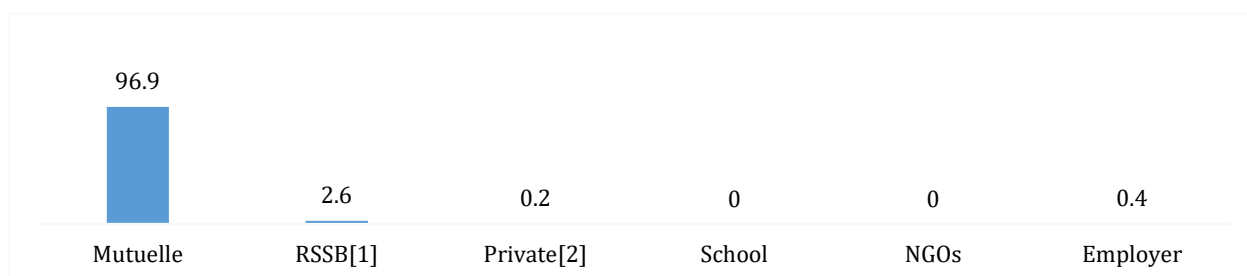


Figure 8: Population who have a medical insurance by main type of insurance in Rutsiro district

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Rutsiro district, 61.2% of private households use improved water sources. At the sector level, the percentage of the private households using water from improved sources is highest in Kivumu (83.2%), and the lowest in Rusebeya (35.3%).

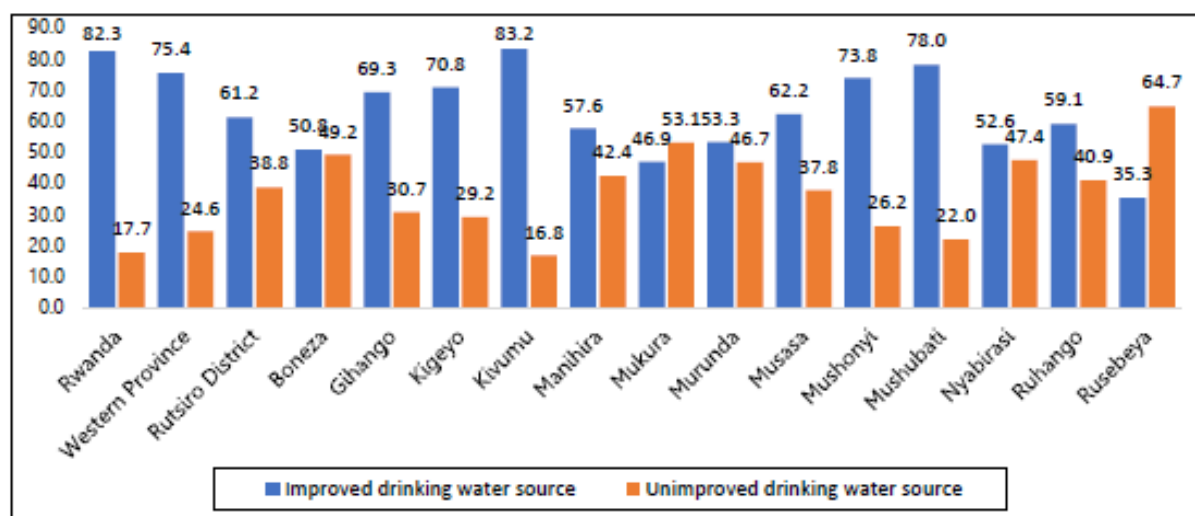


Figure 9: Percentage of households of Rutsiro district by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In both urban and rural areas of Rutsiro district, private households use mainly improved drinking water source (76.7% in urban and 60.3% in rural). The percentage of private households using unimproved drinking water source is higher in rural (39.7%) than in urban (23.3%).

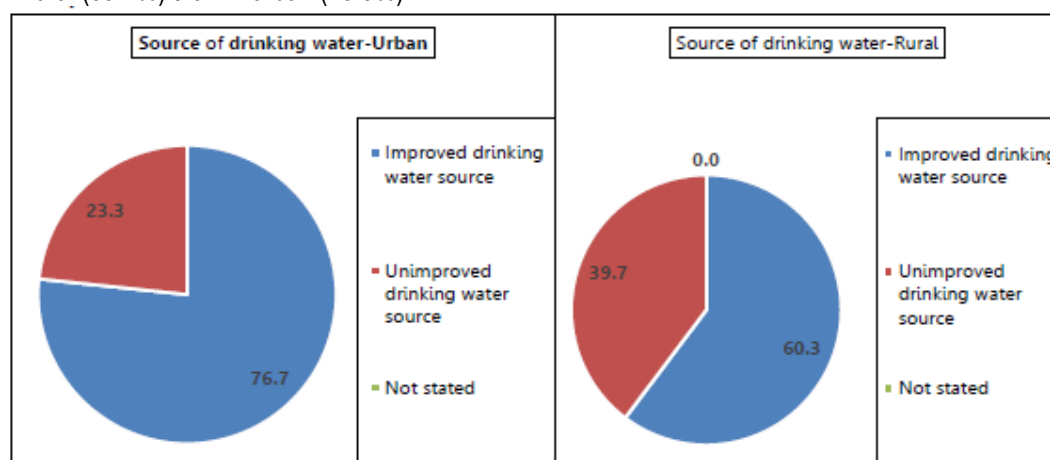


Figure 10: Distribution of the private households of Rutsiro district by main source of water and by area of residence

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

g. Appliance and assets ownership

At the district level, 75.8% of private households possess a radio, 73.0% a mobile phone, 9.9% a smartphone, 4.1% a TV and 0.9% a computer. The percentages of private households possessing a radio and mobile phone are high in Boneza (84.7% for radio and 82.5% for mobile phone), Mushonyi (82.8% for radio and 80.8% for mobile phone), Kigeyo (81.7% for radio and 80.4% for mobile phone) and Musasa (80.0% for radio and 76.8% for mobile phone). The percentage of private households possessing a television is high in Boneza (7.6%) while it is low in Nyabirasi (1.7%). The sectors with high percentages of households with smartphone are Boneza (16.1%) and Gihango (13.0%) while the percentage of households possessing this asset is low in Rusebeya (5.6%). The computer is mostly possessed in Gihango (1.8%), Boneza (1.6%) and Murunda (1.4%).

Table 27: Percentage of private households and of Rutsiro District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Rutsiro district	86,802	75.8	4.1	73.0	9.9	0.9
Boneza	5,875	84.7	7.6	82.5	16.1	1.6
Gihango	6,683	79.2	5.3	76.5	13.0	1.8
Kigeyo	5,841	81.7	5.3	80.4	11.8	0.8
Kivumu	8,153	77.4	5.4	76.0	10.5	0.9
Manihira	4,703	73.4	3.1	68.8	7.1	0.4
Mukura	9,144	68.6	2.1	64.4	6.8	0.6
Murunda	5,473	74.7	4.0	70.8	9.4	1.4
Musasa	6,383	80.0	4.5	76.8	10.8	0.8
Mushonyi	5,926	82.8	5.0	80.8	10.6	0.8
Mushubati	7,624	76.4	3.9	72.8	10.4	1.1
Nyabirasi	7,427	71.4	1.7	69.8	7.1	0.6
Ruhango	7,085	74.3	3.3	72.1	11.2	1.1
Rusebeya	6,485	65.0	3.6	61.3	5.6	0.6

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

h. Access to energy for lighting and cooking

In Rutsiro district, the main source of energy for lighting used by households is electricity (50.2%). At the sector level, the percentage of households using electricity for lighting is high in Boneza (69.0%), Kivumu (64.0%), Gihango (61.1%) and Nyabirasi (60.1%). The sectors with the high percentages of private households using flashlight/phone flashlight for lighting are Mukura (50.0%) and Rusebeya (45.7%). Firewood's are most found in Rusebeya (21.5%), Ruhango (20.4%), Nyabirasi (16.4%) and Kigeyo (15.5%).

The sources of energy for lighting in Rutsiro districts are the same in both urban areas and rural areas where in urban areas they are mainly electricity (64.2%), followed by flashlight/phone flashlight (17.9%), firewood's with 12.1% and candles (3.8%). In rural areas, 49.3% of private households use electricity as main source of energy for lighting while 32.2% use flashlight/ phone flashlight, 13.9% use firewood and candle is used by 1.6% households.

Table 28: Distribution of households of Rutsiro district by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin in lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy	Not stated
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5	0.0
Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6	0.0
Rutsiro District	86,802	100	50.2	0.4	0.0	1.8	13.8	0.8	31.4	0.2	0.8	0.6	0.0
Rutsiro-Urban	4,951	100	64.2	0.3	-	3.8	12.1	0.2	17.9	0.0	1.0	0.4	-
Rutsiro-Rural	81,851	100	49.3	0.4	0.0	1.6	13.9	0.9	32.2	0.3	0.8	0.6	0.0
Boneza	5,875	100	69.0	0.4	0.0	2.3	6.4	0.3	19.5	0.3	1.5	0.2	0.0
Gihango	6,683	100	61.1	0.1	0.0	2.6	9.5	0.4	25.4	0.1	0.4	0.4	-
Kigeyo	5,841	100	55.4	0.2	-	2.3	15.5	0.2	24.1	0.6	1.3	0.4	-
Kivumu	8,153	100	64.0	0.4	0.0	5.4	14.5	0.2	13.6	0.1	1.6	0.1	-

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin in lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy	Not stated
Manihira	4,703	100	37.0	0.3	-	0.5	13.4	4.2	43.0	0.8	0.1	0.6	0.0
Mukura	9,144	100	33.5	0.1	-	0.3	13.3	2.2	50.0	0.1	0.2	0.3	-
Murunda	5,473	100	41.8	0.3	-	0.5	13.8	0.6	41.2	0.8	0.4	0.6	0.0
Musasa	6,383	100	53.5	0.5	-	1.0	11.5	0.3	31.5	0.1	1.0	0.5	-
Mushonyi	5,926	100	58.6	0.4	0.0	1.9	14.2	0.4	22.6	0.3	1.2	0.4	-
Mushubati	7,624	100	49.9	0.3	0.0	1.5	8.7	1.1	36.1	0.1	0.6	1.7	-
Nyabirasi	7,427	100	60.1	0.1	0.0	2.8	16.4	0.2	19.1	0.1	1.0	0.2	-
Ruhango	7,085	100	39.9	0.2	-	0.8	20.4	0.1	36.0	0.3	0.8	1.5	-
Rusebeya	6,485	100	29.4	1.6	-	0.3	21.5	1.1	45.7	0.1	0.1	0.3	-

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (95.6%) followed by charcoal (3.5%) and gas (0.2%). At the sector level, firewood is the most used source of cooking energy by private households in Mushonyi (97.2%) and Musasa (97.0%) followed by Kigeyo and Rusebeya (96.6% each). Sectors with the high percentage of private households using charcoal as main source of cooking energy are Gihango (6.3%), Murunda (4.9%) and Mushubati (4.7%). Sectors with the highest percentages of private households using gas as main source of cooking energy are Gihango (0.8%), Boneza (0.4%), and Murunda and Mushubati (0.3% each).

The main sources of energy for cooking used by private households in Rutsiro district vary by area of residence. In urban areas, private households use most charcoal (88.1%), firewood (10.0%) and gas (1.3%). In Rural areas, private households use mostly firewood (96.1%) and charcoal (3.1%).

i. Vulnerability

At the national level, 3.4% of the resident population have a vulnerability while in Rutsiro district, the vulnerability prevalence rate is 3.2%. In Rutsiro district and at the sector level, the highest prevalence rates of the resident population with vulnerability are in Kivumu (4.9%). The lowest is in Rusebeya (1.7%).

Table 29: Number and share of vulnerability of Rutsiro district by Sector of residence and sex

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Rutsiro district	322,578	10,464	4,686	5,778	3.2
Boneza	26,168	606	284	322	2.3
Gihango	24,036	971	429	542	4
Kigeyo	21,356	828	348	480	3.9
Kivumu	30,882	1,503	627	876	4.9
Manihira	16,903	373	162	211	2.2
Mukura	33,659	1,210	553	657	3.6
Murunda	20,033	445	213	232	2.2
Musasa	22,740	796	354	442	3.5
Mushonyi	21,222	809	365	444	3.8
Mushubati	27,616	996	447	549	3.6
Nyabirasi	28,599	729	338	391	2.5
Ruhango	26,420	807	388	419	3.1
Rusebeya	22,944	391	178	213	1.7

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

4.4 Karongi district

4.4.1 Physical environment

a. Location

Karongi District is one of seven Districts of the Western Province. located in the center of the Western Province and

bordered by Rutsiro to the North, Ngororero and Muhanga Districts to the North East, Nyamagabe Districts to the South, Ruhango District to East and it borders with the Democratic Republic of Congo and Lake Kivu to the West. The district is divided into 13 administrative Sectors, 88 Cells and 537 Villages which are all delegated entities of the district and hence under its full responsibilities in regards of staffing, administration and financing. Karongi.

b. Topography

Karongi district stretches over an area of 993 km², and is characterized by a highly undulating terrain, with a mix of steep hills and deep valleys. The elevation in Karongi ranges from around 1,460 meters to 2,600 meters above sea level. The landscape is predominantly hilly, with numerous streams and rivers cutting through the valleys, contributing to a rich and varied topography. The region's topography significantly influences land use patterns, with terraced farming being common on the hillsides and more intensive agriculture in the valley floors.

c. Climate and Rainfall

The climatic situation of the district does not differ from North-Western part of the Country. As it is the same for the whole Country, Karongi District has two dry seasons covering the period from December to January and from June to mid-September, and it is also characterized by two rainy seasons. The long rains start in mid-September and end in December and from February to June with an annual average of temperature varying from 16°C to 21°C and annual rain falls ranging from 1100 to 1500 mm

d. Geology and soils

The geology and soils of Karongi District are influenced by its complex topography and climatic conditions. While the predominant ferrallitic soils present challenges due to their low fertility, appropriate soil management and agricultural practices can enhance productivity and sustainability. The district's diverse geological features and soil types offer opportunities for varied agricultural activities and land use planning. The district is predominantly underlain by Precambrian rocks, which include schists, quartzites, and granites. These rocks are part of the larger Kibaran Belt, which stretches across Central Africa. The district also contains significant amounts of metamorphic rocks, formed through high pressure and temperature conditions over millions of YEARS while granitic intrusions are common, contributing to the district's varied landscape and mineral composition.

e. Hydrography

Karongi District, is characterized by a complex hydrography that includes numerous rivers and streams flowing through its hilly terrain. The district is notably bordered by Lake Kivu to the west, providing a significant water resource and supporting local fisheries and tourism. Major rivers in Karongi include the Nyabarongo River, which is a critical tributary to the Akagera River and forms part of the upper Nile Basin, and the Rukarara River, which contributes to the Nyabarongo. Other smaller rivers include the Nyamuswaga, Rubagabaga, and Nyagisozi, which play vital roles in local agriculture and ecosystem support. These water bodies are crucial for the district's water supply, irrigation, and hydroelectric potential, shaping the livelihoods of the residents and the district's environmental landscape.

4.4.2 Ecological environment

Karongi District has a diverse range of flora and fauna influenced by its varied topography, climate, and proximity to Lake Kivu. Below is a general description of the district's biodiversity, including dominant species and their ecological characteristics.

- Flora

Karongi's vegetation consists of natural forests, savannah woodlands, and aquatic plants along Lake Kivu. Some of the dominant plant species include: Eucalyptus spp. – Widely planted for timber, firewood, and erosion control; Pinus spp. – Used in reforestation programs and found in plantations; Ficus thonningii (Strangler Fig) – Common in woodlands and provides food for wildlife; Grevillea robusta (Silky Oak) – A fast-growing tree used for agroforestry and erosion control; Vernonia amygdalina (Bitter Leaf) – Common in bushland and known for its medicinal properties; Albizia gummifera (Peacock Flower Tree) – Found in montane forests and plays a role in nitrogen fixation; Papyrus (Cyperus papyrus) – Dominates wetlands and acts as a habitat for aquatic species; Dracaena steudneri (Wild Dragon Tree) – Common in riverine forests and provides habitat for birds and Podocarpus latifolius (Yellowwood) – Found in remnants of natural forests, important for biodiversity.

- Fauna

The district supports various terrestrial and aquatic wildlife species, including mammals, birds, amphibians, and reptiles.

a) Mammals

These include *Cercopithecus mitis* (Blue Monkey) – Found in forested areas, especially near Nyungwe Forest; *Papio anubis* (Olive Baboon) – Inhabits woodland and forest edges, known for its adaptability; *Hystrix cristata* (Crested Porcupine) – A nocturnal species that burrows in rocky landscapes; *Atilax paludinosus* (Marsh Mongoose) – Common in wetland areas and preys on aquatic animals; *Sylvicapra grimmia* (Common Duiker) – Inhabits savannah woodlands and feeds on shrubs; and *Tragelaphus scriptus* (Bushbuck) – Prefers dense vegetation and is commonly found in forested zones.

b) Birds

These include *Cossypha heuglini* (White-browed Robin-Chat) – Common in gardens and forest edges; *Tockus alboterminatus* (White-throated Hornbill) – Found in woodland areas, plays a role in seed dispersal; *Merops bullockoides* (White-fronted Bee-eater) – Frequently seen along riverbanks feeding on insects; *Tauraco schalowi* (Schalow's Turaco) – Inhabits forest canopies, known for its bright plumage; *Ardea cinerea* (Grey Heron) – Common near Lake Kivu and wetlands, preys on fish; *Balearica regulorum* (Grey Crowned Crane) – Found in wetlands, an endangered species in Rwanda; *Halcyon senegalensis* (Woodland Kingfisher) – Occurs near water bodies and is an insectivorous bird.

c) Reptiles and Amphibians

These include *Agama agama* (Common Agama Lizard) – Seen in rocky and semi-urban areas; *Bitis arietans* (Puff Adder) – A venomous snake found in grasslands and forests; *Pelomedusa subrufa* (Helmeted Turtle) – Found in freshwater habitats; *Hyperolius kivuensis* (Kivu Tree Frog) – Inhabits wetlands and is sensitive to environmental changes.

4.4.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census (PHC5) has enumerated 374,319 residents in Karongi District which represent 21.4% of the total population of Western Province. The population of Karongi District is predominantly male: 195,780 are men corresponding to 52.3% of its total population. The below indicates the number of the population of Karongi District by sector, by sex (count and percentage) across sectors. The population of Karongi District is predominantly male: 195,452 residents in this district are women corresponding to 52.3% of its total population. Sector with high percentage of females is Murambi (53.1%) and the sector with high percentage of males is Gitesi (48.2%). Bwishyura, Rubengera and Rwankuba are the most populated sectors. They represent respectively 10.9%; 16.0%; 10.8% and 10.2% of the total population of Karongi District. The two less populated sectors are Ruganda (5.1%) and (5.7%).

Table 30: Population of Karongi District by Sector and sex

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Karongi District	373,869	178,417	195,452	100	47.7	52.3	100
Bwishyura	40,720	19,930	20,790	100	48.9	51.1	10.9
Gashari	21,263	10,156	11,107	100	47.8	52.2	5.7
Gishyita	23,687	11,212	12,475	100	47.3	52.7	6.3
Gitesi	29,312	14,125	15,187	100	48.2	51.8	7.8
Mubuga	23,455	11,144	12,311	100	47.5	52.5	6.3
Murambi	22,374	10,484	11,890	100	46.9	53.1	6
Murundi	27,236	12,909	14,327	100	47.4	52.6	7.3
Mutuntu	25,652	12,237	13,415	100	47.7	52.3	6.9
Rubengera	40,337	19,188	21,149	100	47.6	52.4	10.8
Rugabano	34,207	16,223	17,984	100	47.4	52.6	9.1
Ruganda	19,132	9,184	9,948	100	48	52	5.1
Rwankuba	38,286	18,157	20,129	100	47.4	52.6	10.2
Twumba	28,208	13,468	14,740	100	47.7	52.3	7.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

Karongi District population lives predominantly in rural area (91.0%) while resident population in urban represents 9%.

Almost all sectors of Karongi District (11 out of 13 sectors) are entirely rural. Only Bwishyura and Rubengera sectors have some urban areas.

b. Number of households and size of household

The results of the 5th RPHC 2022 indicate a total number of private households 91,444 in Karongi District. The average household size in Karongi District is 4.1 persons per household. At the sector level, the highest sizes are found in Rwankuba (4.6 persons/household), Gitesi and Mutuntu (4.3 persons/household each). The smallest household sizes are found in Bwishyura, Murambi and Murundi (3.9 persons/household each). The results of 5th RPHC 2022 revealed that nationally 28.9% of private households are headed by women. In Karongi District, private households headed by females are 31.8%. At sector level, the highest percentages of households headed by women are found in Rwankuba sector (36.7%) and Mubuga sector (35.0%) while the lowest is found in Gitesi sector (28.4%).

Table 31: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western Province	671,506	2,871,195	4.3	70.4	29.6
Karongi District	91,444	372,913	4.1	68.2	31.8
Bwishyura	10,294	40,198	3.9	68.7	31.3
Gashari	5,248	21,127	4.0	69.8	30.2
Gishyita	5,931	23,654	4.0	65.7	34.3
Gitesi	6,802	29,302	4.3	71.6	28.4
Mubuga	5,823	23,402	4.0	65.0	35.0
Murambi	5,755	22,367	3.9	67.9	32.1
Murundi	7,046	27,220	3.9	67.7	32.3
Mutuntu	6,010	25,642	4.3	71.2	28.8
Rubengera	10,349	40,257	3.9	66.1	33.9
Rugabano	8,285	34,193	4.1	70.4	29.6
Ruganda	4,707	19,127	4.1	70.3	29.7
Rwankuba	8,399	38,259	4.6	63.3	36.7
Twumba	6,795	28,165	4.1	70.7	29.3

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western Province the predominant type of habitat is “Umudugudu/Planned rural settlement” (70.5%) and “Dispersed/Isolated housing (18.3%). It is the same as in Karongi District as one of districts of the Western Province. The most common type of habitat in Karongi District is “Umudugudu/Planned rural settlement” (56.9%) and “Dispersed/Isolated housing” (33.2%). The type of habitat varies across sectors. “Umudugudu/Planned rural settlement” is most prevalent in Gishyita (78.9%) and Rubengera (77.7%) and low in Ruganda (37.3%) and Mutuntu (38.3%). The sectors with the high percentages of dispersed/isolated housing units are Mutuntu (58.8%) and Ruganda (58.3%).

Table 32: Distribution of households in Karongi District by type of habitat

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu/Planned rural settlement	Integrated model village	Old settlement	Dispersed/Isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Rwanda	3,312,743	100	65.4	0.8	2.3	14.9	6.9	8.9	0.8	0.0

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu(Planned rural settlement)	Integrated model village	Old settlement	Dispersed/isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Western Province	671,506	100	70.5	0.9	3.7	18.3	1.2	4.6	0.8	0.0
Karongi District	91,444	100	56.9	1.4	1.4	33.2	0.2	3.6	3.3	0.0
Karongi Urban	8,794	100	60.2	0.1	4.3	13.4	1.8	19.5	0.8	0.0
Karongi Rural	82,650	100	56.5	1.5	1.1	35.3	0.0	1.9	3.6	0.0
Bwishyura	10,294	100	40.6	1.6	3.1	34.3	1.4	18.6	0.5	0.0
Gashari	5,248	100	53.8	0.2	0.7	43.1	0.0	1.5	0.6	-
Gishyita	5,931	100	78.9	0.8	1.2	16.6	0.0	1.2	1.3	-
Gitesi	6,802	100	65.3	2.5	0.9	30.5	-	0.5	0.3	-
Mubuga	5,823	100	71.5	1.7	0.9	23.8	0.0	1.5	0.6	0.0
Murambi	5,755	100	50.5	2.1	2.4	42.2	0.0	2.3	0.5	-
Murundi	7,046	100	68.3	0.7	0.2	28.6	-	1.6	0.6	0.0
Mutuntu	6,010	100	38.3	1.1	0.7	58.8	0.0	1.0	0.1	-
Rubengera	10,349	100	77.7	0.3	3.7	17.0	0.2	0.5	0.7	-
Rugabano	8,285	100	65.1	4.5	1.2	26.7	0.0	1.1	1.4	-
Ruganda	4,707	100	37.3	1.2	0.0	58.2	-	1.7	1.5	-
Rwankuba	8,399	100	39.8	0.6	0.6	26.4	-	3.7	28.9	-
Twumba	6,795	100	46.5	0.6	0.7	47.2	-	4.3	0.6	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR) The type of habitat in Karongi District varies also according to the area of residence. In urban areas, the predominant types are “Umudugudu/Planned rural settlement” (60.2%) and “Spontaneous/squatter housing” (19.5%). In rural areas, the predominant type is “Umudugudu/Planned rural settlement” (56.5%) followed by “Dispersed/isolated housing” (35.3%).

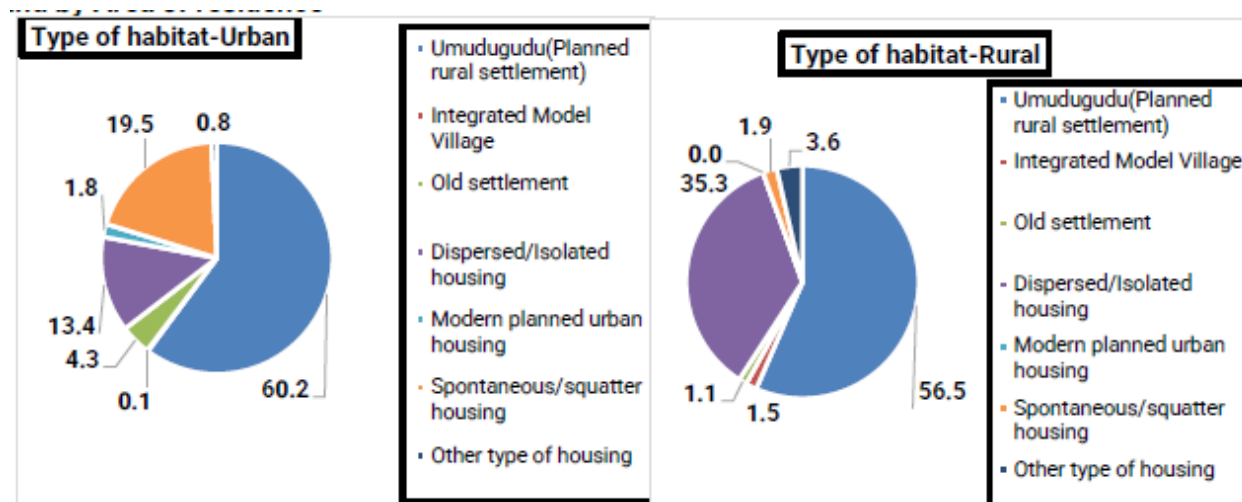


Figure 11: Distribution of households in Karongi District by type of habitat and by area of residence.

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5th RPHC 2022 indicate that the ownership of housing in the Western Province represents 80.5% and tenants represent 13.5%. In Karongi District, 80.8% of housing units are occupied by tenants while 10.7% are occupied by their owners. At the sector level, the percentage of owners of households' units is high in Mutuntu (91.2%), Murundi (91.1%) and Ruganda (91.0%) and low in Bwishyura (64.6%) and Rwankuba (64.7%). The percentage of tenants of housing units is high in Bwishyura (29.3%), Rubengera (21.4%) and low in Mutuntu (2.3%) and Rwankuba (3.2%). According to the area of residence, 3 types of tenure of housing units (owners, tenants and free lodging) predominate in urban area as well as in rural area and their percentages vary substantially. The percentage of owners of housing units is 51.4% in urban areas to 83.9% in rural areas, the percentage of tenants of housing units is 41.5% in urban areas to 7.4% in rural areas. The percentage of free lodging is 5.6% in urban areas to 5% in rural areas.

Table 33: Distribution of households of Karongi District by tenure of the housing units and

Sectors	Total Numbers of	Percentage							
		Total	Owner	Tenant	Hire purchase	Free lodging	Staff housing	Temporary camp or settlement	Other
Rwanda	3,312,743	100	71.6	22.2	0.1	4.4	0.8	0.5	0.2
Western Province	671,506	100	80.5	13.5	0.1	4.9	0.4	0.4	0.2
Karongi District	91,444	100	80.8	10.7	0.1	5.0	0.5	2.7	0.3
Karongi Urban	8,794	100	51.4	41.5	0.1	5.6	1.1	-	0.2
Karongi Rural	82,650	100	83.9	7.4	0.1	5.0	0.4	3.0	0.3
Bwishyura	10,294	100	64.6	29.3	0.0	5.0	0.9	-	0.1
Gashari	5,248	100	88.5	5.2	0.1	5.5	0.4	-	0.3
Gishyita	5,931	100	79.5	15.0	0.1	4.6	0.5	0.0	0.3
Gitesi	6,802	100	90.9	5.5	0.1	3.3	0.2	-	0.1
Mubuga	5,823	100	76.3	17.1	0.0	5.4	0.7	0.0	0.4
Murambi	5,755	100	85.5	5.3	0.1	7.8	0.7	-	0.6
Murundi	7,046	100	91.1	2.3	0.0	6.0	0.3	0.0	0.3
Mutuntu	6,010	100	91.2	3.8	0.0	4.5	0.4	-	0.1
Rubengera	10,349	100	70.0	21.4	0.1	7.4	0.7	-	0.4
Rugabano	8,285	100	90.4	4.7	0.1	4.4	0.2	-	0.2
Ruganda	4,707	100	91.0	3.5	0.2	4.8	0.1	-	0.4
Rwankuba	8,399	100	64.7	3.2	0.0	2.4	0.3	29.1	0.3
Twumba	6,795	100	87.7	7.0	0.1	4.5	0.6	-	0.1

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

d. Education

In Karongi District, 17.0% of the population have never attended school while 2.6% have attended nursery and 61.7% have attended primary school. Other education levels include 0.9% for INGOBOKA/Vocational, 9.5% for lower secondary, 6.3% for upper secondary, 1.9% for university and 0.0% is not stated. The distribution of the highest level of education attended varies among sectors with differences in the percentage of individuals at each education level. For example, Rugabano (21.9%), Rwankuba (21.8%) and Mutuntu (20.1%) have higher percentages of individuals who have never attended school compared to other sectors while Bwishyura has higher percentages of individuals attended Lower secondary (11.7%) and upper secondary school (9.3%). Each sector has its own unique distribution of education levels attended by the population.

Table 34: Distribution of the resident population of Karongi district by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA /Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Karongi District	339,452	100	17.0	2.6	61.7	0.9	9.5	6.3	1.9	0.0
Bwishyura	36,725	100	12.6	3.0	57.8	1.0	11.7	9.3	4.6	0.0
Gashari	19,344	100	14.1	2.3	66.3	1.3	8.7	5.7	1.5	0.0
Gishyita	21,687	100	14.3	2.9	62.1	1.3	11.5	5.9	2.1	0.0
Gitesi	26,551	100	19.3	2.2	66.0	0.4	7.2	3.9	1.0	0.0
Mubuga	21,173	100	18.1	3.4	59.2	1.0	11.4	5.4	1.5	0.0
Murambi	20,475	100	13.1	3.2	66.3	1.4	8.6	5.4	1.9	0.0
Murundi	24,554	100	15.8	2.2	67.8	1.4	8.1	3.7	0.9	0.0
Mutuntu	22,890	100	20.1	1.8	62.1	0.5	8.3	5.9	1.3	0.0
Rubengera	36,657	100	14.6	3.2	57.4	1.5	11.1	8.6	3.5	0.0
Rugabano	30,985	100	21.9	2.1	64.4	0.4	6.5	3.8	0.9	0.0
Ruganda	17,330	100	13.5	2.9	66.0	0.8	10.0	5.7	1.0	0.0

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA Vocational	Lower secondary	Upper secondary	University	Not stated
Rwankuba	35,156	100	21.8	2.6	53.7	0.8	10.2	9.3	1.6	0.0
Twumba	25,925	100	19.7	1.7	61.9	0.4	9.4	5.5	1.4	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Karongi District is one of the districts of the Western Province where crop farming and animal husbandry are on large scale. In Karongi District, agricultural households occupy 83.2% with 76.8% of households engaged in crop farming and 66.2% of households engaged in Livestock husbandry. At the sector level, the highest percentages of agricultural households are found in Murundi (93.3%) Ruganda (92.8%), Gitesi (92.4%), Gashari (91.3%) and Murambi (90.6%). Households engaged in crop farming as well as those engaged in livestock husbandry are more represented in the same sectors: Murundi (88.8% of households in crop farming and 80.8% in livestock husbandry), Ruganda (79.1% of households in crop farming and 85.0% in livestock husbandry), Gitesi (88.7% of households in crop farming and 72.9% in livestock husbandry), Gashari (86.9% of households in crop farming and 78.9% in livestock husbandry) and Murambi (84.2% of households in crop farming and 74.9% in livestock husbandry). Rwankuba has the highest percentage of households engaged in livestock husbandry (85.0%).

It was also revealed that the employment to population ratio is 36.4% among people residing in Karongi District. By area of residence, it is higher in urban (51.2%) than in rural (34.9%) and by sex, it is higher for male than for female in both urban (59.4% to 43.9%) and rural (39.7% to 30.9%). In Karongi District, the employment to population ratio among males as well as females increases from age group 16-19 to 30-34 and starts decreasing from age group 45-49 to 85 years and above as people starts getting very older and retire. It was observed that the highest employment to population ratio among males stands at 57.2% and was observed in age group 30-34. Among females, the highest employment to population ratio is 42.1% and is observed in the age group 35-39. The lowest employment to population ratio stands at 4.3% among males and 2.8% among females and is observed in the age group 85 and above as well for males than for females.

Table 35: Distribution of household engaged in livestock husbandry in Karongi district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Private Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Karongi District	91,444	76,076	83.2	70,199	76.8	60,560	66.2
Bwishyura	8,794	6,863	66.7	6,209	60.3	4,372	42.5
Gashari	82,650	4,791	91.3	4,561	86.9	4,143	78.9
Gishyita	10,294	4,970	83.8	4,521	76.2	3,735	63.0
Gitesi	5,248	6,282	92.4	6,031	88.7	4,957	72.9
Mubuga	5,931	4,907	84.3	4,587	78.8	3,434	59.0
Murambi	6,802	5,212	90.6	4,845	84.2	4,313	74.9
Murundi	5,823	6,571	93.3	6,257	88.8	5,694	80.8
Mutuntu	5,755	5,352	89.1	4,868	81.0	4,593	76.4
Rubengera	7,046	7,955	76.9	7,418	71.7	5,602	54.1
Rugabano	6,010	7,402	89.3	6,971	84.1	6,265	75.6
Ruganda	10,349	4,366	92.8	3,721	79.1	3,999	85.0
Rwankuba	8,285	5,537	65.9	5,328	63.4	4,623	55.0
Twumba	4,707	5,868	86.4	4,882	71.8	4,830	71.1

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, Water supply and Sanitation facilities

In Karongi District 91.8% are using Mutuelle as main health insurance, 3.7% using RSSB or RAMA, 0.4% using private insurance, 0.0% using school insurance, 3.6% using NGOs insurance and 0.6% using employer insurance.

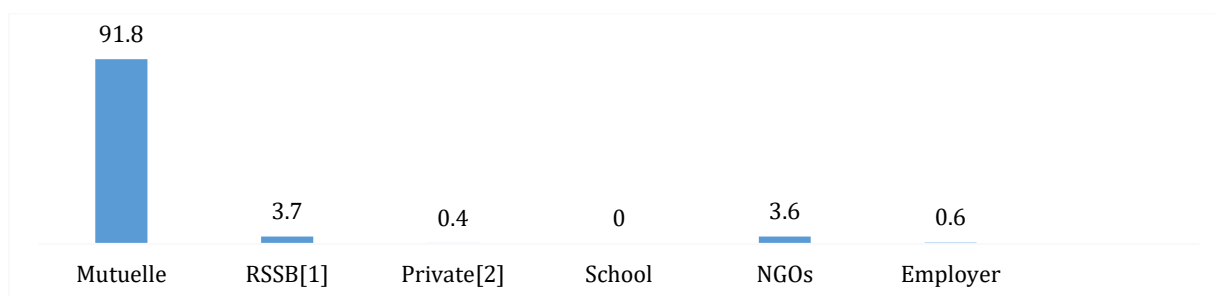


Figure 12: Population who have a medical insurance by main type of insurance in Karongi district

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved drinking water sources are used by 82.3% of private households in Rwanda while they are 75.4% in the Western Province. In Karongi District, the percentage of private households using improved drinking water is 63.7%. At the sector level, the percentage of the private households using water from improved sources is highest in Gishyita (85.0%), Mubuga (80.6%) and Rubengera (75.2%). The lowest percentages are found in Murundi (47.2%), Ruganda (46.7%) and Mutuntu (41.3%).

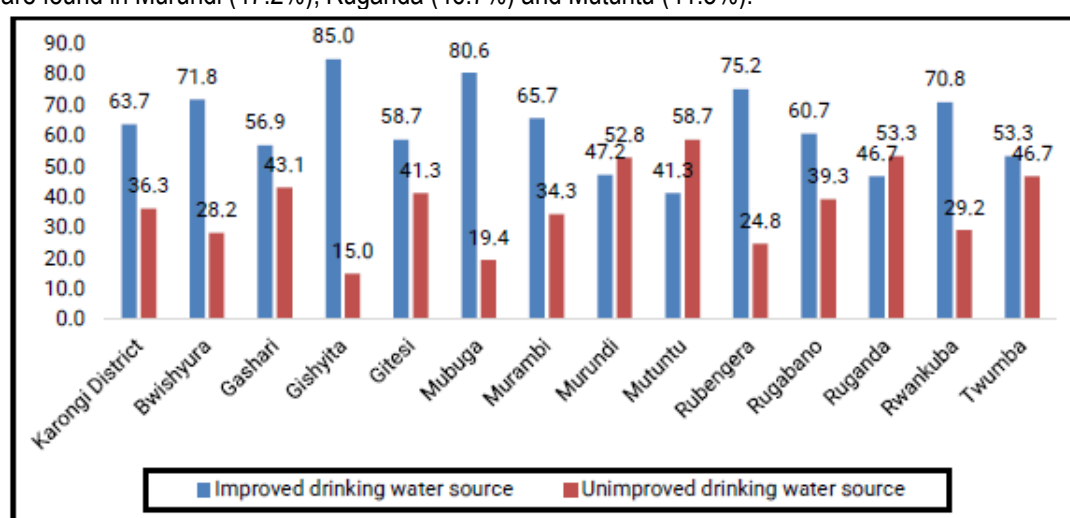


Figure 13: Percentage of households of Karongi District by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

By area of residence, private households use mainly improved drinking water source in both urban and rural areas of Karongi District (88.7% in urban and 61.1% in rural). The percentage of private households using unimproved drinking water source is higher in rural (38.9%) than in urban (11.3%).

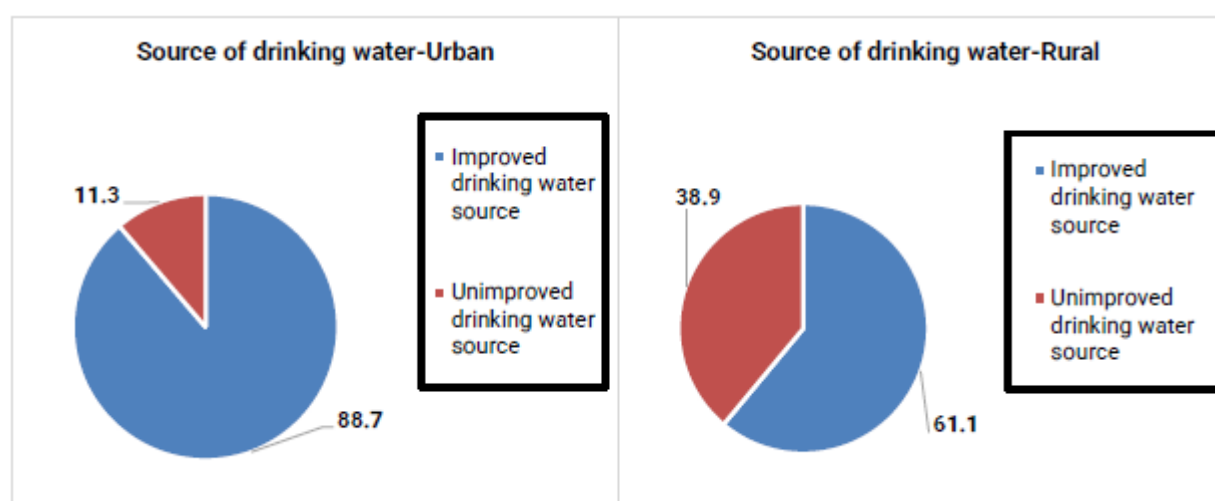


Figure 14: Distribution of the private households of Karongi district by main source of water and by area of residence

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

g. Appliance and assets ownership

At the district level, 77.7% of private households possess one radio including one from phone, 74.1% a mobile phone, 14.1% a smartphone, 5.0% a TV and 1.6% a computer. By sectors, the percentage of private households possessing a radio is high in Bwishyura (84.0%), Rubengera (83.0%), Rwankuba (81.0%) and Mubuga (80.3%). It is low in Mutuntu (69.8%) and Murundi (67.6%). The percentage of private households possessing a television is high in Bwishyura (12.5%) and Rubengera (12.1%) while it is low in Mutuntu (1.9%), Murundi (1.2%) and Ruganda (1.0%). Mobile phone is mostly possessed by private households of Bwishyura (72.6%), Rubengera (66.9%) and Gishyita (64.9%) while it is low in Mutuntu (48.8%), Ruganda (48.6%) and Murundi (45.1%). The sectors with relatively high percentage of households with smartphone are Bwishyura (27.1%), Rubengera (23.3%), Rwankuba (21.9%) and Gishyita (15.3%) while the percentage of households possessing this asset is low in Murundi (5.4%) a. The computer is slightly possessed in Bwishyura (4.5%) and Rubengera (3.7%).

Table 36: Percentage of private households of Karongi District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication assets				
		Radio	Television	Mobile phone ²	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Karongi District	91,444	77.7	5.0	74.1	14.1	1.6
Bwishyura	10,294	84.0	12.5	82.3	27.1	4.5
Gashari	5,248	76.5	3.1	72.2	10.2	0.8
Gishyita	5,931	82.8	7.0	79.8	15.3	1.9
Gitesi	6,802	77.0	2.0	72.5	8.0	0.4
Mubuga	5,823	80.3	5.0	77.0	15.1	1.4
Murambi	5,755	73.8	4.2	69.4	10.1	0.8
Murundi	7,046	67.6	1.2	63.2	5.4	0.3
Mutuntu	6,010	69.8	1.9	66.5	7.7	0.8
Rubengera	10,349	83.0	12.1	80.2	23.3	3.7
Rugabano	8,285	75.1	1.7	69.8	7.9	0.7
Ruganda	4,707	72.6	1.0	67.1	7.4	0.4
Rwankuba	8,399	81.0	2.1	78.4	21.9	0.8
Twumba	6,795	77.9	3.4	74.6	8.6	0.9

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

h. Access to energy for lighting and cooking

In Karongi District, the main source of energy for lighting used by households is electricity (50.3%) followed by flash lighting/phone flash lighting (36.6%). At the sector level, electricity as main source of energy for lighting floor is most found in Bwishyura (68.5%), Rubengera (66.2%) and Mubuga (59.1%). The sectors with low percentages of private households using electricity are Mutuntu (28.8%), Murundi (32.2%) and Rwankuba (39.2%). The sectors with the high percentages of private households using flashlight or phone flashlight for lighting are Murundi (53.4%), Rwankuba (47.2%) and Mutuntu (44.8%). According to the area of residence, the main source of energy for lighting is electricity (79.9%) followed by flashlight or phone flashlight (14.2%) and candles (3.3%) in urban areas. In rural areas, 47.2% of private households use electricity as main source of energy for lighting while 39.0% use flashlight or phone flashlight and 7.7% use firewood.

According to the area of residence, the main source of energy for lighting is electricity (79.9%) followed by flashlight or phone flashlight (14.2%) and candles (3.3%) in urban areas. In rural areas, 47.2% of private households use electricity as main source of energy for lighting while 39.0% use flashlight or phone flashlight and 7.7% use firewood.

Table 37: Distribution of households of Karongi District by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for Lighting	Not stated
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5	0.0

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for Lighting	Not stated
Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6	0.0
Karongi District	91,444	100	50.3	0.4	0.0	1.9	7.1	1.7	36.6	0.2	0.9	0.8	0.0
Karongi Urban	8,794	100	79.9	0.3	0.0	3.3	1.2	0.1	14.2	0.0	0.5	0.4	0.0
Karongi Rural	82,650	100	47.2	0.4	0.0	1.8	7.7	1.8	39.0	0.3	0.9	0.9	0.0
Bwishyura	10,294	100	68.5	0.4	0.0	3.8	2.2	0.4	22.6	0.1	1.4	0.5	0.0
Gashari	5,248	100	48.7	0.3	-	1.2	6.9	3.1	38.2	0.1	0.7	0.8	-
Gishyita	5,931	100	62.9	0.6	-	1.3	3.2	0.6	30.0	0.2	0.6	0.6	-
Gitesi	6,802	100	48.4	0.3	0.0	1.7	7.1	3.3	36.9	0.1	0.6	1.5	-
Mubuga	5,823	100	59.1	0.4	0.1	2.2	4.4	2.0	28.3	1.4	1.4	0.6	0.0
Murambi	5,755	100	43.7	0.5	-	1.0	9.1	2.5	38.4	0.1	2.5	2.3	-
Murundi	7,046	100	32.4	0.3	-	0.6	10.7	1.1	53.4	0.1	0.7	0.8	0.0
Mutuntu	6,010	100	28.8	0.2	-	1.2	20.4	2.7	44.8	0.3	0.5	1.1	-
Rubengera	10,349	100	66.2	0.6	-	1.9	2.9	0.7	26.0	0.1	0.9	0.6	-
Rugabano	8,285	100	48.6	0.2	-	0.6	6.5	3.1	40.4	0.2	0.3	0.3	-
Ruganda	4,707	100	44.3	0.2	-	0.4	9.5	3.2	41.1	0.2	0.4	0.7	-
Rwankuba	8,399	100	39.2	0.3	0.0	5.3	5.3	0.9	47.2	0.3	0.2	1.4	-
Twumba	6,795	100	46.4	0.9	0.0	1.5	11.1	0.4	38.4	0.1	1.0	0.3	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (87.8%) followed by charcoal (10.2% each). At the sector level, firewood is the most used source of cooking energy by private households in all sectors. Twumba (97.4%), Murundi (97.3%), Mutuntu (97.1%), Gitesi and Ruganda (96.9% each) have the highest percentages of households using this material for cooking while Bwishyura (68.7%), Rwankuba (72.1%) and Rubengera (74.1%) have the lowest. Sectors with the high percentage of private households using charcoal as main source of cooking energy are Rwankuba (26.6%), Bwishyura (25.8%) and Rubengera (22.5%).

By area of residence, private households use mostly charcoal (64.8%) and gaz (19.9%) in urban areas. In rural areas, private households use most firewood (71.5%) and charcoal (24.3%). The percentage of private households that not cook is 4.5% in urban area and 1.9% in rural.

i. Vulnerability

The results of the 5th PHC reveal that at the national level, 3.4% of the resident have a vulnerability. In Karongi District, the vulnerability prevalence rate is 3.8%. At sector level, the highest prevalence rates of the resident with vulnerability are in Murundi (6.1%), Mutuntu (5.8%), Gitesi (5.0%) and Ruganda (4.5%). The lowest is in Rwankuba (2.8%).

Table 38: Number and share of persons with vulnerability of Karongi District

Sectors of residence	Total resident population	Persons with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Karongi District	328,774	12,628	5,561	7,067	3.8
Bwishyura	35,575	1,080	480	600	3
Gashari	18,949	546	242	304	2.9
Gishyita	20,870	723	322	401	3.5
Gitesi	25,715	1,278	574	704	5
Mubuga	20,443	716	286	430	3.5
Murambi	19,955	1,222	501	721	6.1
Murundi	24,010	819	347	472	3.4
Mutuntu	22,356	1,296	592	704	5.8
Rubengera	35,417	1,051	489	562	3
Rugabano	30,149	1,178	503	675	3.9

Sectors of residence	Total resident population	Persons with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Ruganda	16,936	759	332	427	4.5
Rwankuba	33,488	933	437	496	2.8
Twumba	24,911	1,027	456	571	4.1

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

4.5 Nyamasheke district

4.5.1 Physical environment

Nyamasheke District is one of the seven districts of the Western Province of Rwanda. It borders Karongi District in the North, Rusizi District in the South, Nyamagabe District in the East and the Democratic Republic of Congo (DRC) in the West. It has a surface area of 1,174 km² including 225.85 km² as part of Nyungwe National Park and 346.53 km² as part of Lake Kivu (Nyamasheke DDP, 2013-2018). The district is subdivided into fifteen (15) administrative Sectors/Imirenge (Ruharambuga, Bushekeri, Bushenge, Cyato, Gihombo, Kagano, Kanjongo, Karambi, Karengera, Kirimbi, Macuba, Nyabitekeri, Mahembe, Rangiro and Shangi.), 68 Cells and 588 Villages (Imidugudu).

a. Topography

The overall, Nyamasheke District's topography plays a crucial role in shaping its natural environment, agricultural practices, and socio-economic activities, making it a significant part of Rwanda's Western Province. The district encompasses a varied relief characterized by hills, valleys, and plateaus. These features contribute to a dynamic landscape across the region. The altitude of the district typically ranges between 1,500 meters to 2,500 meters above sea level. And different hills dominate the landscape of the district providing scenic views and challenging terrain for settlement and agriculture. The slopes of these hills are often cultivated with crops like coffee, tea, and bananas.

b. Climate and rainfall

The climate in Nyamasheke District is generally mild and temperate due to its high elevation. It falls within Rwanda's subtropical highland climate zone, characterized by moderate temperatures throughout the year. The average temperatures vary between 15°C to 25°C depending on the season. The district experiences distinct wet and dry seasons influenced by Rwanda's tropical location and altitude. The district receives substantial rainfall, typically ranging from 1,000 mm to 1,500 mm annually and rainfall is concentrated during the wet season, which typically spans from around March to May and again from September to December. The dry season, from June to August and January to February, sees reduced precipitation.

c. Geology and Soils

Nyamasheke District features diverse geological characteristics with Precambrian rocks, volcanic formations, and sedimentary deposits contributing to its geological complexity. The soils in the district range from highly weathered Ferralsols to fertile Andosols and Luvisols, each with distinct characteristics influencing agricultural potential and land use practices. Effective soil conservation measures are essential to mitigate erosion and maintain soil fertility in this hilly region. The district is part of the broader Western Rift Valley, which has influenced its geological formations. The district is predominantly composed of Precambrian rocks, which include schists, quartzites, and granites. These rocks are among the oldest geological formations in Rwanda and are known for their metamorphic origins. Some areas of Nyamasheke District are influenced by volcanic activities associated with the East African Rift System. Basaltic lava flows and volcanic ash deposits are present, particularly in the northern parts of the district.

Along the Lake Kivu shoreline, there are significant sedimentary rock formations, primarily consisting of sandstones and shales. These formations are products of sedimentation processes over millions of years. The district is also known to have deposits of minerals such as cassiterite (tin ore), coltan (columbite-tantalite), and wolframite (tungsten ore). These minerals are economically significant and contribute to local mining activities.

These soils in Nyamasheke District vary widely due to the district's diverse topography and geological formations. Key soil characteristics include:

- **Ferralsols:** These are highly weathered soils commonly found in tropical regions. In Nyamasheke, Ferralsols are prevalent and are characterized by a low natural fertility due to intense leaching. They are generally acidic and have a high content of iron and aluminum oxides.

- **Andosols:** These volcanic soils are rich in organic matter and have good water-holding capacity. They are typically found in areas influenced by volcanic activity. Andosols in Nyamasheke are fertile and suitable for various types of agriculture.
- **Acrisols:** These soils are also found in the district and are characterized by a clay-rich B horizon. They are acidic and have a lower base saturation. Acrisols are less fertile than Andosols but can still support agriculture with proper management.
- **Luvisols:** These soils have a higher base saturation and are more fertile than Ferralsols and Acrisols. Luvisols are found in areas with less intense leaching and are suitable for a variety of crops.
- **Histosols:** These organic-rich soils are found in wetland areas and are characterized by a high content of organic matter. They are typically found in the low-lying areas near Lake Kivu and are used for rice cultivation and other water-intensive crops.

d. Hydrography

Nyamasheke District, located in the Western Province of Rwanda, is characterized by a diverse hydrography shaped by its topography and climate. The district is intersected by several significant rivers, including the Mbirurume River, which flows through the eastern part of the district, and the Mwogo River, which runs along the southern border. These rivers, along with numerous smaller tributaries and streams, contribute to the hydrological network that sustains agriculture and local communities throughout the district. The hydrography of Nyamasheke plays a crucial role in water resource management, supporting irrigation for agriculture and providing water for domestic use and livestock.

4.5.2 Ecological environment

Nyamasheke District has diverse ecological characteristics due to its proximity to Lake Kivu, Nyungwe National Park, and various wetlands. The district is characterized by a high-altitude tropical climate, dense forests, and fertile soils, making it a suitable habitat for various flora and fauna species. The district plays a crucial role in Rwanda's ecological conservation due to its diverse and unique species.

- Flora

The district is home to a variety of plant species, many of which are found in Nyungwe National Park and surrounding landscapes. The project is not expected to touch any part of the Nyungwe National Park. The dominant flora species include:

a) Trees and shrubs

These include *Carapa grandiflora* – A large tree species found in montane rainforests, commonly used for timber; *Macaranga kilimandscharica* – A fast-growing pioneer species in disturbed forest areas; *Prunus africana* (African cherry) – A medicinal tree known for its use in treating prostate-related illnesses; *Syzygium guineense* (Waterberry) – A tree found near rivers and wetlands, providing food for birds and mammals; *Entandrophragma excelsum* – A tall tree found in montane forests, valuable for timber production; *Newtonia buchananii* – A large canopy tree important for forest structure and biodiversity; *Ficalhoa laurifolia* – A montane tree species common in high-altitude regions.

b) Bamboo and understory plants

These include *Ushania alpina* (African Alpine Bamboo) – Dominates high-altitude forest areas; *Mimulopsis arborescens* – A shrub commonly found in secondary forests; *Neoboutonia macrocalyx* – A fast-growing tree species that helps in forest regeneration; *Begonia meyeri-johannis* – A ground-cover plant with ornamental value; *Olea capensis* (Wild Olive) – A species found in dry montane forests.

c) Wetland and grassland plants

These include *Cyperus papyrus* – A dominant wetland species in marshy areas; *Pennisetum purpureum* (Elephant Grass) – Commonly found in grazing lands and along riverbanks; *Miscanthus violaceus* – A grass species in montane areas.

- Fauna

Due to the presence of Nyungwe National Park, the district hosts a rich variety of wildlife, including primates, birds, mammals, and amphibians.

a) Mammals

These include the *Pan troglodytes schweinfurthii* (Eastern Chimpanzee) – Found in Nyungwe National Park, highly intelligent and endangered; *Cercopithecus mitis kandti* (Golden Monkey) – A rare primate living in bamboo forests; *Lophocebus albigena* (Grey-cheeked Mangabey) – A forest-dwelling monkey found in Nyamasheke's high-altitude

regions; *Tragelaphus scriptus* (Bushbuck) – Common in forested areas and near water sources; *Hylochoerus meinertzhageni* (Giant Forest Hog) – The largest wild pig species in Africa, found in dense forests; *Atilax paludinosus* (Marsh Mongoose) – Found in wetlands and riverbanks.

b) Birds (Avifauna)

Nyamasheke District is part of Rwanda's Important Bird Areas (IBA) due to the presence of numerous bird species. Some dominant species include: Turaco species (Great Blue Turaco – *Corythaeola cristata*, Rwenzori Turaco – *Gallirex johnstoni*) – Colorful and commonly seen in forests; *Buteo oreophilus* (Mountain Buzzard) – A raptor species in high-altitude regions; *Columba arquatrix* (African Olive Pigeon) – Prefers montane forests; *Cinnyris regius* (Regal Sunbird) – A small nectar-feeding bird found in forest edges and *Stephanoaetus coronatus* (African Crowned Eagle) – A top predator hunting small mammals in the forest.

c) Reptiles and Amphibians

The dominant species in the district include the *Arixalus orophilus* (Nyungwe Forest Tree Frog) – Found in humid montane areas; *Hyperolius castaneus* – A tree frog endemic to Rwanda; *Rhampholeon boulengeri* (Boulenger's Pygmy Chameleon) – Found in forest undergrowth; *Naja melanoleuca* (Forest Cobra) – A large venomous snake found in forested habitats; *Kinixys belliana* (Bell's Hingeback Tortoise) – Found in both forest and savanna habitats.

4.5.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census (PHC5) has enumerated 434,221 residents in Nyamasheke district, which represent 15.0% of the total population of Western province (2,896,484 residents). The population of Nyamasheke district is predominantly female: 229,363 are women corresponding to 52.8% of the total population of Nyamasheke district. The results indicate that females are predominant in all 15 sectors of Nyamasheke district. Kanjongo (40,341 population) and Kagano (39,994 population) are the most populated sectors. They represent 9.3% and 9.2% of the total population of Nyamasheke district, respectively. The two less populated sectors are Rangiro (17,967 inhabitants) and Mahembe (20,043 inhabitants). They represent 4.1% and 4.6% of the total resident population of Nyamasheke district, respectively.

Table 39: Population of Nyamasheke District by Sector

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Nyamasheke district	434,221	204,858	229,363	100	47.2	52.8	100
Bushekeri	29,680	14,067	15,613	100	47.4	52.6	6.8
Bushenge	22,624	10,571	12,053	100	46.7	53.3	5.2
Cyato	26,996	12,548	14,448	100	46.5	53.5	6.2
Gihombo	29,843	14,099	15,744	100	47.2	52.8	6.9
Kagano	39,994	19,047	20,947	100	47.6	52.4	9.2
Kanjongo	40,341	19,241	21,100	100	47.7	52.3	9.3
Karambi	29,726	14,082	15,644	100	47.4	52.6	6.8
Karengera	32,504	15,399	17,105	100	47.4	52.6	7.5
Kirimbi	25,647	12,092	13,555	100	47.1	52.9	5.9
Macuba	33,319	15,818	17,501	100	47.5	52.5	7.7
Mahembe	20,043	9,519	10,524	100	47.5	52.5	4.6
Nyabitekeri	29,293	13,663	15,630	100	46.6	53.4	6.7
Rangiro	17,967	8,354	9,613	100	46.5	53.5	4.1
Ruharambuga	28,180	13,244	14,936	100	47	53	6.5
Shangi	28,064	13,114	14,950	100	46.7	53.3	6.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The Western province is predominantly by the rural area (77.9%) and urban area (22.1%). Nyamasheke district population lives predominantly in rural area 92.3% while urban represents 7.7%. The sectors of Nyamasheke district which are entirely rural are Cyato, Gihombo, Karambi, Karengera, Kirimbi, Macuba, Mahembe, Nyabitekeri and Rangiro.

b. Number of households and size of household

The results of 5th RPHC 2022 indicate the total of 3,312,743 private households in Rwanda. in Western province, they are 671,506 and 95,229 in Nyamasheke district. The average household size in Nyamasheke district is 4.5 persons per household. At the Sector level, the highest sizes are found in Shangi (4.8 persons/household) while the smallest household sizes are found in Mahembe (4.2 persons/household each). The results of 5th RPHC 2022 revealed that 28.9% of private households are headed by women at national level. In Nyamasheke district, private households headed by females are 28.8%. At sector level, the highest percentage of households headed by women are found in Bushenge sector (32.2%) while the lowest is found in Karambi sector (25.1%).

Table 40: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western Province	671,506	2,871,195	4.3	70.4	29.6
Nyamasheke Total	95,229	433,196	4.5	71.2	28.8
Bushekeri	6,290	29,597	4.7	71.3	28.7
Bushenge	4,862	22,620	4.7	67.8	32.2
Cyato	5,912	26,979	4.6	71.6	28.4
Gihombo	6,751	29,800	4.4	68.8	31.2
Kagano	8,821	39,827	4.5	71.3	28.7
Kanjongo	9,087	39,923	4.4	73.9	26.1
Karambi	6,752	29,713	4.4	74.9	25.1
Karengera	6,963	32,471	4.7	73.8	26.2
Kirimbi	5,659	25,638	4.5	70.3	29.7
Macuba	7,345	33,270	4.5	72.6	27.4
Mahembe	4,725	20,010	4.2	68.5	31.5
Nyabitekeri	6,216	29,276	4.7	70.4	29.6
Rangiro	3,967	17,964	4.5	68.9	31.1
Ruharambuga	6,021	28,085	4.7	70.3	29.7
Shangi	5,858	28,023	4.8	68.6	31.4

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in Western province the predominant type of habitat is Umudugudu “Planned rural settlement” (70.5%) and Dispersed or isolated housing (18.3%). It is the same as in Nyamasheke district as one of districts of the Western province. The most common type of habitat in Nyamasheke district is Umudugudu “Planned rural settlement” (74.5%) followed by Dispersed or isolated housing (22.2%). The type of habitat varies across sectors. Umudugudu “Planned rural settlement” is most prevalent in Nyabitekeri and Shangi with a rate of 98.6% each and Karengera (98.2%) while Gihombo has the lowest with 30.2%. Gihombo has the highest percentage of dispersed or isolated housing units at 64.7%, while Karengera and Shangi have the lowest at 0.2% and 0.4 respectively. According to the area of residence. In urban areas, the predominant types are Umudugudu “Planned rural settlement” (84.9%) followed by spontaneous/squatter housing (8.1%) and dispersed/ isolated housing (2.1% each). In rural areas, the predominant type is also Umudugudu “Planned rural settlement” (85.7%) followed by Dispersed/Isolated housing (10.1%) and Spontaneous/squatter housing (2.8%).

The results of 5th Population and Housing Census 2022 revealed that in Western province the predominant type of habitat is Umudugudu “Planned rural settlement” (70.5%) and Dispersed or isolated housing (18.3%). It is the same as in Nyamasheke district as one of districts of the Western province. The most common type of habitat in Nyamasheke district is Umudugudu “Planned rural settlement” (74.5%) followed by Dispersed or isolated housing (22.2%). The type of habitat varies across sectors. Umudugudu “Planned rural settlement” is most prevalent in Nyabitekeri and Shangi with a rate of 98.6% each and Karengera (98.2%) while Gihombo has the lowest with 30.2%. Gihombo has the highest percentage of dispersed or isolated housing units at 64.7%, while Karengera and Shangi have the lowest at 0.2% and 0.4 respectively.

Table 41: Distribution of households in Nyamasheke District by type of habitat

Sectors	Total Number of Households	Percentage								
		Total	Umudugudu(Planned rural settlement)	Integrated model village	Old settlement	Dispersed/Isolated housing	Modern planned	Spontaneous/squatter housing	Other type of housing	Not stated
Rwanda	3,312,743	100	65.4	0.8	2.3	14.9	6.9	8.9	0.8	0.0
Western Province	671,506	100	70.5	0.9	3.7	18.3	1.2	4.6	0.8	0.0
Nyamasheke District	95,229	100	74.5	1.3	0.5	22.2	0.0	1.0	0.5	0.0
Nyamasheke Urban	35,056	100	84.9	1.3	1.5	2.1	2.1	8.1	0.1	0.0
Nyamasheke Rural	69,881	100	85.7	1.0	0.3	10.1	0.0	2.8	0.0	0.0
Bushekeri	6,290	100	77.3	3.4	1.2	17.5	0.0		0.5	0.0
Bushenge	4,862	100	95.3	0.8	0.3	3.2	0.0	0.3	0.1	-
Cyato	5,912	100	87.5	0.1	0.7	10.0	-	0.1	1.6	-
Gihombo	6,751	100	30.2	0.1	2.1	64.7	0.0	2.6	0.3	-
Kagano	8,821	100	53.0	0.0	0.1	46.3	0.0	0.5	0.1	-
Kanjongo	9,087	100	61.9	2.9	0.4	32.7	0.0	1.7	0.5	-
Karambi	6,752	100	74.8	5.4	0.5	17.4	-	1.8	0.1	-
Karengera	6,963	100	98.2	0.4	0.1	0.2	-	0.6	0.5	-
Kirimbi	5,659	100	54.1	0.0	0.5	43.6	0.1	1.0	0.7	-
Macuba	7,345	100	63.1	0.2	0.5	32.2	0.0	2.0	2.0	-
Mahembe	4,725	100	63.8	1.0	1.0	30.4	0.2	2.9	0.8	-
Nyabitekeri	6,216	100	98.6	0.3	-	1.1	-	-		-
Rangiro	3,967	100	96.3	0.1	0.1	2.8	-	0.6	0.1	-
Ruharambuga	6,021	100	92.6	3.5	0.3	3.4	-	0.2	0.0	-
Shangi	5,858	100	98.6	0.8	0.0	0.4	0.0	-	0.2	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

According to the area of residence. In urban areas, the predominant types are Umudugudu “Planned rural settlement” (84.9%) followed by spontaneous/squatter housing (8.1%) and dispersed/ isolated housing (2.1% each). In rural areas, the predominant type is also Umudugudu “Planned rural settlement” (85.7%) followed by Dispersed/Isolated housing (10.1%) and Spontaneous/squatter housing (2.8%).

d. Education

In Nyamasheke District, 17.1% of the population has never attended school, while 2.0% have attended nursery, and 64.4% have attended primary school. Other education levels include 0.7% for INGOBOKA/Vocational, 8.5% for lower secondary, 5.6% for upper secondary, 1.8% for university, and 0.0% is not stated. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Cyato has a higher percentage (23.5%) of individuals who have never attended school compared to other sectors, while Kanjongo has a higher percentage of individuals attended upper secondary and university (6.9% and 4.1% respectively). Karambi has a high percentage of individuals who have never attended primary school (70.3%). Each sector has its own unique distribution of educational levels attended by the population.

Table 42: Distribution of the resident population of Nyamasheke district by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Nyamasheke District	387,354	100	17.1	2.0	64.4	0.7	8.5	5.6	1.8	0.0
Bushekeri	26,397	100	20.9	1.8	63.0	0.5	7.6	4.9	1.4	0.0
Bushenge	20,191	100	15.9	1.7	64.4	1.0	8.9	5.7	2.3	0.0
Cyato	24,004	100	23.5	3.3	63.7	0.2	5.0	3.4	0.9	0.0
Gihombo	26,828	100	15.4	1.7	66.2	0.8	9.3	5.1	1.5	-
Kagano	35,634	100	16.4	1.8	63.6	1.2	8.6	6.1	2.3	0.0
Kanjongo	36,449	100	16.4	2.2	60.3	0.8	9.4	6.9	4.1	0.0

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Karambi	26,238	100	14.8	1.6	70.3	0.2	6.9	5.0	1.2	0.0
Karengera	28,504	100	18.6	1.4	67.0	0.5	6.8	4.6	1.0	0.0
Kirimbi	23,034	100	13.2	2.1	66.3	1.0	9.3	6.2	1.9	0.0
Macuba	29,928	100	15.7	2.6	63.5	0.6	9.2	6.4	1.8	-
Mahembe	17,910	100	13.2	2.1	67.4	0.6	9.7	5.9	1.2	0.0
Nyabitekeri	26,137	100	16.6	1.4	62.4	0.5	10.9	6.5	1.7	-
Rangiro	15,800	100	18.2	3.4	62.2	0.6	8.7	5.5	1.3	0.0
Ruharambuga	25,330	100	18.2	2.0	62.4	0.8	8.4	6.1	2.0	-
Shangi	24,970	100	19.4	1.0	64.9	0.5	8.1	4.5	1.5	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Nationally, 2,280,854 of private households (68.9%) are engaged in agriculture country wide. Among them, 62.6% are engaged in crop farming and 50.4% are engaged in Livestock husbandry. In Nyamasheke district, Agricultural households occupy (85.1%), with 78.5% of households engaged in crop farming and 64.2% Households engaged in Livestock husbandry. At sector level, the highest percentages of agricultural households are found in Rangiro (91.6%) and Nyabitekeri (88.7%). Households engaged in crop farming are more represented in Rangiro sector (86%) and Bushenge (83.6%) while those engaged in Livestock husbandry are in Rangiro (73.8%) and Nyabitekeri (70.5%).

It was also revealed that the employment to population ratio is 42.5 percent among people residing in Nyamasheke districts, it is higher in urban areas (54.6 percent) than in rural areas of Nyamasheke (41.5 percent). The employment to population ratio among males as well as females increases from age group 16-19 to 35-44 and starts decreasing from age group 45-49 to 85 years and above as people starts getting very older and retire. It was observed that in district of Nyamasheke, the highest employment to population ratio among males stands at 65.2% and was observed in age group 35-39, On the other side the highest employment to population among females is 51.2% and was also observed in the age group 35-39. The lowest employment to population ratio among males stands at 6.7% and was observed among males in the age group 85+, the lowest employment to population ratio among females is 3.6% and was observed among females in the age group 85+.

Table 43: Distribution of household engaged in livestock husbandry in Nyamasheke district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Private Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Nyamasheke district	95,229	81,009	85.1	74,794	78.5	61,150	64.2
Bushekeri	6,290	4,955	78.8	4,459	70.9	3,706	58.9
Bushenge	4,862	4,264	87.7	4,066	83.6	3,162	65.0
Cyato	5,912	5,216	88.2	4,752	80.4	4,074	68.9
Gihombo	6,751	5,969	88.4	5,595	82.9	4,577	67.8
Kagano	8,821	7,081	80.3	6,522	73.9	4,952	56.1
Kanjongo	9,087	6,871	75.6	6,251	68.8	4,719	51.9
Karambi	6,752	5,950	88.1	5,431	80.4	4,622	68.5
Karengera	6,963	6,052	86.9	5,511	79.1	4,795	68.9
Kirimbi	5,659	4,839	85.5	4,540	80.2	3,506	62.0
Macuba	7,345	6,356	86.5	5,850	79.6	4,850	66.0
Mahembe	4,725	4,081	86.4	3,762	79.6	3,124	66.1
Nyabitekeri	6,216	5,511	88.7	5,115	82.3	4,381	70.5
Rangiro	3,967	3,633	91.6	3,412	86.0	2,929	73.8
Ruharambuga	6,021	5,066	84.1	4,658	77.4	3,888	64.6
Shangi	5,858	5,165	88.2	4,870	83.1	3,865	66.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, water supply and sanitation facilities

In Nyamasheke District 92.7% are using Mutuelle as main health insurance, 4.1% using RSSB or RAMA, 0.7% using

private insurance, 0.2% using school insurance, 0.2% using NGOs insurance and 2% using employer insurance.

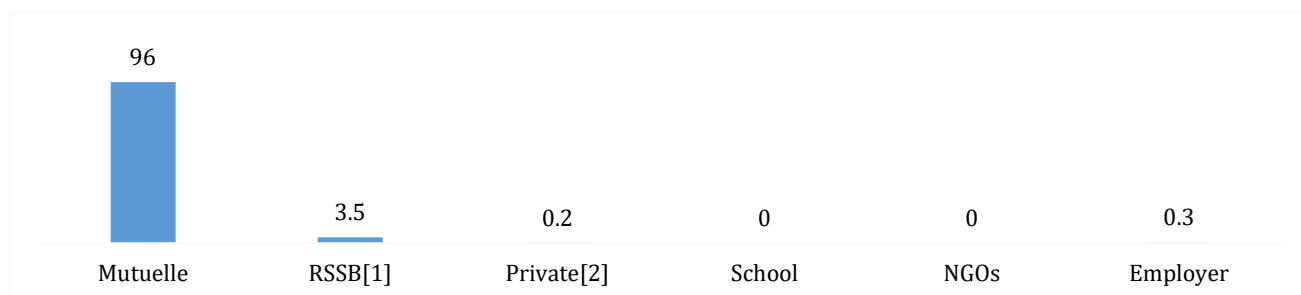


Figure 15: Population who have a medical insurance by main type of insurance in Nyamasheke district

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Nyamasheke district, 73.5% of private households use improved water sources. At the sector level, the percentage of the private households using water from improved sources is highest in Bushenge (91.9%), and the lowest in Gihombo (61.0%).

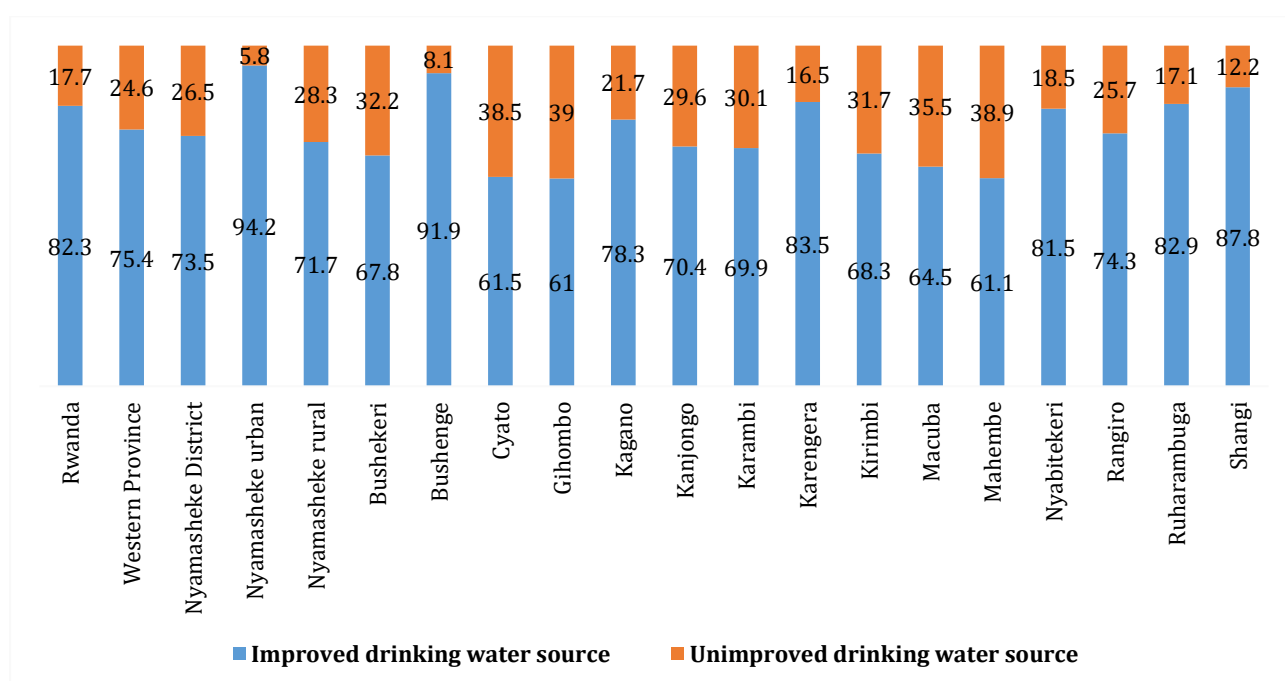


Figure 16: Percentage of households of Nyamasheke district by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In both urban and rural areas of Nyamasheke, private households use mainly improved sources of water (94.2% in urban and 71.7% in rural areas). The percentage of private households using unimproved source of water is higher in rural (28.3%) than in urban (5.8%).

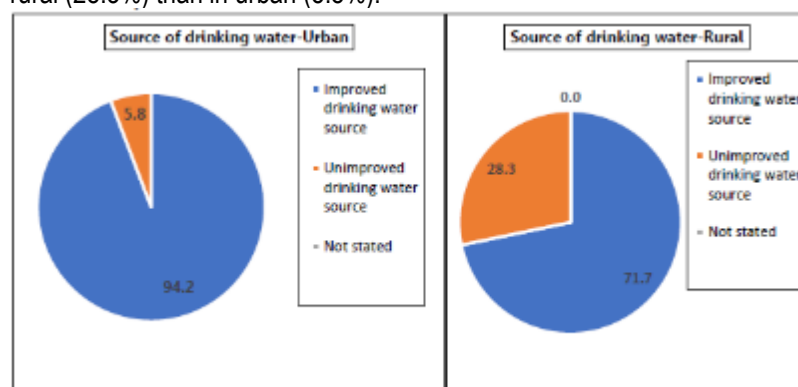


Figure 17: Distribution of the private households of Nyamasheke district by main source of water and by area

of residence

Source: Fifth Rwanda Population and Housing Census,2022(NISR)

g. Appliance and assets ownership

At the district level, 84.3% of private households possess a radio, 82.1% a mobile phone, 14.8% a smartphone, 6.7% a TV and 1.2% a computer. At sector level, the percentage of private households possessing a radio is high in Ruharambuga (88.7%), Bushenge (88.6%), Nyabitekeri (88.4%) and Shangi (87.1%). It is low in Gihombo (79.9%). The percentage of private households possessing a television is high in Kanjongo (11.5%) and Ruharambuga (9.7%) while it is low in Cyato (1.9%) and Rangiro (2.8%). Mobile phone is mostly possessed by private households of Bushenge (86.9%), Ruharambuga (86.7%) and Nyabitekeri (86.2%). The sectors with high percentage of households with smartphone are Kanjongo (21.8%), Ruharambuga (18.5%) and Bushenge (17.9%) while the percentage of households possessing this asset is low in Cyato (8.2%) and Gihombo (10.6%). The computer is mostly possessed in Kanjongo (3.3%) and Kagano (2.1%), Bushenge (1.5%).

Table 44: Percentage of private households of Nyamasheke District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone2	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Nyamasheke District	95,229	84.3	6.7	82.1	14.8	1.2
Bushekeri	6,290	86.5	7.1	84.8	16.0	1.3
Bushenge	4,862	88.6	8.2	86.9	17.9	1.5
Cyato	5,912	81.9	1.9	77.3	8.2	0.4
Gihombo	6,751	79.9	4.6	78.0	10.6	0.5
Kagano	8,821	83.0	8.4	81.2	17.7	2.1
Kanjongo	9,087	83.3	11.5	81.8	21.8	3.3
Karambi	6,752	84.2	5.8	82.5	11.4	1.2
Karengera	6,963	83.9	5.3	80.9	13.1	0.4
Kirimbi	5,659	82.6	6.0	80.6	13.5	1.0
Macuba	7,345	83.4	7.0	81.7	14.8	1.1
Mahembe	4,725	82.7	5.0	80.2	11.0	0.9
Nyabitekeri	6,216	88.4	6.5	86.2	15.4	0.5
Rangiro	3,967	81.4	2.8	78.2	10.7	0.7
Ruharambuga	6,021	88.7	9.7	86.7	18.5	1.1
Shangi	5,858	87.1	6.2	85.2	15.3	0.6

Source: Fifth Rwanda Population and Housing Census,2022(NISR)

h. Access to energy for lighting and cooking

In Nyamasheke district, the main source of energy for lighting used by households is electricity (61.5%). At the sector level, the percentage of households using electricity for lighting is high in Bushenge (68.3%), Ruharambuga (68.2%), Shangi (66.0%) and Karengera (65.5%). The sectors with the high percentages of private households using flashlight/phone flashlight for lighting are Gihombo (32.8%) and Kirimbi (27.8%).

Cyato (15.5%) and Rangiro (13.3%) have a high percentage of private households that use firewood for lighting. The sources of energy for lighting in Nyamasheke district are mainly electricity, flashlight/phone flashlight, Firewood, and candles. However, the percentages of households using them vary by area of residence. In urban areas, the main source of energy for lighting is electricity (72.7%), followed by flashlight/phone flashlight (13.5%), candles occupy (5.6%) and 2.5% use lantern. In rural areas, 60.6% of private households use electricity as their main source of energy for lighting while 23.8% use flashlight, 8.2% use firewood, 2.6% use candles and 2.4 use lantern.

Table 45: Distribution of households of Nyamasheke district by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5

Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6
Nyamasheke District	95,229	100	61.5	0.9	0.0	2.8	7.8	0.7	23.0	0.2	2.4	0.7
Nyamasheke Urban	7,351	100	72.7	1.3	0.0	5.6	3.3	0.4	13.5	0.1	2.5	0.6
Nyamasheke Rural	87,878	100	60.6	0.8	0.0	2.6	8.2	0.7	23.8	0.2	2.4	0.7
Bushekeri	6,290	100	59.0	0.6	0.0	3.2	9.9	0.5	24.1	0.2	2.0	0.5
Bushenge	4,862	100	68.3	0.8	-	2.6	2.0	0.2	22.6	0.1	2.9	0.3
Cyato	5,912	100	57.4	0.8	-	1.2	-	0.3	23.4	0.1	0.7	0.6
Gihombo	6,751	100	50.3	0.4	0.0	4.1	8.3	0.5	32.8	0.3	2.1	1.1
Kagano	8,821	100	62.9	0.9	0.0	3.9	7.7	0.2	20.4	0.1	3.2	0.7
Kanjongo	9,087	100	64.8	1.1	0.0	4.0	8.7	0.4	17.7	0.2	2.7	0.5
Karambi	6,752	100	59.5	0.6	0.0	1.9	7.8	2.0	26.4	0.1	0.8	1.0
Karengera	6,963	100	65.5	1.2	-	1.3	7.1	0.3	19.0	0.2	4.8	0.4
Kirimbi	5,659	100	54.3	0.3	0.0	4.5	8.1	1.4	27.8	0.2	2.7	0.7
Macuba	7,345	100	64.6	0.8	0.0	3.4	8.1	0.6	19.6	0.4	1.6	0.8
Mahembe	4,725	100	55.7	1.3	0.0	2.4	9.7	1.4	26.1	0.5	2.1	0.7
Nyabitekeri	6,216	100	63.2	1.4	0.0	2.0	3.2	1.2	25.5	0.3	2.6	0.7
Rangiro	3,967	100	60.0	0.6	-	1.8	-	0.5	22.2	0.1	0.9	0.6
Ruharambuga	6,021	100	68.2	1.0	-	3.3	4.0	0.2	20.1	0.0	2.7	0.3
Shangi	5,858	100	66.0	0.7	-	1.8	4.8	1.2	21.5	0.1	3.1	0.8

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (95.1%) followed by charcoal (3.5%) and gas (0.4%). At the sector level, firewood is the most used source of cooking energy by private households in Rangiro (98.1%) and Cyato (98.0%), Nyabitekeri (97.9%), Karengera (97.6%) and Gihombo (97.4%). Sector with the highest percentage of private households using charcoal as a source of cooking energy is Kanjongo. Sectors with the highest percentages of private households using gas as a source of cooking energy are Kanjongo (1.3%), Kagano (0.9%), Bushekeri and Bushenge (0.5% each).

The main sources of energy for cooking used by private households in Nyamasheke district vary by area of residence. In Rural areas, private households use mostly firewood (96.8%) and charcoal (2.1%). In urban areas, private households use most also firewood (75.3%), charcoal (20.3%) and gas (2.8%).

i. Vulnerability

In Nyamasheke district the vulnerability prevalence rate is 4.3%. At sector level, the highest prevalence rates of the resident population are in Kirimbi (6.5%) and Mahembe (5.9%), while the lowest is in Ruharambuga and Macuba with (2.4%) and (2.9%) respectively.

Table 46: Number and share of persons with vulnerability of Nyamasheke district

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Nyamasheke district	376,882	16,020	7,031	8,989	4.3
Bushekeri	25,471	1,006	439	567	3.9
Bushenge	19,728	851	345	506	4.3
Cyato	23,014	771	328	443	3.4
Gihombo	25,776	941	451	490	3.7
Kagano	34,690	1,365	607	758	3.9
Kanjongo	35,276	1,880	806	1,074	5.3
Karambi	25,910	907	415	492	3.5
Karengera	27,857	1,543	652	891	5.5
Kirimbi	22,435	1,466	592	874	6.5
Macuba	29,280	839	377	462	2.9
Mahembe	17,437	1,025	450	575	5.9
Nyabitekeri	25,673	1,263	554	709	4.9
Rangiro	15,424	635	289	346	4.1
Ruharambuga	24,496	584	297	287	2.4

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Shangi	24,415	944	429	515	3.9

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

4.6 Rusizi district

4.6.1 Physical environment

Rusizi District is one of the 30 Districts in Rwanda and one of 7 Districts in Western Province that frontiers Lake Kivu, which it shares borders with Democratic Republic of Congo (DRC) and River Rusizi to the West and the Republic of Burundi to the South where it is separated by river Ruhwa. Within the Western Province, it borders the Districts of Nyamasheke to the North, Nyamagabe to the North-East and Nyaruguru to the East. Rusizi City is a waterfront Secondary City of Lake Kivu which separates it with Bakavu Town of DRC. The district which has an area of 940.95 SqKm comprised of 18 Sectors, 93 Cells and 586 Villages.

a. Topography

The Rusizi district landscape rises from Lake Kivu and connects to Lake Tanganyika. The general topography is divided into three namely the great plain of Bugarama, with an altitude varying between 800m and 900m, a chain of plateaus with an average altitude of 1600m and the Congo-Nile Ridge, home to the Nyungwe forest. The morphology of the mountains shows that they are washed out due to erosion. This situation is prevalent in Rwimbogo, Nzahaha, Butare and Gitambi sectors.

b. Climate and Rainfall

Rusizi District has an average temperature of 23°C, the hottest month of the year being July. The average annual rainfall is 1,350 mm which is well distributed throughout the year except for the period of long dry season which extends from June to mid-September. The highest rainfall recorded being 1,500mm in the months of March, April and November.

c. Geology and Soils

Geologically, rusizi district primarily consists of Precambrian basement rocks, including gneisses, schists, and granites, which form the underlying bedrock. These rocks contribute to the rugged terrain and hilly landscape typical of the area. In terms of soil types, Rusizi District exhibits a range from sandy loams to clay loams, often influenced by the underlying geology. These soils are generally fertile and suitable for agriculture, supporting a variety of crops including bananas, beans, maize, and coffee. The district's geology and soils play a crucial role in shaping its agricultural productivity and overall landscape.

d. Hydrography

The hydrology of the district is dense and is dominated by Lake Kivu and River Rusizi. The Longest is river Ruhwa, followed by Rusizi which is the largest. There are other notable marsh lands like Koko, Rushwati and Kabakamba. The main Rivers based on their Length are given as per NLA data of 2010 as Ruhwa, Rubyiro, Rusizi, Katabuvuga, Shyara, Gishoma, Koko, Rugunga and Cyunyu. Overall, there are there documented over 130 rivers and springs. Rusizi is a major port in Rwanda and provides blue economic value to the nation.

4.6.2 Ecological environment

Rusizi district has a rich biodiversity, influenced by its proximity to Nyungwe National Park, the Lake Kivu, and the Rusizi River.

- Flora

The vegetation in Rusizi district consists of tropical montane forests, riverine forests, wetlands, and savanna woodlands. The dominant plant species include:

a) Montane and riverine forest flora

These include the *Carapa grandiflora* – Found in humid forest areas, known for its medicinal and timber value; *Entandrophragma excelsum* – A large tree species common in montane forests; *Newtonia buchananii* – A dominant

tree species in Nyungwe National Park; *Macaranga kilimandscharica* – Pioneer species in disturbed forest areas; *Podocarpus latifolius* – An evergreen tree dominant in montane forests; *Prunus africana* – Medicinal tree species known for its bark, used in traditional medicine; *Ficus* spp. – Fig trees that provide food for various animal species; *Albizia gummifera* – A fast-growing tree commonly found in both forest and woodland areas.

b) Wetlands and aquatic flora

These include *Cyperus papyrus* – Dominates swampy areas near the Rusizi River and wetlands; *Typha domingensis* – A reed-like plant growing in marshy habitats; *Eichhornia crassipes* (Water hyacinth) – Invasive species found in aquatic ecosystems.

c) Grassland and savannah flora

These include the *Hyparrhenia rufa* – Tall grasses covering open savanna areas; *Panicum maximum* – A dominant grass species, essential for grazing animals. and the *Loudetia simplex* – Found in dry savanna areas.

- Fauna

Rusizi District supports a variety of animal species, ranging from large mammals to birds, amphibians, and reptiles.

a) Mammals

These include the Chimpanzees (*Pan troglodytes schweinfurthii*) – Found in Nyungwe National Park; Black and white colobus monkeys (*Colobus angolensis ruwenzorii*) – Common in montane forests; L'Hoest's monkey (*Cercopithecus lhoesti*) – Lives in forested regions; African elephant (*Loxodonta africana*) – Occasionally observed in Nyungwe; Golden cat (*Caracal aurata*) – A rare forest predator; Serval (*Leptailurus serval*) – Found in savannas and wetland areas; Hippopotamus (*Hippopotamus amphibius*) – Present in the Rusizi River and wetland zones and the African clawless otter (*Aonyx capensis*) – Inhabits rivers and lakeshores.

b) Birds

Rusizi is a birdwatcher's paradise, hosting many species, including: the Great blue turaco (*Corythaeola cristata*) – A large colorful bird found in forested areas; Ruwenzori turaco (*Ruwenzorornis johnstoni*) – Restricted to the montane forests; African fish eagle (*Haliaeetus vocifer*) – Found along lakes and rivers; Shoebill stork (*Balaeniceps rex*) – Rare but occasionally spotted in wetlands; Malachite kingfisher (*Corythornis cristatus*) – Found near water bodies; and the Grey-crowned crane (*Balearica regulorum*) – Inhabits wetlands and open grasslands.

c) Amphibians and reptiles

These include the Rwanda reed frog (*Hyperolius rwandae*) – Found in marshlands and wetlands; Lake Victoria clawed frog (*Xenopus victorianus*) – Common in freshwater habitats; Nile monitor lizard (*Varanus niloticus*) – Lives near rivers and lakes and the African rock python (*Python sebae*) – Found in wetlands and savanna zones.

4.6.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census has enumerated 485,529 residents in Rusizi district, which represent 16.8% of the total population of the Western Province (2,896,484 residents). The population of Rusizi district is predominantly female, 249,103 corresponding to 51.3 % of the total population Rusizi district. Males are predominant in 1 out of 18 sectors of the district (Kamembe sector with 19,621 males versus 15,262 females, which represents 7.2% of total population of the district. Bugarama and Gihundwe sectors are the most populated sectors, with 42,830 and 41,615 inhabitants respectively. The three less populated sectors are Bweyeye (18,109 inhabitants), Nyakarenzo (18,384 inhabitants) and Nkombo (18,637 inhabitants). The table below provides the number of the population of Rusizi district by sector, by sex and their shares across sectors to the total population of Rusizi district.

Table 47: Population of Rusizi District by Sector

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Rusizi district	485,529	236,426	249,103	100	48.7	51.3	100
Bugarama	42,830	21,197	21,633	100	49.5	50.5	8.8
Butare	25,483	12,243	13,240	100	48	52	5.2
Bweyeye	18,109	9,042	9,067	100	49.9	50.1	3.7

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Gashonga	26,791	12,869	13,922	100	48	52	5.5
Giheke	20,740	9,739	11,001	100	47	53	4.3
Gihundwe	41,615	20,404	21,211	100	49	51	8.6
Gikundamvura	21,909	10,394	11,515	100	47.4	52.6	4.5
Gitambi	25,119	11,866	13,253	100	47.2	52.8	5.2
Kamembe	34,883	19,621	15,262	100	56.2	43.8	7.2
Muganza	32,849	15,608	17,241	100	47.5	52.5	6.8
Mururu	29,774	14,488	15,286	100	48.7	51.3	6.1
Nkanka	19,857	9,359	10,498	100	47.1	52.9	4.1
Nkombo	18,637	9,028	9,609	100	48.4	51.6	3.8
Nkungu	21,696	10,221	11,475	100	47.1	52.9	4.5
Nyakabuye	33,200	15,739	17,461	100	47.4	52.6	6.8
Nyakarenzo	18,384	8,842	9,542	100	48.1	51.9	3.8
Nzahaha	30,399	14,631	15,768	100	48.1	51.9	6.3
Rwimbogo	23,254	11,135	12,119	100	47.9	52.1	4.8

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The Western Province is predominantly rural (77.9%) and urban area (22.1%). Rusizi district population is predominantly rural 66.6% while urban represents 33.4%. The sectors of Rusizi district which don't have urban areas are Butare, Bweyeye, Giheke, Gikundamvura, Nkombo and Nkungu. The sectors with Predominant urban areas are Bugarama (94%), Kamembe (81.2%), and Muganza (98.7%) and Rwimbogo (59.5%). The table below 1.3 illustrates the details

Table 48: Population of Rusizi District by sector and area of residence

Sectors	Counts			Percentage		
	Area of residence			Area of residence		
	Total	Urban	Rural	Total	Urban	Rural
Rwanda	13,246,394	3,701,245	9,545,149	100	27.9	72.1
Western Province	2,896,484	640,307	2,256,177	100	22.1	77.9
Rusizi district	485,529	162,165	323,364	100	33.4	66.6
Bugarama	42,830	40,276	2,554	100	94.0	6.0
Butare	25,483	-	25,483	100	-	100.0
Bweyeye	18,109	-	18,109	100	-	100.0
Gashonga	26,791	3,515	23,276	100	13.1	86.9
Giheke	20,740	-	20,740	100	-	100.0
Gihundwe	41,615	15,528	26,087	100	37.3	62.7
Gikundamvura	21,909	-	21,909	100	-	100.0
Gitambi	25,119	8,657	16,462	100	34.5	65.5
Kamembe	34,883	28,338	6,545	100	81.2	18.8
Muganza	32,849	32,421	428	100	98.7	1.3
Mururu	29,774	5,677	24,097	100	19.1	80.9
Nkanka	19,857	1,707	18,150	100	8.6	91.4
Nkombo	18,637	-	18,637	100	-	100.0
Nkungu	21,696	-	21,696	100	-	100.0
Nyakabuye	33,200	5,963	27,237	100	18.0	82.0
Nyakarenzo	18,384	1,502	16,882	100	8.2	91.8
Nzahaha	30,399	4,735	25,664	100	15.6	84.4
Rwimbogo	23,254	13,846	9,408	100	59.5	40.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

Population density is a measurement of population per unit land area. Density is the number of inhabitants per Km². The figure below indicates distribution of population density per sectors in Rusizi District and higher densely sector is Kamembe with 1,708 inhabitant/Km².

b. Number of households and size of household

The results of 5th RPHC 2022 indicate the total of 3,312,743 households in Rwanda, 671,506 in the Western Province and 104,937 in Rusizi district. The average household size in Rusizi district is 4.6 persons per household. At the Sector level, the highest sizes are found in Nkombo (5.5 persons/household) followed by Bweyeye and Nkanka with both 4.8 persons/household. The smallest household size is found in Kamembe (4.0 persons/household). The results of 5th RPHC 2022 revealed that nationally 28.9% of private households are headed by women. In Western Province, 29.6% are headed by Women, while in Rusizi district, private households headed by females are 27.3%. At sector level, the highest percentages of households headed by women are found in Bugarama sector (32.7%) and Bweyeye sector (31.7%) while the lowest is found in Nkungu sector (23%).

Table 49: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western Province	671,506	2,871,195	4.3	70.4	29.6
Rusizi District	104,937	478,754	4.6	72.7	27.3
Bugarama	9,152	41,752	4.6	67.3	32.7
Butare	5,485	25,461	4.6	74.4	25.6
Bweyeye	3,602	17,175	4.8	68.3	31.7
Gashonga	6,191	26,740	4.3	71.8	28.2
Giheke	4,697	20,724	4.4	68.7	31.3
Gihundwe	8,877	41,591	4.7	78.9	21.1
Gikundamvura	4,823	21,904	4.5	69.4	30.6
Gitambi	5,445	25,108	4.6	71.8	28.2
Kamembe	7,667	30,402	4.0	76.2	23.8
Muganza	7,364	32,832	4.5	70.1	29.9
Mururu	6,516	29,752	4.6	71.3	28.7
Nkanka	4,148	19,842	4.8	69.0	31.0
Nkombo	3,408	18,622	5.5	73.6	26.4
Nkungu	4,951	21,678	4.4	77.0	23.0
Nyakabuye	7,382	33,186	4.5	74.4	25.6
Nyakarenzo	4,122	18,376	4.5	72.2	27.8
Nzahaha	6,428	30,391	4.7	74.0	26.0
Rwimbogo	4,679	23,218	5.0	76.0	24.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western Province the predominant type of habitat is umudugudu/planned rural housing (70.5%) and Spontaneous/squatter housing (4.6%). It is much higher in Rusizi district (85.4%) as one of districts of the Western Province. Another common type of habitat in Rusizi district is spontaneous/squatter housing (4.6%) which is equal as the one of the province, followed by Dispersed/Isolated housing (7.4%). The type of habitat varies across sectors. Planned rural settlement or housing is much higher in Nyakabuye (99.6%), followed by Mururu (98.9%). Spontaneous/squatter housing is most prevalent in Kamembe (30.3%), while dispersed/isolated housing is 30.7%, and modern planning urban is only high in Gihundwe (6.1%) and Kamembe (2.9%).

The type of habitat in Rusizi district varies according to the area of residence. In urban areas, the predominant the Umudugudu/planned rural settlement housing (84.9%) and spontaneously/squatter housing (8.1%) while in rural areas, the types of habitats are the planned rural settlement represents 85.7% and dispersed/isolated housing represents 10.1%.

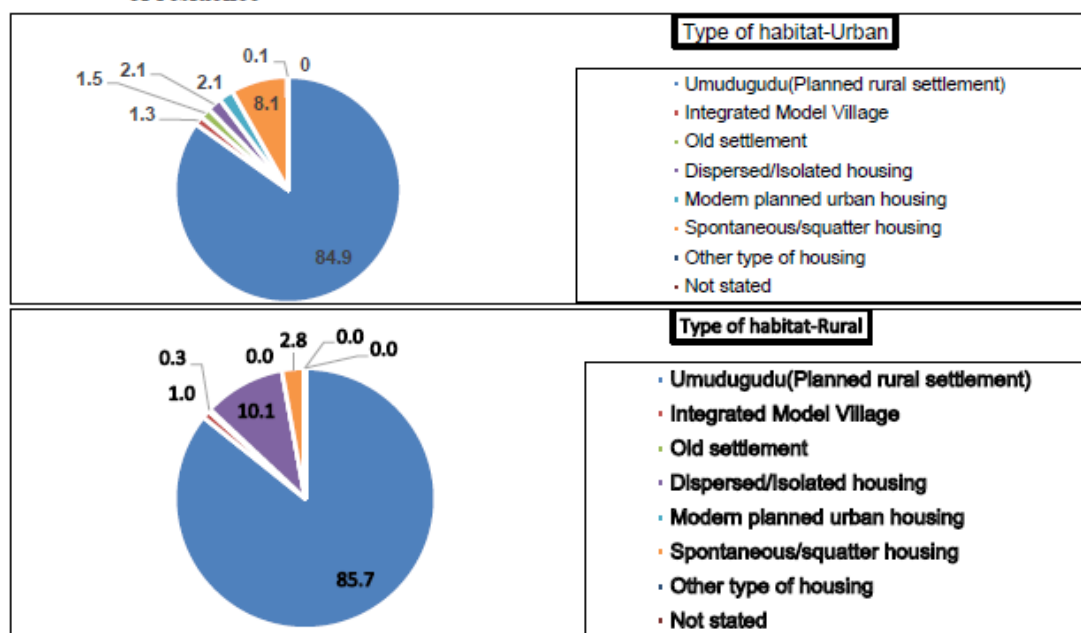


Figure 18: Distribution of households in Rusizi District by type of habitat and by area of residence.
Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

d. Education

In Rusizi District, 19.3% of the population has never attended school, while 2.0% have attended nursery, and 60.5% have attended primary school. Other education levels include 0.6% for INGOBOKA/Vocational, 8.4% for lower secondary, 6.7% for upper secondary, 2.4% for university, and 0.0% is not stated. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Nkombo has a higher percentage (35.3%) of individuals who have never attended school compared to other sectors while Nyakarenzo (66.7%) and Nkungu (66.6%) have the high percentages of individuals attended primary school. Kamembe has a higher percentage of individuals attended lower secondary school, upper secondary school and University level (11.7%, 13.8% and 8.2% respectively). Each sector has its own unique distribution of educational levels attended by the population.

Table 50: Distribution of the resident population of Rusizi District by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Rusizi District	441,717	100	19.3	2.0	60.5	0.6	8.4	6.7	2.4	0.0
Bugarama	39,091	100	22.1	2.3	58.1	0.3	8.7	6.6	1.9	0.0
Butare	22,724	100	25.4	1.8	61.7	0.2	6.1	4.1	0.7	-
Bweyeye	16,342	100	24.5	2.8	56.3	0.2	7.6	7.6	0.9	0.0
Gashonga	24,595	100	17.4	1.3	65.5	0.9	7.4	5.8	1.7	0.0
Giheke	19,028	100	18.9	2.1	62.4	0.9	7.7	5.3	2.7	0.0
Gihundwe	37,879	100	14.9	3.0	55.8	0.9	9.7	10.1	5.6	0.0
Gikundamvura	20,009	100	21.8	1.8	62.3	0.2	8.1	5.3	0.6	-
Gitambi	22,650	100	16.9	1.8	65.1	0.4	8.7	6.2	1.0	-
Kamembe	32,079	100	12.6	2.9	49.7	0.9	11.7	13.8	8.2	0.1
Muganza	30,076	100	17.8	2.5	60.5	0.8	9.2	7.0	2.2	0.0
Mururu	27,061	100	19.2	1.8	61.3	0.8	9.1	6.3	1.6	0.0
Nkanka	17,431	100	20.8	1.1	65.2	0.6	6.9	3.4	2.0	0.0
Nkombo	16,825	100	35.3	1.9	50.5	0.5	6.0	5.0	0.8	-
Nkungu	19,775	100	18.6	1.7	66.6	0.8	7.2	4.4	0.7	-
Nyakabuye	30,323	100	18.0	1.9	63.6	0.4	8.8	5.8	1.6	0.0
Nyakarenzo	16,715	100	16.8	1.9	66.7	0.5	7.3	5.3	1.5	-
Nzahaha	27,867	100	20.0	1.3	64.0	0.6	7.6	5.2	1.3	-

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA Vocational	Lower secondary	Upper secondary	University	Not stated
Rwimbogo	21,247	100	16.8	1.7	61.5	0.5	9.2	7.7	2.6	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

At the district level, 83.1% of private households possess a radio, 81.1% a mobile phone, 20.0% a smartphone, 12.4% a TV and 1.9% a computer. The percentage of private households possessing a radio is high in Kamembe (93.9%), Gihundwe (92%) and others have also over to 81%. The percentage of private households possessing a television is high in Kamembe (33.1%) and Gihundwe 25%. The private households with mobile phones are high in Kamembe at 92.7%, Gihundwe at 90.2% and Mururu at 85.5%. Private households possessing the smart phone are high in Kamembe at 52.4% and Gihundwe at 39.9%. Only 9% of households in Kamembe possess a computer. The lowest sectors to possess private households with those items are mostly Butare which has 70.5% of radio, 1.5% of television, 68.0% of mobile phone, 3.9% of smart phone and only 0.2% of computers. Another low sector is Bweyeye which its private households possess radio at 70.6%, with 2.3% of television, 68.4% of mobile phones, 7.1% of smart phone among the lowest and finally 0.4% of computers.

It was also revealed that the employment to population ratio is 41.9 percent among people residing in Rusizi districts, it is higher in urban areas of Rusizi (47.6 percent) than in rural areas of Rusizi (39.0 percent). The employment to population ratio among males as well as females increases from age group 16-19 to 35-44 and starts decreasing from age group 45-49 to 85 years and above as people starts getting very older and retire. It was observed that in district of Rusizi, the highest employment to population ratio among males stands at 65.4 and was observed in age group 30-34, On the other side the highest employment to population among females is 46.4% and was observed in the age group 30-34. The lowest employment to population ratio among males stands at 6.8% and was observed among males in the age group 85+, the lowest employment to population ratio among females is 2.6% and was observed among females in the age group 85+.

Table 51: Distribution of household engaged in livestock husbandry in Rusizi district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Households	Private	Counts	Counts	%	Counts	%
Rwanda	3,312,743		2,280,854	2,074,928	62.6	1,669,273	50.4
Western Province	671,506		503,360	451,603	67.3	373,648	55.6
Rusizi district	104,937		78,039	72,247	68.8	52,901	50.4
Bugarama	9,152		6,010	5,577	60.9	2,612	28.5
Butare	5,485		4,664	4,362	79.5	3,428	62.5
Bweyeye	3,602		3,173	3,016	83.7	2,265	62.9
Gashonga	6,191		5,565	5,340	86.3	4,178	67.5
Giheke	4,697		4,053	3,898	83.0	3,059	65.1
Gihundwe	8,877		4,461	3,868	43.6	2,745	30.9
Gikundamvura	4,823		4,139	3,902	80.9	2,745	56.9
Gitambi	5,445		4,782	4,585	84.2	3,374	62.0
Kamembe	7,667		1,982	1,500	19.6	1,117	14.6
Muganza	7,364		4,771	4,137	56.2	2,754	37.4
Mururu	6,516		4,559	4,023	61.7	2,996	46.0
Nkanka	4,148		3,524	3,337	80.4	2,581	62.2
Nkombo	3,408		1,914	1,493	43.8	1,230	36.1
Nkungu	4,951		4,484	4,166	84.1	3,614	73.0
Nyakabuye	7,382		6,375	5,945	80.5	4,815	65.2
Nyakarenzo	4,122		3,732	3,648	88.5	2,722	66.0
Nzahaha	6,428		5,838	5,608	87.2	4,061	63.2
Rwimbogo	4,679		4,013	3,842	82.1	2,605	55.7

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, water supply and Sanitation facilities

In Rusizi District 95.6% are using Mutuelle as main health insurance, 3.6% using RSSB or RAMA, 0.3% using private insurance, 0.0% using school insurance, 0.0% using NGOs insurance and 0.5% using employer insurance.

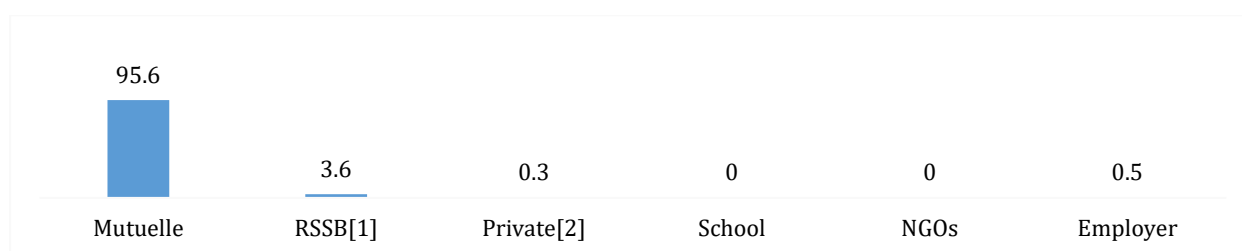


Figure 19: Population who have a medical insurance by main type of insurance in Rusizi district

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5th RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Western Province, they use an improved water source at 75.4%. In Rusizi district, 82.1% of private households use improved water sources. At the sector level, the percentage of the private households using water from improved sources is highest in Muganza (98.1%), Nkombo (97.9%) and Bugarama (97.0%). The lowest sector to use an improved source of water is Butare (37.9%) and Bweyeye (58.2%).

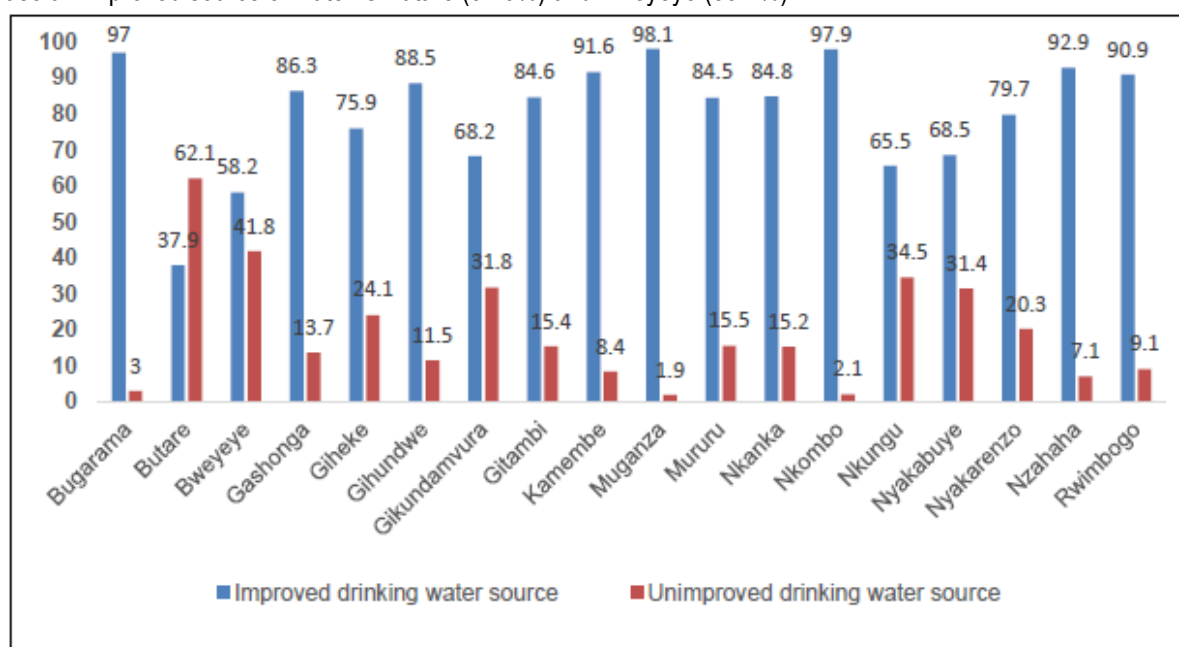


Figure 20: Percentage of households of Rusizi District by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In Rusizi district, both urban and rural areas, private households use mainly improved source of water (95.8% in urban and 75.2% in rural). The percentage of private households using unimproved source of water is higher in rural (24.8%) than in urban (4.2%). More details are displayed in figure below:

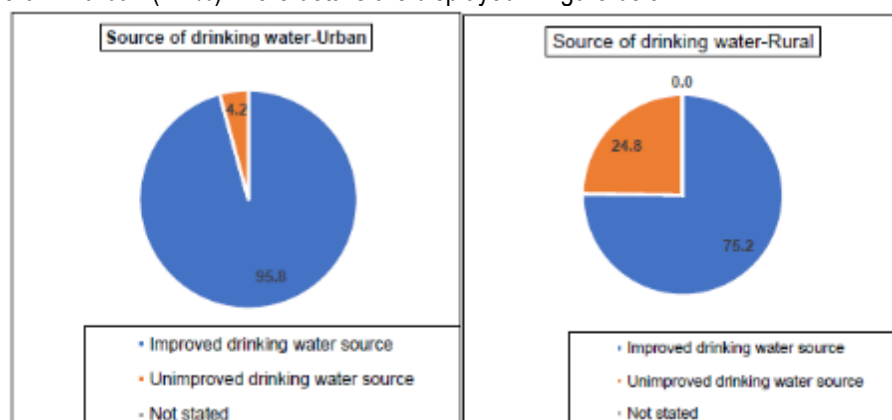


Figure 21: Distribution of the private households of Rusizi District by main source of water and by area of

residence

Source: Fifth Rwanda Population and Housing Census,2022(NISR)

g. Appliance and assets ownership

At the district level, 83.1% of private households possess a radio, 81.1% a mobile phone, 20.0% a smartphone, 12.4% a TV and 1.9% a computer. The percentage of private households possessing a radio is high in Kamembe (93.9%), Gihundwe (92%) and others have also over to 81%. The percentage of private households possessing a television is high in Kamembe (33.1%) and Gihundwe 25%. The private households with mobile phones are high in Kamembe at 92.7%, Gihundwe at 90.2% and Mururu at 85.5%. Private households possessing the smart phone are high in Kamembe at 52.4% and Gihundwe at 39.9%. Only 9% of households in Kamembe possess a computer. The lowest sectors to possess private households with those items are mostly Butare which has 70.5% of radio,1.5% of television,68.0% of mobile phone,3.9% of smart phone and only 0.2% of computers. Another low sector is Bweyeye which its private households possess radio at 70.6%, with 2.3% of television,68.4% of mobile phones,7.1% of smart phone among the lowest and finally 0.4% of computers. The table below provides details:

Table 52: Percentage of private households of Rusizi District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone ²	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Rusizi	104,937	83.1	11.7	81.0	20.0	1.9
Bugarama	9,152	81.2	12.4	79.1	20.8	1.6
Butare	5,485	70.5	1.5	68.0	7.1	0.2
Bweyeye	3,602	70.6	2.3	68.4	8.7	0.4
Gashonga	6,191	83.9	6.3	81.5	13.7	1.0
Giheke	4,697	87.7	8.8	85.5	17.0	1.2
Gihundwe	8,877	92.0	25.0	90.2	39.9	5.1
Gikundamvura	4,823	72.5	4.1	69.6	8.8	0.4
Gitambi	5,445	82.0	7.7	79.8	12.7	0.6
Kamembe	7,667	93.9	33.1	92.7	52.4	9.0
Muganza	7,364	81.2	14.7	78.7	18.5	2.3
Mururu	6,516	87.5	18.8	85.5	25.5	1.3
Nkanka	4,148	82.3	6.1	82.9	14.6	0.6
Nkombo	3,408	83.5	7.8	82.8	15.6	0.8
Nkungu	4,951	81.4	4.7	77.7	9.7	0.7
Nyakabuye	7,382	80.6	7.6	78.4	13.6	0.7
Nyakarenzo	4,122	87.0	7.4	85.0	17.2	0.9
Nzahaha	6,428	81.3	5.6	78.8	11.8	0.5
Rwimbogo	4,679	84.9	10.6	82.9	20.5	1.1

Source: Fifth Rwanda Population and Housing Census,2022(NISR)

h. Access to energy for lighting and cooking

Rusizi district, the main source of energy for lighting used by households is electricity (67.3%). At the sector level, the percentage of households using electricity for lighting is high in Kamembe (92.9%), Bugarama (71.7%), Gihundwe (83.5%) and the lowest sector is Butare which has 39.2%. According to the area of residence, the main source of energy for lighting is electricity (61.2%), followed by flashlight/phone flashlight (23.0%) and firewood (7.3%) in rural areas. In urban areas, 79.4% of private households use electricity as main source of energy for lighting while use 11.5% use flashlight or phone flashlight and 3.9% use candles.

Table 53: Distribution of households of Rusizi District by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraff in lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for Lighting
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5
Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6
Rusizi District	104,937	100	67.3	1.1	0.0	3.2	5.4	1.0	19.1	0.1	2.1	0.7

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for Lighting
Rusizi-urban	35,056	100	79.4	0.8	0.0	3.9	1.7	0.6	11.5	0.1	1.5	0.6
Rusizi-rural	69,881	100	61.2	1.2	0.0	2.8	7.3	1.2	23.0	0.1	2.4	0.8
Bugarama	9,152	100	71.7	0.8	-	4.2	2.0	2.0	16.8	0.0	1.7	0.6
Butare	5,485	100	39.2	0.2	-	0.9	31.4	1.3	25.2	0.1	1.5	0.1
Bweyeye	3,602	100	46.4	0.5	-	2.6	24.4	2.9	21.1	0.1	1.3	0.7
Gashonga	6,191	100	58.8	1.4	0.0	3.5	3.8	1.2	26.3	0.3	2.9	1.7
Giheke	4,697	100	65.1	1.9	-	3.4	2.4	0.2	23.6	-	2.7	0.7
Gihundwe	8,877	100	83.5	1.8	0.0	3.1	1.0	0.2	7.5	0.1	2.7	0.2
Gikundamvura	4,823	100	60.5	0.5	-	1.7	7.2	2.4	23.7	0.0	2.0	2.0
Gitambi	5,445	100	54.9	1.0	-	3.9	5.8	1.0	30.4	0.1	2.4	0.4
Kamembe	7,667	100	92.9	0.6	0.0	2.3	0.3	0.1	3.2	0.0	0.5	0.1
Muganza	7,364	100	75.7	0.3	0.0	5.1	1.8	0.3	13.5	0.1	1.0	2.3
Mururu	6,516	100	76.4	1.8	0.0	5.5	1.0	0.8	11.2	0.0	2.9	0.4
Nkanka	4,148	100	58.1	2.5	-	1.8	3.6	1.3	27.4	0.2	4.6	0.7
Nkombo	3,408	100	68.9	0.9	0.0	1.9	3.3	0.8	22.4	0.1	1.3	0.1
Nkungu	4,951	100	62.0	0.6	-	1.5	6.3	1.4	25.7	-	2.0	0.5
Nyakabuye	7,382	100	65.9	0.8	0.0	2.0	5.0	1.1	22.9	0.1	1.7	0.5
Nyakarenzo	4,122	100	65.4	0.7	0.0	2.5	2.7	0.3	26.3	0.1	1.9	0.1
Nzahaha	6,428	100	61.3	1.7	-	4.7	5.0	1.0	23.6	0.0	1.7	0.9
Rwimbogo	4,679	100	67.9	1.5	-	4.1	4.0	1.0	16.8	0.2	4.1	0.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In the Western Province, the main sources of energy for cooking used by the private households are firewood (83.9%) followed by charcoal (13.9%) and gas (1.2%). The trend is almost the same within Rusizi district, where the main sources of energy for cooking used by the private households are firewood (82.5%) followed by charcoal (14.4%) and gas (1.4%). At the sector level, firewood is the most used source of cooking energy by private households in 60% of all sectors of Rusizi district for more than 94%. Sectors with the high percentage of private households using charcoal as main source of cooking energy are Kamembe (61.2%), Gihundwe (34.8%), and Bugarama (28.2%). The lowest sector to use firewood is Kamembe which use only 26.2%, while the lowest to use charcoal as cooking energy is Nkombo (1.1%) and Nkanka (1.3%). Sectors with the highest percentages of private households using gas as main source of cooking energy are Kamembe (9.6%) and Gihundwe (3.8%).

By area of residence, the main sources of energy for cooking used by private households in Rusizi district vary by area of residence. In Rural areas, private households use mostly firewood (93.3%) and charcoal (5.3%). In urban areas, private households use most firewood (61.1%) and charcoal (32.6%).

i. Vulnerability

In Western Province, vulnerability rate is at 3.5 as the same as in Rusizi district. At sector level, the highest prevalence rates are in Butare (5.7%) and Nyakabuye (4.6% each) while the lowest is in Nkungu (2.5%) and Muganza (2.6%) respectively.

Table 54: Number and share of persons with vulnerability of Rusizi district

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Rusizi district	417,025	14,773	6,794	7,979	3.5
Bugarama	36,752	1,262	586	676	3.4
Butare	21,187	1,215	518	697	5.7

Bweyeye	15,529	617	273	344	4
Gashonga	23,109	769	347	422	3.3
Giheke	18,019	542	248	294	3
Gihundwe	35,470	1,190	491	699	3.4
Gikundamvura	18,809	531	247	284	2.8
Gitambi	21,532	780	373	407	3.6
Kamembe	30,645	909	574	335	3
Muganza	28,416	748	343	405	2.6
Mururu	25,404	823	382	441	3.2
Nkanka	17,206	681	328	353	4
Nkombo	15,990	617	265	352	3.9
Nkungu	18,662	460	205	255	2.5
Nyakabuye	28,367	1,317	567	750	4.6
Nyakarenzo	15,615	601	264	337	3.8
Nzahaha	26,249	861	402	459	3.3
Rwimbogo	20,064	850	381	469	4.2

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

4.7 Ngororero district

4.7.1 Physical environment

Ngororero District is one of the 7 districts of the Western Province and shares its borders with Gakenke district to the North East, Nyabihu District to the North, Karongi district to the South: Muhanga district to the East: and, Rutsiro District to the West. The district has an area of 679 Km² and it is subdivided into 13 administrative Sectors (Imirenge), 73 administrative Cells (Utugari), and 419 Villages (Imidugugu).

a. Topography

District has a relief characterized by high mountains with very steep slopes that flow into valleys. The altitude varies between 1,460 m and 2,883 m above sea level. The average annual temperature is 18°C which varies with the altitude. The average altitude is at 1,500 meters. The higher peaks are found in Gishwati forest along the Congo-Nile Crete; these are Mugano (2,842.1 m) Butimba (2,833.5 m), Kagano (2,450 m), Nyaburama (2,427 m), Ntaganzwa (2,257 m), Rushari (2,059 m), Gatwenabo (2,023 m), Ruhunga (1,978 m and Mushyiga (1,930 m).

b. Climate and Rainfall

The Climate of the region is more of the tropical type with 4 seasons (short rainy season of October-December corresponding to the agriculture season A; short dry season from January February; long rainy season of March-June corresponding to the agriculture season B and long dry season of July-September corresponding to the swamp agriculture season C.

Rainfall is regular with a rainfall of 1527.7mm per year although irregularities are recorded sometimes with weakness or excess in rainfall. The variety of characteristics of the relief and climate offer to the district the advantage of growing a diversity of agriculture products including coffee, tea, banana, maize, wheat, beans, cassava, potatoes and Gishwati pasture area is favorable for cattle production. However, the high steep slopes combined with land over exploitation due to intense agriculture activities result in soil degradation and this requires to the district huge investments in soil protection.

c. Geology and Soils

Ngororero District, exhibits diverse geological formations primarily composed of Precambrian basement rocks. These include granite and gneiss formations, which form the underlying bedrock of the area. These rocks are typically resistant to weathering and erosion, contributing to the hilly and undulating topography characteristic of the district. In terms of soil types, Ngororero features mainly Ferralsols (red tropical soils) and Acrisols (weathered soils), which are well-drained and suitable for agriculture. The combination of these geological and soil characteristics supports the cultivation of crops such as beans, maize, and potatoes, which are important for the local economy.

d. Hydrography

The main rivers in the district are Nyabarongo, Rubagabaga, Mukungwa, Satinsyi, Muhembe, Kibirira, Rukubi, Kintiti, Nyampiri, Mugunda, Giciye, Rucanzogera, Nyantanga and Gasumo. These rivers allow practicing agriculture especially in their swamps during dry seasons (twenty swamps totaling approximately an area of over 1000 ha) and this is an advantage as there is possibility of three agriculture seasons in one-year period. In addition, this offers an opportunity of energy generation through hydropower plants. The district is however required to invest considerable resources in the protection of the river banks and watersheds.

4.7.2 Ecological environment

Ngororero District is characterized by diverse biodiversity due to its varied topography, climate, and ecosystems. The district features hilly terrain, river valleys, and forested areas, contributing to the presence of a rich array of flora and fauna. The district has a tropical highland climate with significant rainfall, which supports a mixture of natural forests, farmlands, and riverine ecosystems. The district is part of the Congo-Nile Divide, which influences its biodiversity by harbouring species adapted to both moist forest environments and agricultural landscapes.

The vegetation in Ngororero includes a mix of montane forests, grasslands, and wetlands, which support various plant and animal species. The district is home to both natural and human-modified ecosystems, with conservation efforts aimed at protecting biodiversity, particularly in areas linked to Nyungwe National Park.

- Flora

The flora in Ngororero district consists of indigenous tree species, shrubs, grasses, and cultivated crops. The most dominant plant species include:

a) Indigenous tree species

These include the *Newtonia buchananii* – A dominant montane forest tree species, known for its role in maintaining soil stability and providing habitat for birds and insects; *Podocarpus latifolius* (Broad-leaved Yellowwood) – A key species in the high-altitude forests, important for biodiversity conservation; *Syzygium guineense* (Waterberry) – Common in riverine and forested areas, offering food sources for birds and mammals; *Polyscias fulva* – Frequently found in montane forests, providing habitat for many wildlife species; *Entandrophragma excelsum* – A large tree species found in montane areas, contributing to carbon sequestration.

b) Shrubs and understory Plants

These include the *Mimulopsis solmsii* – A common shrub in forested areas, helping in soil retention and erosion control; *Rubus steudneri* – A wild berry-producing shrub that serves as food for birds and small mammals; *Maesa lanceolata* – Frequently found in secondary forests and farmlands.

c) Grass and wetland vegetation

These include the *Pennisetum purpureum* (Elephant grass) – Grows in riverbanks and grasslands, important for livestock feed; *Cymbopogon nardus* (Citronella grass) – Found in open fields and hillsides, known for its aromatic properties; *Cyperus papyrus* – Occurs in wetlands and along water bodies, supporting aquatic biodiversity.

d) Agricultural crops

Due to extensive human activity, the district also contains cultivated species, including: Coffee (*Coffea arabica*) – One of the main cash crops grown in the region; Banana (*Musa* spp.) – A staple food and cash crop in the district; Beans (*Phaseolus vulgaris*) – Cultivated widely in farming areas and *Eucalyptus* spp. – Introduced for timber and fuelwood.

- Fauna

The diverse ecosystems of Ngororero District support a variety of animal species, including mammals, birds, reptiles, amphibians, and insects.

a) Mammals

These include the *Cercopithecus mitis* (Blue Monkey) – Found in forested areas, particularly near Nyungwe National Park; *Papio anubis* (Olive Baboon) – Frequently spotted in farmlands and forest edges, often causing human-wildlife conflicts; *Hystrix cristata* (Crested Porcupine) – Common in rocky and forested areas, feeding on roots and tubers; *Atilax paludinosus* (Marsh Mongoose) – Found in wetland and riverine habitats and the *Cephalophus harveyi* (Harvey's Duiker) – A small antelope that inhabits dense vegetation.

b) Birds

Ngororero District hosts a range of bird species, many of which are adapted to montane forests and wetlands. Some dominant bird species include: *Tauraco schuettii* (Ruwenzori Turaco) – A strikingly colorful bird found in forest

canopies; *Columba arquatrix* (African Olive Pigeon) – Frequently observed in montane forests; *Bostrychia hagedash* (Hadada Ibis) – Common near wetlands and agricultural areas; *Cisticola chiniana* (Rattling Cisticola) – A small passerine bird found in grasslands and farmlands; *Ploceus baglafecht* (Baglafecht Weaver) – Often seen around human settlements, building intricate nests.

c) Reptiles and amphibians

The district's wetlands and forests support various reptile and amphibian species including *Naja melanoleuca* (Forest Cobra) – Found in forested regions and near water bodies; *Bitis arietans* (Puff Adder) – Common in grasslands and rocky areas; *Leptopelis karissimbensis* (Karissimbi Tree Frog) – Found in forested wetlands.; and the *Hyperolius viridiflavus* (Variable Reed Frog) – Occurs in marshes and wet grasslands.

d) Insects and pollinators

Insects play a crucial ecological role in Ngororero District, especially for pollination and soil health. Some dominant insect species include *Apis mellifera* (African Honeybee) – Essential for pollination in forests and agricultural landscapes; *Papilio nireus* (Green-banded Swallowtail) – A butterfly species commonly seen in open fields and the *Macrotermes bellicosus* (Giant Termite) – Important for soil aeration and decomposition.

4.7.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census (PHC5) has enumerated 367,955 residents in Ngororero district, which represent 12.7% of the total population of the Western Province (2,896,484 residents). The population of Ngororero district is predominantly female: 196,890 are women corresponding to 53.5 % of its the total population of Ngororero district. The Table below indicates the number of the population of Ngororero district by sector, by sex and their shares across sectors to the total population of Ngororero district. Females are predominant in all sectors of the Ngororero district, the most populated sectors are Ngororero (38,823 population), Kabaya (36,324 population), Kavumu (32,791 population), Sovu (31,966 population), and Muhanda (31,869 population).

Table 55: Population of Ngororero District by sector

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Ngororero district	367,955	171,065	196,890	100	46.5	53.5	100
Bwira	20,012	9,341	10,671	100	46.7	53.3	5.4
Gatumba	24,952	11,718	13,234	100	47	53	6.8
Hindiro	26,040	12,030	14,010	100	46.2	53.8	7.1
Kabaya	36,324	16,932	19,392	100	46.6	53.4	9.9
Kageyo	25,929	12,075	13,854	100	46.6	53.4	7
Kavumu	32,791	15,019	17,772	100	45.8	54.2	8.9
Matyazo	27,673	12,962	14,711	100	46.8	53.2	7.5
Muhanda	31,869	14,678	17,191	100	46.1	53.9	8.7
Muhororo	22,273	10,488	11,785	100	47.1	52.9	6.1
Ndaro	24,444	11,317	13,127	100	46.3	53.7	6.6
Ngororero	38,823	18,254	20,569	100	47	53	10.6
Nyange	24,859	11,536	13,323	100	46.4	53.6	6.8
Sovu	31,966	14,715	17,251	100	46	54	8.7

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The Western Province is predominantly by the rural area (77.9%) and urban area (22.1%). Ngororero district population is predominantly in rural areas 95.1% while urban area represents 4.9%. The almost all sectors of Ngororero district are entirely rural except Kabaya and Ngororero which have both urban and rural areas.

b. Number of households and size of household

The results of 5th RPHC 2022 indicate the total of 3,312,743 households in Rwanda, 671,506 in the Western Province and 92,623 in Ngororero district. The average household size in Ngororero district is 4 persons per household. At the Sector level, the highest sizes are found in Sovu, Kabaya, Kavumu, Muhanda, Hindiro, Matyazo, and Kageyo sectors

(at least 4.0 persons/household each). In other sectors, the average household size is under 4 persons/household but around.

Table 56: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage		
				Male HHs	Headed	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1		28.9
Western Province	671,506	2,871,195	4.3	70.4		29.6
Ngororero District	92,623	367,493	4.0	67.9		32.1
Bwira	5,121	20,006	3.9	67.5		32.5
Gatumba	6,572	24,896	3.8	67.2		32.8
Hindiro	6,480	26,021	4.0	67.9		32.1
Kabaya	8,739	36,168	4.1	69.3		30.7
Kageyo	6,560	25,919	4.0	67.8		32.2
Kavumu	8,038	32,778	4.1	68.7		31.3
Matyazo	6,870	27,642	4.0	68.8		31.2
Muhanda	7,701	31,840	4.1	65.3		34.7
Muhororo	5,757	22,260	3.9	70.1		29.9
Ndaro	6,351	24,432	3.8	67.0		33.0
Ngororero	10,269	38,749	3.8	68.7		31.3
Nyange	6,484	24,821	3.8	65.9		34.1
Sovu	7,681	31,961	4.2	67.3		32.7

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western Province the predominant type of habitat is Umudugudu (Planned rural settlement) (70.5%) and Dispersed/ Isolated housing (18.3%). The most common type of habitat in Ngororero district is Umudugudu (Planned rural settlement) (60.4%) followed by dispersed or isolated housing (33.3%). The type of habitat varies across sectors. Umudugudu (Planned rural settlement) is most prevalent in Gatumba, Kabaya, and Ngororero sectors (77.9%, 75.9% and 75.5%, respectively), and low in Sovu sector (35.8%). dispersed or isolated housing is most prevalent in Sovu sector (58.2%) and low in Kabaya and Ngororero sectors (16.6% and 18.4%, respectively). The sectors with the high percentages of Spontaneous/squatter housing are Kageyo (5.7%).

The type of habitat in Ngororero district varies according to the area of residence. In urban areas, the predominant types are umudugudu/Planned rural settlement (70.1%) and dispersed/isolated housing (15.9%). In rural areas it is the same, the predominant type is umudugudu/Planned rural settlement (59.9%) followed by dispersed/isolated housing (34.2%).

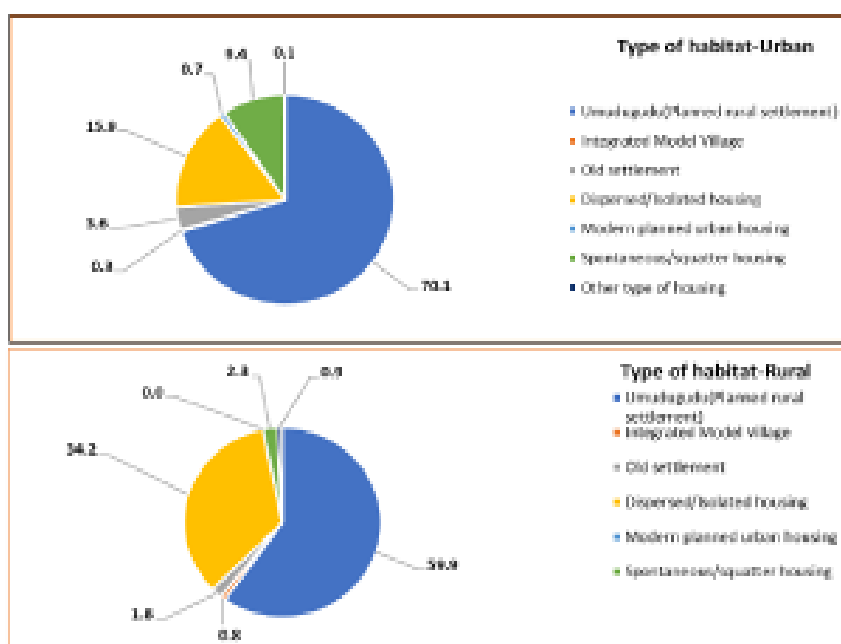


Figure 22: Distribution of households in Ngororero District by type of habitat and by Area of residence.

Source: Fifth Rwanda Population and Housing Census, 2022

d. Education

In Ngororero District, 18.8% of the population has never attended school, while 2.4% have attended nursery, and 65.6% have attended primary school. Other education levels include 0.6% for INGOBOKA/Vocational, 7.1% for lower secondary, 4.1% for upper secondary, and 1.3% for university. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Muhanda has a higher percentage (33.8%) of individuals who have never attended school compared to other sectors, while Kabaya has a higher percentage (6.6%) of individuals who attended upper secondary school. Each sector has its own unique distribution of educational levels attended by the population.

Table 57: Distribution of the resident population of Ngororero District by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Ngororero District	326,874	100	18.8	2.4	65.6	0.6	7.1	4.1	1.3	0.0
Bwira	17,707	100	19.0	1.9	69.8	0.4	5.6	2.8	0.6	-
Gatumba	22,201	100	13.5	2.6	66.7	1.2	9.0	5.0	2.0	0.0
Hindiro	22,947	100	16.8	3.1	66.1	1.0	7.0	4.3	1.8	0.0
Kabaya	32,411	100	16.7	2.3	62.1	0.4	9.3	6.6	2.6	-
Kageyo	22,929	100	16.9	2.1	70.0	0.6	6.4	3.2	0.8	0.0
Kavumu	28,642	100	23.6	2.0	63.7	0.2	6.3	3.5	0.7	0.0
Matyazo	24,736	100	15.9	2.3	69.7	0.7	6.7	3.8	1.0	0.0
Muhanda	29,017	100	33.8	1.9	55.5	0.1	5.1	3.1	0.5	0.1
Muhororo	19,889	100	15.0	2.4	68.4	0.9	8.2	4.1	1.0	0.0
Ndaro	21,520	100	20.0	2.8	68.8	0.7	4.6	2.0	1.0	0.0
Ngororero	34,683	100	12.2	3.1	67.0	0.8	9.2	5.5	2.2	0.0
Nyange	21,960	100	14.2	2.3	67.2	0.8	8.9	5.2	1.3	0.0
Sovu	28,232	100	24.6	2.8	63.3	0.2	5.7	2.9	0.5	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Nationally, 2,280,854 of private households (68.9%) are engaged in agriculture, among them 62.6% are engaged in crop farming and 50.4% are engaged in Livestock husbandry. In Ngororero district, Agricultural households occupy 89.5%, with 82.9% of households engaged in crop farming and 73.9% Households engaged in Livestock husbandry. All sectors of Ngororero district apply agriculture activities and have a high proportion of Households engaged in agriculture activities (above 80%). Bwira, Muhororo and Ndaro sectors have the high percentages of Households engaged in crop farming (around 91% each) and Ndaro, Nyange, Kageyo, and Bwira sectors have a high proportion of households engaged in Livestock husbandry (above 81% each).

It was also revealed that the employment to population ratio is 34.8 percent among people residing in Ngororero district, it is higher in urban areas of Ngororero (44.2 percent) than in rural areas of Ngororero (34.3 percent). The employment to population ratio among males as well as females increases from age group 16-19 to 35-44 and starts decreasing from age group 45-49 to 85 years and above as people starts getting very older and retire. It was observed that in district of Ngororero, the highest employment to population ratio among males stands at 52.8% and was observed in age group 30-34, On the other side the highest employment to population among females is 38.2% and was observed in the age group 30-34. The lowest employment to population ratio among males stands at 5.4% and was observed among males in the age group 85+, the lowest employment to population ratio among females is 4.6% and was observed among females in the age group 85+.

Table 58: Distribution of household engaged in livestock husbandly in Ngororero district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Private Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Ngororero district	92,623	82,102	89.5	76,015	82.9	67,594	73.9
Bwira	5,121	4,858	94.9	4,644	90.7	4,158	81.2
Gatumba	6,572	5,911	89.9	5,601	85.2	4,867	74.1
Hindiro	6,480	5,828	90.0	5,450	84.1	4,869	75.1
Kabaya	8,739	7,294	83.5	6,644	76.0	5,849	66.9
Kageyo	6,560	6,181	94.2	5,887	89.7	5,373	81.9
Kavumu	8,038	6,741	83.9	5,968	74.2	5,274	65.6
Matyazo	6,870	6,197	90.2	5,613	81.7	5,304	77.2
Muhanda	7,701	6,243	81.1	5,595	72.7	4,296	55.8
Muhororo	5,757	5,381	93.5	5,233	90.9	4,556	79.1
Ndaro	6,351	5,999	94.5	5,770	90.9	5,270	83.0
Ngororero	10,269	8,829	86.0	8,085	78.7	7,175	69.9
Nyange	6,484	5,992	92.4	5,480	84.5	5,356	82.6
Sovu	7,681	6,648	86.6	6,045	78.7	5,247	68.3

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, Water supply and Sanitation facilities

In Ngororero District 96.4% are using Mutuelle as main health insurance, 3% using RSSB or RAMA, 0.1% using private insurance, 0.0% using school insurance, 0.0% using NGOs insurance and 0.5% using employer insurance.

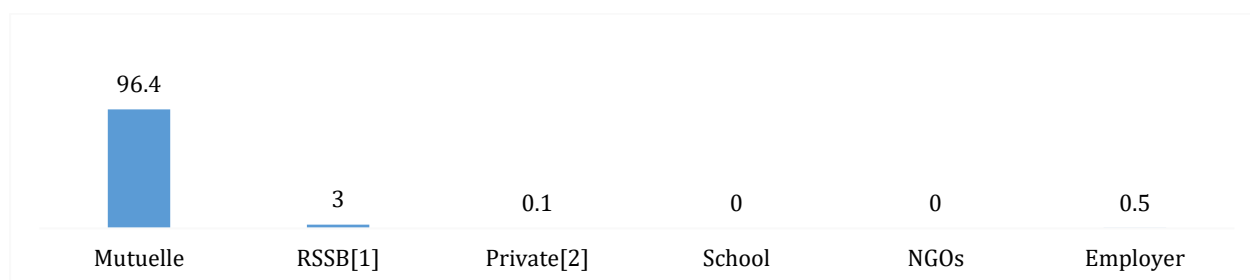


Figure 23: Population who have a medical insurance by main type of insurance in Ngororero district

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Ngororero district, 68.6% of private households use improved water sources while those use unimproved water sources is 31.4%. At the sector level, the percentage of the private households using water from improved sources is high in Gatumba sector (77.4%), and the lowest is in Sovu sector (39.5%).

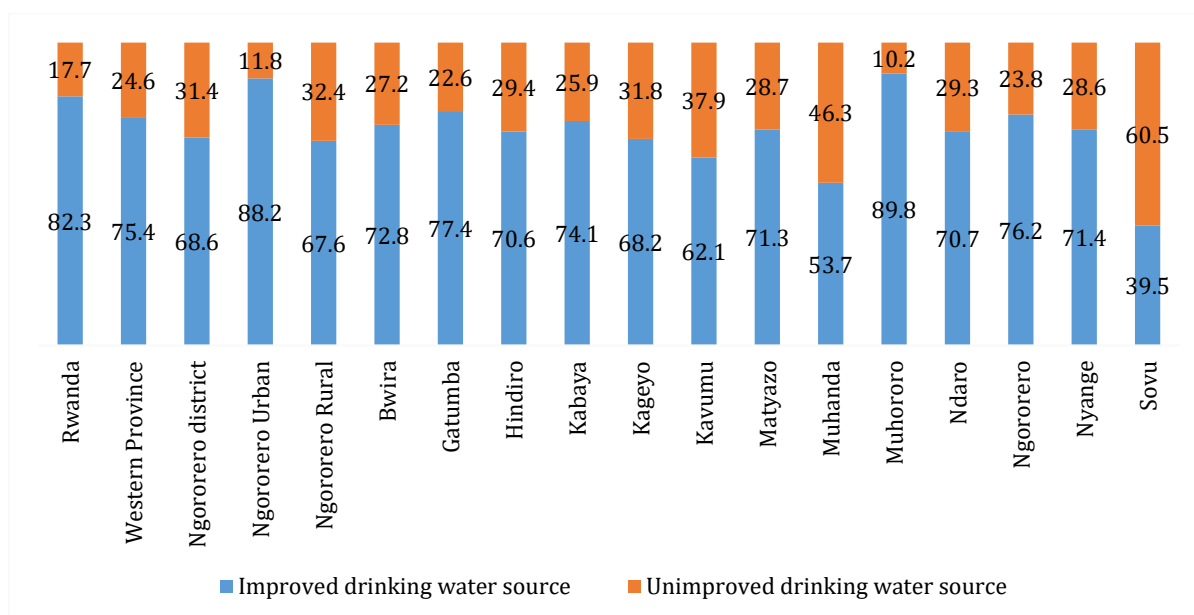


Figure 24: Percentage of households of Ngororero District by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In Ngororero district, both urban and rural areas, private households use mainly improved source of water (88.2% in urban and 67.6% in rural). The percentage of private households using unimproved source of water is higher in rural (32.4%) than in urban (11.8%).

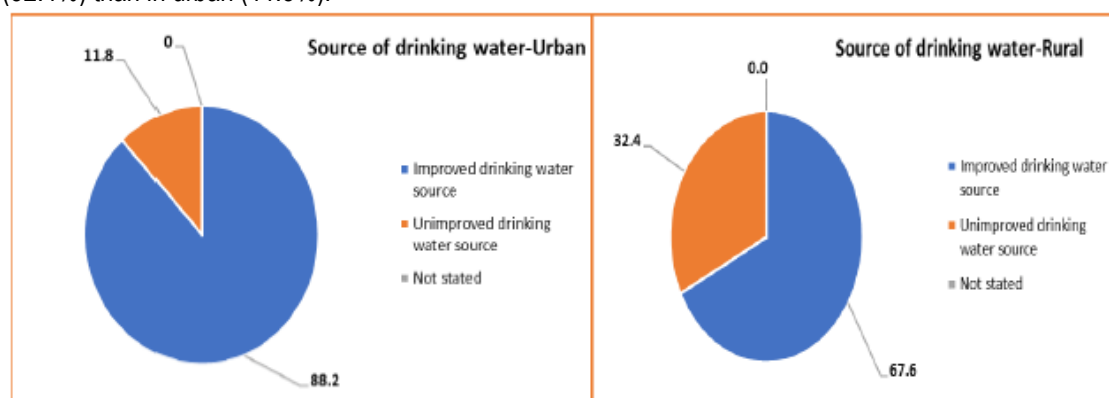


Figure 25: Distribution of the private households of Ngororero District by main source of water and by area of residence

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

g. Appliance and assets ownership

The district level, 74.9% of private households possess a radio, 58.7% a mobile phone, 5.8% a smartphone, 3.1% a TV and 0.8% a computer. The percentage of private households possessing a radio is high in Kageyo sector (86%), and it is low in Sovu sector (61%). The percentage of private households possessing a television is high in Gatumba (6.6%) while it is low in Kavumu, and Muhanda, sectors (1% each). Mobile phones are mostly possessed by private households of Kageyo, and Bwira sectors (79% and 70%, respectively). The sectors with high percentage of households with smartphone are Kabaya and Ngororero (about 10% each), while the percentage of households possessing this asset is low in Kavumu and Muhanda sectors (3% each). The computer is mostly possessed by Kabaya and Ngororero sectors (1.6%).

Table 59: Percentage of private households and of Ngororero District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone ²	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Ngororero district	92,623	74.9	3.1	72.1	8.8	0.8
Bwira	5,121	83.1	1.7	86.6	6.2	0.6

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication assets				
		Radio	Television	Mobile phone ²	Smart Mobile	Computer
Gatumba	6,572	82.9	6.6	79.6	13.6	1.3
Hindiro	6,480	76.9	2.7	73.5	10.0	0.7
Kabaya	8,739	79.7	4.9	77.7	13.7	1.6
Kageyo	6,560	86.0	2.4	95.4	7.8	0.5
Kavumu	8,038	64.3	1.2	60.4	4.9	0.5
Matyazo	6,870	75.0	1.6	72.5	7.2	0.4
Muhanda	7,701	65.1	1.3	61.1	5.2	0.6
Muhororo	5,757	80.9	3.4	75.6	9.5	0.6
Ndaro	6,351	71.6	1.5	66.2	5.4	0.6
Ngororero	10,269	79.0	6.1	74.2	14.0	1.6
Nyange	6,484	72.6	2.9	68.6	9.3	0.8
Sovu	7,681	61.1	1.8	56.9	4.9	0.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

h. Access to energy for lighting and cooking

In Ngororero district, the main source of energy for lighting used by households is electricity (40.4%) followed by flashlight/phone flashlight for lighting (39.0%). At the sector level, the percentage of households using electricity for lighting is high in Gatumba (55.6%), Ngororero (53.3%), Kabaya (53.1%), and Hindiro sectors (52.8%). The sectors with the high percentages of private households using flashlight/phone flashlight for lighting are Ndaro (50.7%). The sector with the lowest percentage of private households using electricity for lighting is Sovu (19.4%).

The sources of energy for lighting in Ngororero district are mainly electricity, firewood, and flashlight/phone flashlight. However, the percentages of households using them vary by area of residence. In urban areas, the main source of energy for lighting is electricity (75.5%), followed by flashlight/phone flashlight (13.5%) and firewood (5.1%). In rural areas, 40.3% of private households use flashlight/phone flashlight as main source of energy for lighting while 38.6% use electricity, 16.2% use firewood.

Table 60: Distribution of households of Ngororero District by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for lighting	Not stated
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5	0.2
Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6	0.0
Ngororero district	92,623	100	40.4	0.4	0.0	1.3	15.6	1.1	39.0	0.2	1.3	0.6	0.1
Ngororero Urban	4,560	100	75.5	0.9	0.0	1.7	5.1	0.2	13.5	0.0	2.0	1.0	0.1
Ngororero Rural	88,063	100	38.6	0.4	0.0	1.3	16.2	1.2	40.3	0.2	1.2	0.6	0.0
Bwira	5,121	100	39.7	0.1	0.0	0.8	9.0	1.4	47.6	0.6	0.3	0.5	0.0
Gatumba	6,572	100	55.6	0.7	0.0	1.6	6.6	0.3	33.7	0.1	1.0	0.3	0.1
Hindiro	6,480	100	52.8	0.3	0.0	1.3	19.7	0.8	22.3	0.1	1.3	1.3	0.1
Kabaya	8,739	100	53.1	0.3	0.0	1.4	21.1	0.0	22.9	0.0	0.7	0.5	0.0
Kageyo	6,560	100	44.5	0.4	0.0	0.6	7.6	0.6	43.7	0.3	2.2	0.2	0.0
Kavumu	8,038	100	27.9	0.2	0.0	0.6	26.3	1.8	42.1	0.1	0.3	0.8	0.0
Matyazo	6,870	100	26.8	0.9	0.1	1.8	19.3	0.9	46.7	0.4	2.6	0.4	0.1
Muhanda	7,701	100	31.4	0.2	0.0	2.8	29.5	0.1	35.1	0.1	0.2	0.5	0.1
Muhororo	5,757	100	43.4	0.6	0.0	2.0	6.8	1.2	43.5	0.2	1.8	0.4	0.1
Ndaro	6,351	100	34.2	0.4	0.0	0.5	8.4	4.2	50.7	0.3	0.2	1.1	0.0
Ngororero	10,269	100	53.3	0.9	0.0	1.8	7.8	1.1	31.5	0.1	3.1	0.4	0.0
Nyange	6,484	100	41.0	0.2	0.0	1.1	5.2	1.3	48.2	0.3	1.1	1.5	0.1
Sovu	7,681	100	19.4	0.1	0.0	0.3	28.3	1.3	49.3	0.1	0.8	0.4	0.0

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (94.9%)

followed by charcoal (4.0%) and gas (0.3%). At the sector level, firewood is the most used source of cooking energy by private households in all sectors of Ngororero district (above 90% each, except Ngororero sector with 87.9%). Sector with the high percentage of private households using charcoal as main source of cooking energy is Ngororero (10.2%). Sectors with the highest percentages of private households using gas as main source of cooking energy are Ngororero (0.7%), and Gatumba (0.6%).

The main sources of energy for cooking used by private households in Ngororero district vary by area of residence. In Rural areas, private households use mostly firewood (96.5%) and charcoal (2.6%). In urban areas, private households use most firewood (64.8%) and charcoal (31.4%).

i. Vulnerability

In Ngororero district the vulnerability prevalence rate is 3.2%. At sector level, the highest prevalence rates of the resident are in Matyazo (5.1%) and while the lowest is in Kageyo and Bwira sectors (1.4% and 1.6% respectively).

Table 61: Number and share of persons with vulnerability of Ngororero district

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Ngororero district	321,989	10,379	4,533	5,846	3.2
Bwira	17,669	289	141	148	1.6
Gatumba	21,971	446	230	216	2
Hindiro	22,714	1,020	435	585	4.5
Kabaya	32,016	1,176	504	672	3.7
Kageyo	22,738	319	149	170	1.4
Kavumu	28,067	795	330	465	2.8
Matyazo	24,412	1,246	522	724	5.1
Muhanda	27,790	857	400	457	3.1
Muhororo	19,594	409	196	213	2.1
Ndaro	21,414	897	358	539	4.2
Ngororero	34,104	1,246	526	720	3.7
Nyange	21,851	805	352	453	3.7
Sovu	27,649	874	390	484	3.2

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

4.8 Nyabihu district

4.8.1 Physical environment

a. Location

Nyabihu District is located in western province of Rwanda with a relief being about 90% rugged mountains with more than 55% of the total area characterized by steep slopes. The district has 12 sectors namely Bigogwe, Jenda, Jomba, Kabatwa, Karago, Kintobo, Mukamira, Mulinga, Rambura, Rugera, Rurembo, and Shyira. It is divided into 73 cells and 473 villages. The district borders with Rubavu district in the West, Ngororero district in the South, Gakenke district in the East, Musanze district in the north-east, Rutsiro district in the south –west and Uganda in the north. The hills of the district are populated with scattered settlements often located on the small holdings of individual households. However, the government has launched an initiative, which encourages the scattered settlers to live in small townships established at selected central locations for a population living in a defined rural neighborhood (Imidugudu). The hills are covered with forests, farms and small grazing lands.

b. Topography

The relief of Nyabihu District is characterized by two major natural regions, the flat volcanic area, and the mountainous region, which can be classified in to three categories:

1. Low slope zones (0-5 % slope), which correspond to flow lines or valley lines (talwegs)
2. Average zones (5-15% slope)
3. Steep hilly areas (greater than 15% slope)

Nyabihu District is mainly composed by steep hilly areas, which makes it very vulnerable to erosion and this has a very

big impact on agricultural activities. With the exception of the steep hills to the east and south of the district, most of the site is made up gently sloping ground.

c. Climate and rainfall

The relief of Nyabihu District is characterized by high, rocky and steep mountains with an altitude ranging between 1460 m and 4507 m. The Climate of Nyabihu district is generally mild, with an average temperature of 15°C, and rain fall reaching 1,400 mm per year creating a high risk for natural disasters including landslides and soil erosion which result into the destruction of both human activities and his environment.

d. Geology and Soils

The Soil property in Nyabihu district is sandy, clay, laterite and volcanic. Basically, the sandy and permeable soil type found especially in Bigogwe, Jenda and Rambura sectors of Nyabihu district are among the main factors causing landslides in the area. During the dry season, soil is quite dusty although during the rainy season they filter the water rather than holding it as they don't contain any clay and they are not compact at all. The lava is so altered that it has resulted in black soil, salty, rich in humus and very fertile but with high porosity. In some places, the lava is intact and presents itself in various sizes, from pebbles to blocks of 100 kg and even more. The bedrock can sometimes be found at a depth of less than one meter. The best soil for agriculture in Nyabihu District is located in Kabatwa, Jenda and Mukamira Sectors.

e. Hydrography

Despite heavy precipitations, Nyabihu district suffers from the lack of water sources given a poor hydrographical network. The network of the district comprises many streams, brooks, springs, ponds and Lake Karago, which is the largest in the area (27 ha). All streams and springs are concentrated in lowland valleys between steep mountains. Nyabihu is one of the districts which are highly prone to floods and landslides

4.8.2 Ecological environment

Nyabihu District is characterized by a rich biodiversity due to its location in the high-altitude zones of the western part of Rwanda, near Volcanoes National Park. The district is home to a diverse range of flora and fauna, with species adapted to montane forests, bamboo zones, wetlands, and agricultural landscapes. The district plays a crucial role in biodiversity conservation, particularly for endangered species like the mountain gorilla and golden monkey.

- Flora

a) Montane forest tree species

These include the *Hagenia abyssinica* (*African Redwood*) – A characteristic tree species of high-altitude montane forests, known for its medicinal properties; *Dombeya torrida* (*Wild Pear Tree*) – A tree species commonly found in montane woodlands; *Podocarpus latifolius* (*Yellowwood*) – A slow-growing evergreen tree, important for maintaining forest structure; *Polyscias fulva* – A tree species that plays a role in forest regeneration.

b) Bamboo Species

These include the *Yushania alpina* (*Highland Bamboo*) – A dominant bamboo species, serving as food for mountain gorillas and providing materials for local communities; Herbaceous and Shrub Species; *Mimulopsis arborescens* – A flowering plant found in montane forests, supporting insect pollinators; *Rubus steudneri* (*Wild Raspberry*) – Provides fruits for birds and small mammals; *Erica arborea* (*Tree Heath*) – Common in high-altitude regions, forming dense shrubland; *Lobelia* spp. (*Giant Lobelias*) – Important for alpine ecosystems.

c) Wetland and aquatic plants

These include the *Cyperus papyrus* (*Papyrus Reed*) – Dominates wetland areas and provides habitat for birds and aquatic life and the *Typha latifolia* (*Cattail*) – Grows in marshy areas and acts as a filter for water purification.

- Fauna

a) Mammals

These include the *Gorilla beringei beringei* (*Mountain Gorilla*) – Found in Volcanoes National Park, a critically endangered species and an important part of the district's biodiversity; *Cercopithecus mitis kandti* (*Golden Monkey*) – An endemic primate species living in bamboo forests; *Panthera pardus* (*Leopard*) – Occasionally spotted in forested

areas, though rare; *Hystrix cristata* (*Crested Porcupine*) – Common in agricultural landscapes and forest edges; *Sylvicapra grimmia* (*Bush Duiker*) – A small antelope species found in montane woodlands.

b) Birds

These include the *Tauraco schuettii* (*Ruwenzori Turaco*) – A striking bird with green and red plumage, found in montane forests; *Cinnyris regius* (*Regal Sunbird*) – An endemic bird species of the Albertine Rift; *Buteo oreophilus* (*Mountain Buzzard*) – A bird of prey adapted to high-altitude environments; *Cryptospiza jacksoni* (*Dusky Crimsonwing*) – A small, colorful bird found in bamboo forests; *Bradypterus graueri* (*Grauer's Swamp Warbler*) – An endangered bird species dependent on wetlands.

c) Reptiles and amphibians

These include the *Leptopelis kivuensis* (*Kivu Tree Frog*) – Found in montane forests and wetlands; *Rhampholeon boulengeri* (*Boulenger's Pygmy Chameleon*) – A small reptile adapted to forest habitats and the *Bitis arietans* (*Puff Adder*) – A venomous snake found in grasslands and rocky areas.

4.8.3 Socio-economic environment

a. Population

The 5th Rwanda Population and Housing Census (PHC5) has enumerated 319,047 residents in Nyabihu district, which represent 11% of the total population of the Western Province (2,896,484 residents). The population of Nyabihu district is predominantly female: 168,975 are women corresponding to 53% of its total population. The results in previous table indicates that, the population share of Nyabihu district is 2.4% of the total Rwandan population. Females are predominant in all 12 sectors of the district (Rugera with 53.4%, Rambura 53.4%, Kintobo 53.3%, Karago 53.2%, Jomba 53.2%, Muringa 53.1%, Mukamira 53.1%, Shyira 53%, Rurembo 52.9%, Jenda 52.6%, Kabatwa 52.5% and Bigogwe 52.4%). Jenda (43,168 population) and Bigogwe (34,439 population) are the most populated sectors. They represent 13.5% and 10.8% of the total population of Nyabihu district, respectively. The two less populated sectors are Kintobo (15,315 inhabitants) and Kabatwa (20,841 inhabitants). They represent 4.8% and 6.5% of the total resident population of Nyabihu district, respectively. The table below indicates the number of the population of Nyabihu district by sector, by sex and their shares across sectors to the total population of Nyabihu district.

Table 62: Population of Nyabihu District by sector

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	
Nyabihu district	319,047	150,072	168,975	100	47	53	100
Bigogwe	34,439	16,385	18,054	100	47.6	52.4	10.8
Jenda	43,168	20,454	22,714	100	47.4	52.6	13.5
Jomba	21,897	10,253	11,644	100	46.8	53.2	6.9
Kabatwa	20,841	9,907	10,934	100	47.5	52.5	6.5
Karago	25,832	12,090	13,742	100	46.8	53.2	8.1
Kintobo	15,315	7,153	8,162	100	46.7	53.3	4.8
Mukamira	33,013	15,496	17,517	100	46.9	53.1	10.3
Muringa	22,599	10,606	11,993	100	46.9	53.1	7.1
Rambura	28,820	13,435	15,385	100	46.6	53.4	9
Rugera	26,938	12,554	14,384	100	46.6	53.4	8.4
Rurembo	24,399	11,500	12,899	100	47.1	52.9	7.6
Shyira	21,786	10,239	11,547	100	47	53	6.8

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The western Province is predominantly by the rural area (77.9%) and urban area (22.1%). Nyabihu district population is predominantly by rural area 75.5% while urban represents 24.5%. The sectors of Nyabihu district which are entirely rural are Jomba, Kabatwa, Karago, Kintobo, Muringa, Rugera and Rurembo. The table below illustrates the results.

b. Number of households and size of household

The results of 5th RPHC 2022 indicate the total of 3,312,743 households in Rwanda, 671,506 in the Western province

and 76,391 in Nyabihu District. The average household size in Nyabihu District is 4.2 persons per household. At the Sector level, the highest sizes are found in Bigogwe (4.3 persons/household). The smallest household sizes are found in Shyira (3.9 persons/household). The results of 5th RPHC 2022 revealed that 28.9% of private households are headed by women at national level. In Nyabihu district, private households headed by females are 30.9%. At sector level, the highest percentages of households headed by women are found in Mukamira sector (35.1%) while the lowest is found in Kabatwa sector (26.4%).

Table 63: Number of households and their corresponding population, mean size and sex of household head

Sectors	Total number of private households	Corresponding Population ¹	Household Size	Percentage	
				Male Headed HHs	Female Headed HHs
Rwanda	3,312,743	13,100,600	4.0	71.1	28.9
Western Province	671,506	2,871,195	4.3	70.4	29.6
Nyabihu District	76,391	317,918	4.2	69.1	30.9
Bigogwe	7,797	33,705	4.3	67.1	32.9
Jenda	10,352	43,140	4.2	70.6	29.4
Jomba	5,266	21,864	4.2	70.1	29.9
Kabatwa	5,046	20,793	4.1	73.6	26.4
Karago	6,287	25,739	4.1	68.1	31.9
Kintobo	3,672	15,304	4.2	71.3	28.7
Mukamira	7,947	32,911	4.1	64.9	35.1
Muringa	5,343	22,584	4.2	68.6	31.4
Rambura	6,954	28,796	4.1	68.9	31.1
Rugera	6,372	26,913	4.2	69.4	30.6
Rurembo	5,817	24,396	4.2	72.3	27.7
Shyira	5,538	21,773	3.9	67.5	32.5

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

c. Housing characteristics

The results of 5th Population and Housing Census 2022 revealed that in the Western province the predominant type of habitat is Planned rural settlement (Umudugudu) (70.5%). It is in same as in Nyabihu district as one of the districts of the Western province. The most common type of habitat in Nyabihu district is Planned rural settlement (61.8%) followed by dispersed or isolated housing (18.1%). The type of habitat varies across sectors. Spontaneous/squatter housing is most prevalent in Bigogwe (13.5%) and Kintobo (13.3%) and low in Rugera (0.2%) and not present in Kabatwa (0%). The sectors with the high percentages of dispersed/isolated housing units are Rurembo (45.8%) and Jomba (37.9%).

According to the area of residence, the predominant types is umudugudu/planned rural settlement (74.9%) in urban areas. In rural areas, the predominant types are umudugudu/planned rural settlement (57.6%) followed by dispersed/isolated housing (22.2%).

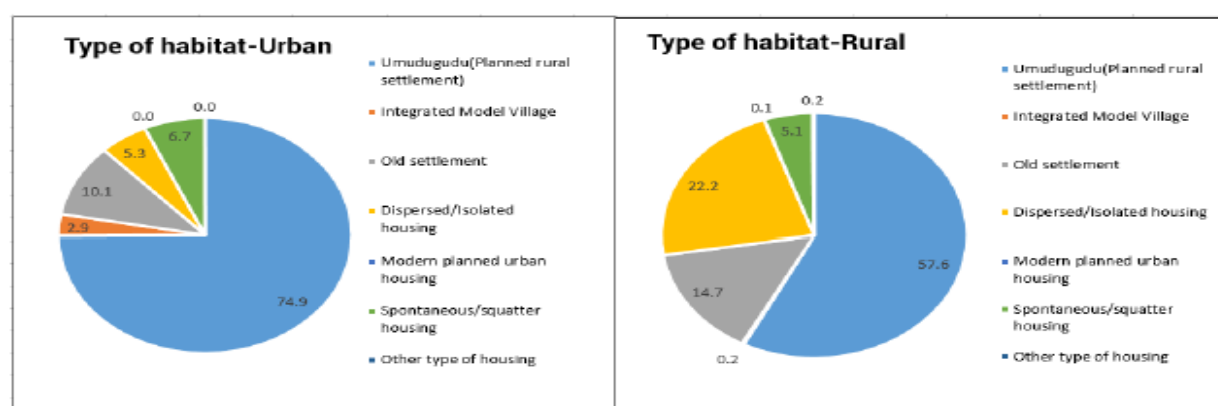


Figure 26: Distribution of households in Nyabihu District by type of habitat and by area of residence.

Source: Fifth Rwanda Population and Housing Census, 2022

d. Education

In Nyabihu District, 18.1% of the population has never attended school, while 2.5% have attended nursery, and 60.1% have attended primary school. Other education levels include 0.5% for INGOBOKA/Vocational, 10.3% for lower

secondary, 6.8% for upper secondary, 1.8% for university, and 0.0% is not stated. The distribution of the highest level of education attended varies among sectors, with differences in the percentage of individuals at each education level. For example, Muringa has a higher percentage (28.1%) of individuals who have never attended school compared to other sectors, while Mukamira has a higher percentage (10.4%) of individuals attended upper secondary school.

Table 64: Distribution of the resident population of Nyabihu District by highest level of school attended

Sectors	Count	Percentage								
	Total(counts)	Total	Never attended school	Nursery	Primary	INGOBOKA/Vocational	Lower secondary	Upper secondary	University	Not stated
Rwanda	11,999,691	100	16.7	2.7	59.5	0.8	9.6	7.1	3.6	0.0
Western Province	2,613,461	100	19.4	2.2	60.7	0.6	8.7	6.2	2.2	0.0
Nyabihu District	286,472	100	18.1	2.5	60.1	0.5	10.3	6.8	1.8	0.0
Bigogwe	31,405	100	22.3	2.5	51.4	0.2	11.8	8.8	2.9	-
Jenda	38,619	100	15.0	2.8	61.2	0.3	11.0	7.5	2.2	0.0
Jomba	19,490	100	17.4	2.1	66.0	0.4	8.2	4.9	1.0	0.0
Kabatwa	18,789	100	14.0	2.4	58.8	0.4	14.0	8.6	1.6	0.0
Karago	23,080	100	21.5	1.4	61.3	0.5	8.5	5.7	1.1	0.0
Kintobo	13,648	100	16.0	2.1	60.8	0.7	11.1	7.8	1.5	-
Mukamira	29,674	100	15.2	3.0	54.9	0.4	12.6	10.4	3.5	0.0
Muringa	20,249	100	28.1	1.8	58.1	0.2	7.4	3.9	0.6	-
Rambura	25,956	100	22.8	1.9	57.4	0.3	9.3	6.4	1.8	0.0
Rugera	24,235	100	14.2	3.2	65.4	0.6	10.5	5.1	1.0	0.0
Rurembo	21,872	100	19.8	3.0	64.6	0.5	7.4	3.9	0.8	0.0
Shyira	19,455	100	10.8	3.2	66.7	1.3	10.0	6.4	1.6	-

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

e. Means of livelihoods

The results of 5th RPHC 2022 revealed that Nationally, 2,280,854 of private households (68.9%) are engaged in agriculture, among them 62.6% are engaged in crop farming and 50.4% are engaged in Livestock husbandry. Nyabihu district is the one of districts of the Western province where crop farming and animal husbandry are on large scale. In Nyabihu district, Agricultural households occupy 68.9% with 64.3% of households engaged in crop farming and 51.9% Households engaged in Livestock husbandry. A big part of Nyabihu district sectors is located in rural areas where the agriculture activities are applied, Rurembo sector has a high proportion of Households engaged in crop farming (89.7%) and Households engaged in Livestock husbandry (70.7%).

It was also revealed that the employment to population ratio is 46.2% among people residing in Nyabihu district, it is higher in urban areas of Nyabihu (47.9%) than in rural areas of Nyabihu (45.6%). The employment to population ratio among males as well as females increases from age group 16-19 to 35-44 and starts decreasing from age group 45-49 up to 85 years and above as people starts getting very older and retire. It was observed that in Nyabihu district, the highest employment to population ratio among males stands at 67.2% and was observed in age group 35-39, On the other side the highest employment to population among females is 55.7% and was observed in the age group 40-44. The lowest employment to population ratio among males stands at 10.8% and was observed among males in the age group 85+, the lowest employment to population ratio among females is 4.9% and was also observed among females in the age group 85+.

Table 65: Distribution of household engaged in livestock husbandry in Nyabihu district

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry	
	Total Households	Counts	%	Counts	%	Counts	%
Rwanda	3,312,743	2,280,854	68.9	2,074,928	62.6	1,669,273	50.4
Western Province	671,506	503,360	75.0	451,603	67.3	373,648	55.6
Nyabihu district	76,391	2,280,854	68.9	49,087	64.3	39,628	51.9
Bigogwe	7,797	4,114	52.8	2,999	38.5	2,769	35.5
Jenda	10,352	5,676	54.8	4,371	42.2	3,635	35.1
Jomba	5,266	4,744	90.1	4,388	83.3	3,779	71.8
Kabatwa	5,046	3,401	67.4	2,455	48.7	2,531	50.2
Karago	6,287	4,444	70.7	3,747	59.6	2,942	46.8
Kintobo	3,672	3,045	82.9	2,807	76.4	1,942	52.9

Sector	Agricultural households			Households engaged in crop farming		Households engaged in Livestock husbandry		
	Total Households	Private	Counts	%	Counts	%	Counts	%
Mukamira	7,947		5,140	64.7	4,491	56.5	3,056	38.5
Muringa	5,343		4,474	83.7	4,167	78.0	3,250	60.8
Rambura	6,954		5,252	75.5	4,656	67.0	3,667	52.7
Rugera	6,372		5,711	89.6	5,351	84.0	4,396	69.0
Rurembo	5,817		5,383	92.5	5,216	89.7	4,111	70.7
Shvira	5,538		4,742	85.6	4,439	80.2	3,550	64.1

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

f. Health, water supply and Sanitation facilities

In Nyabihu District 94.6% are using Mutuelle as main health insurance, 3.6% using RSSB or RAMA, 0.1% using private insurance, 0.0% using school insurance, 0.2% using NGOs insurance and 1.4% using employer insurance.



Figure 27: Population who have a medical insurance by main type of insurance in Nyabihu District

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

The results of 5RPHC 2022 reveal that improved water sources are the most water sources in Rwanda that represent (82.3%). In Nyabihu district, 75.1% of private households use improved water sources. At the sector level, the percentages of the private households using water from improved sources are highest in Mayange (99.1%), Ruhuha (96.1%), Nyamata (95.0%), Gashora and Rilima (90.7% each) and Nyarugenge (90.3%) while the lowest are in Rweru (32.4%), Juru (38.6%) and Mwogo (39.6%).

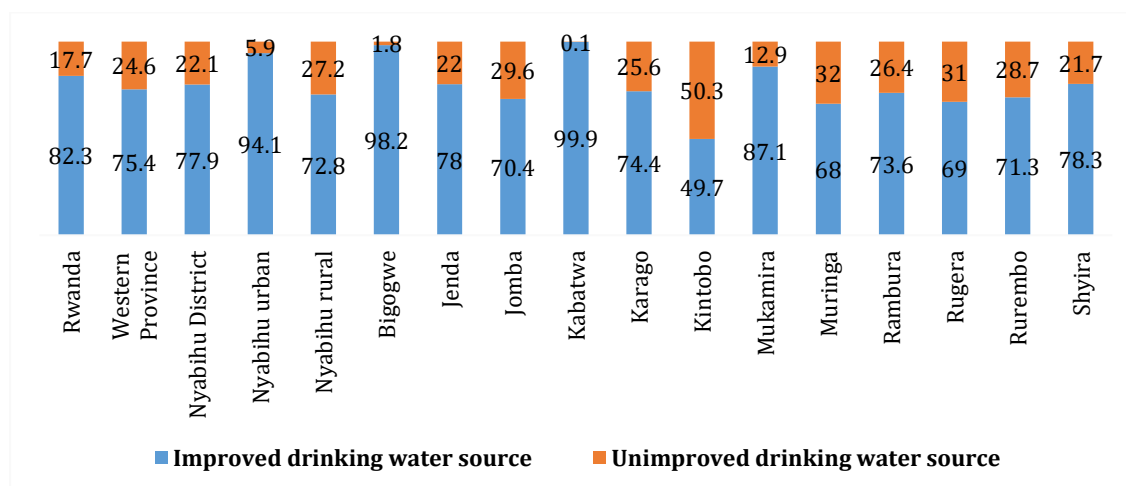


Figure 28: Percentage of households of Nyabihu District by main source of drinking water

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

In Nyabihu district, both urban and rural areas, private households use mainly improved source of water (94.1% in urban and 72.8% in rural). The percentage of private households using unimproved source of water is higher in rural (27.2%) than in urban (5.9%).

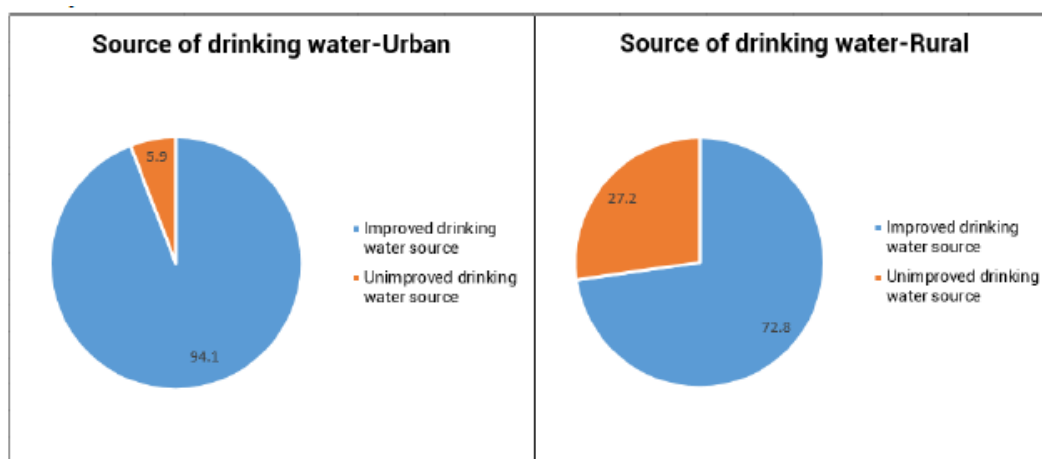


Figure 29: Distribution of the private households of Nyabihu district by main source of water and by area of residence

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

g. Appliance and assets ownership

At the district level, 78.3% of private households possess a radio, 76.1% a mobile phone, 13.1% a smartphone, 4.1% a TV and 1.2% a computer. The percentage of private households possessing a radio is high in Mukamira (84.6%), Kabatwa (84.2%), Bigogwe (83.7%) and Jenda (80.4%). It is low in Muringa (70.6%). The percentage of private households possessing a television is high in Mukamira (9.1%) and Kabatwa (7.2%) while it is low in Rurembo (0.8%). Mobile phone is mostly possessed by private households of Bigogwe (82.8%), Kabatwa (82.6%) and Mukamira (82.5%). The sectors with high percentage of households with smartphone are Bigogwe (23.3%), Mukamira (21.6%), Jenda (16.2%) and Kabatwa (15.2%) while the percentage of households possessing this asset is low in Muringa (5.9%). The computer is mostly possessed in Mukamira (2.7%).

Table 66: Percentage of private households of Nyabihu District possessing electrical appliance

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone ²	Smart Mobile	Computer
Rwanda	3,312,743	81.5	12.3	78.1	20.8	4.2
Western Province	671,506	79.5	8.0	77.1	15.8	1.9
Nyabihu district	76,391	78.3	4.1	76.1	13.1	1.2
Bigogwe	7,797	83.7	4.3	82.8	23.3	1.5
Jenda	10,352	80.4	5.8	78.9	16.2	1.6
Jomba	5,266	75.0	2.2	73.3	8.9	0.9
Kabatwa	5,046	84.2	7.2	82.6	15.2	1.0
Karago	6,287	72.2	2.4	69.4	7.2	0.6
Kintobo	3,672	75.7	1.6	73.7	9.5	0.8
Mukamira	7,947	84.6	9.1	82.5	21.6	2.7
Muringa	5,343	70.6	1.3	69.5	5.9	0.5
Rambura	6,954	77.3	3.5	74.0	11.4	1.0
Rugera	6,372	79.4	3.5	74.5	9.3	0.8
Rurembo	5,817	71.9	0.8	69.5	6.8	0.5
Shyira	5,538	78.3	3.8	75.9	11.6	1.2

Source: Fifth Rwanda Population and Housing Census, 2022 (NISR)

h. Access to energy for lighting and cooking

In Nyabihu district, the main source of energy for lighting used by households is electricity (47.0%). At the sector level, the percentage of households using electricity for lighting is high in Bigogwe (61.4%) and Mukamira (60.4%). The sectors with the high percentages of private households using flashlight/phone flashlight for lighting are Rurembo (41.2%) and Karago (40.3%). According to the area of residence, the main source of energy for lighting is electricity (39.4%), followed by flashlight/phone flashlight (36.6%) and Firewood (18.7%) in rural areas. In urban areas, 71.1% of private households use electricity as main source of energy for lighting while use 17.5% use flashlight/phone flashlight and 4.9% use candles.

Table 67: Distribution of households of Nyabihu District by main source of energy for lighting

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for lighting	Not stated
Rwanda	3,312,743	100	61.0	0.4	0.0	2.9	4.2	1.1	28.4	0.1	1.2	0.5	0.0
Western Province	671,506	100	56.7	0.6	0.0	3.2	9.8	0.8	26.7	0.2	1.5	0.6	0.0
Nyabihu District	76,391	100	47.0	0.5	0.0	3.0	14.9	0.4	32.0	0.1	1.6	0.5	0.0
Nyabihu urban	18,485	100	71.1	0.8	0.0	4.9	2.9	0.3	17.5	0.1	1.6	0.7	-
Nyabihu rural	57,906	100	39.4	0.4	0.0	2.5	18.7	0.4	36.6	0.1	1.6	0.4	0.0
Bigogwe	7,797	100	61.4	0.7	0.0	7.1	5.1	0.3	22.3	0.1	2.4	0.6	-
Jenda	10,352	100	56.8	0.8	0.0	6.0	7.8	0.4	26.0	0.0	1.9	0.3	-
Jomba	5,266	100	31.6	0.5	-	0.9	29.4	0.1	36.3	0.0	1.0	0.2	0.0
Kabatwa	5,046	100	59.4	0.4	-	4.4	6.1	0.7	26.9	0.1	1.6	0.4	-
Karago	6,287	100	33.9	0.3	-	3.0	20.5	0.1	40.3	0.1	1.7	0.2	-
Kintobo	3,672	100	41.8	0.5	-	0.8	20.2	0.4	34.7	0.1	1.0	0.6	-
Mukamira	7,947	100	60.4	0.3	0.0	2.5	6.9	0.4	27.6	0.0	1.1	0.7	-
Muringa	5,343	100	37.1	0.2	-	0.9	28.1	0.1	31.8	0.1	1.2	0.4	-
Rambura	6,954	100	37.4	0.2	0.0	2.1	21.8	0.5	35.4	0.1	1.4	0.9	-
Rugera	6,372	100	48.9	0.4	0.0	1.1	11.0	0.2	35.8	0.1	1.8	0.7	-
Rurembo	5,817	100	34.3	0.2	0.0	1.5	21.6	0.2	41.2	0.1	0.7	0.2	-
Shyira	5,538	100	43.9	1.1	-	1.8	14.1	1.0	34.1	1.0	2.5	0.6	-

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

At the district level, the main sources of energy for cooking used by the private households are firewood (85.6%) followed by charcoal (13.6%). At the sector level, firewood is the most used source of cooking energy by private households in Rurembo (98.6%), Muringa (98.5%), Kintobo (98.0%) and Jomba (97.5%). Sectors with the high percentage of private households using charcoal as main source of cooking energy are Bigogwe (41.3%), Jenda (28.9%) and Kabatwa (21.1%). Sector with the highest percentage of private households using gas as main source of cooking energy is Mukamira with only 0.8%. By area of residence, private households use mostly firewood (94.4%) and charcoal (5.0%) in rural areas. In urban areas, private households use most firewood (57.9%) and charcoal (40.5%).

i. Vulnerability

In Nyabihu district the vulnerability prevalence rate is 3.7%. At sector level, the highest prevalence rates are in Muringa (4.6%) while the lowest is in Rambura (2.3%).

Table 68: Number and share of persons with vulnerability of Nyabihu district

Sectors of residence	Total resident population	Person with vulnerability			Prevalence of vulnerability
	Both sexes	Both sexes	Male	Female	Both sexes
Rwanda	11,537,934	391,775	174,949	216,826	3.4
Western Province	2,515,660	88,967	39,357	49,610	3.5
Nyabihu district	278,236	10,257	4,297	5,960	3.7
Bigogwe	30,239	1,082	475	607	3.6
Jenda	37,157	1,163	526	637	3.1
Jomba	19,181	769	302	467	4
Kabatwa	18,338	747	299	448	4.1
Karago	22,424	1,009	399	610	4.5
Kintobo	13,459	603	268	335	4.5
Mukamira	28,609	1,234	490	744	4.3
Muringa	19,737	904	372	532	4.6
Rambura	25,068	569	245	324	2.3
Rugera	23,638	707	313	394	3
Rurembo	21,304	759	314	445	3.6
Shyira	19,082	711	294	417	3.7

Source: Fifth Rwanda Population and Housing Census, 2022(NISR)

5 PUBLIC CONSULTATION AND PARTICIPATION

5.1 Overview

Public consultation and stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts. Stakeholder engagement is an on-going process that involves the following elements; stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism and on-going reporting to affected communities.

Public and stakeholders' consultation and involvement are principal for the successful implementation and management of a project's environmental and social impacts. The stakeholder engagement is conducted with the objective to build a trusting relationship with the affected communities and other interested stakeholders based on a transparent and timely supply of information and open dialogue. The consultation helps also to actively build and maintain productive working relationships, based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities. In our case consultations were held at the project sites in all districts covering the project area. The purposes of conducting the consultation were:

- To actively build and maintain productive working relationships, based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities and other stakeholders.
- To collect relevant and trustable information that shall be based on to formulate project impacts and their mitigation measures;
- To ensure effective engagement with local communities and key stakeholders throughout all phases of the project;
- To identified alternatives related to the project implementation and build a trusting relationship with the project activities and affected personnel;
- To inform local community about the project implementation and prepare them on potential impacts that could be caused by the project and that can affect them;

5.2 Purpose

- To prepare communities on potential impacts that could be caused by the project and can affect the community.
- To build a trusting relationship with the affected communities and other interested stakeholders based on a transparent and timely supply of information and open dialogue.
- To ensure effective engagement with local communities and other key stakeholders throughout all phases of the project.
- To actively build and maintain productive working relationships, based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities and other stakeholders.

5.3 Public participation – methods and process

In compliance with National regulations and international standards, Stakeholder engagement was the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts. Stakeholder engagement involved varying degrees, and the following elements were considered: stakeholder analysis and planning, disclosure and dissemination of information, consultation with stakeholders and participation, grievance mechanism, and ongoing reporting to beneficiaries or project Affected Persons.

The combination of both structured and unstructured interviews was used to consult different actors and stakeholders. From the scoping exercise, stakeholders were identified in three categories. (1) First category include project implementing entities, 2) Secondary category of Regulatory agencies, Government Institutions and local authorities, (3) Third category of Potential project beneficiaries. During the Public consultation, the consultant applied different participatory methods, namely; interviews, one-to-one discussions and community meeting and official meetings with stakeholders. Stakeholders meeting was informed on the proposed project and by using the key guiding questionnaires the consultant guided discussions and obtain relevant information on the likely impacts of the project activities. The

next table summarizes categories of consulted stakeholders.

Discussions with decision making bodies, key stakeholders, sector institutions and specialist experts were made on the very concepts and nature of the proposed project, giving emphasis on levels of public participation, role of key stakeholders and joint contributions of these actors to the success of the project. In addition, the scope of the proposed project and possible means of maximizing local communities' social, economic and environmental benefits from the project implementation were underlined. The project is designed as an EPC and affected people have not yet identified for consultation. Thus the consultant consulted sampled members of communities living in different areas where the project will be implemented. Key stakeholders and authorities with whom consultations made at the project study areas were:

Consultative meetings were held in different localities of the project areas of intervention and grouped local population susceptible to benefit or be affected by project implementation. Selection of the areas for interviews were based on the sites to be connected to the electricity and one to one or group interviews with local residents were used. Consultations with REG staff at branches (located in each district) and other authorities at district level were also consulted. The lists of consulted people are presented in Annexes of this report. Local communities of the project sites who will be positively or negatively were provided with relevant and sufficient information on the project prior to its start – up.

Table 69: Categories of consulted stakeholders at institutional level

Category	Institution/desired person	Relevance to the project	Issue to discuss
National regulatory and standards authorities	Rwanda Environment Management Authority (REMA)	REMA ensures the environmental sustainability of the project. Their role is critical to assess and mitigate environmental impacts, protect biodiversity, and enforce environmental laws to prevent degradation of ecosystems.	Environmental and social requirements for the project implementation
	Ministry of Environment (MoE)	The ministry sets overarching environmental policies and strategies. Their involvement ensures that the present project aligns with national environmental goals, such as water conservation, climate resilience, and sustainable land use.	Environment requirements related to the project implementation.
	Rwanda Land use and Management Authority	The authority ensures that the present project aligns with national land use plans. It prevents conflicts with existing land uses and ensure that the project supports proper land management and does not infringe on protected or restricted areas.	Land ownership and resettlement impacts.
	Rwanda Development Board	RDB is responsible for investment promotion and economic development. However, the EIA process was transferred to the authority / One Stop Center- EIA department to fast tracking investments and project certification process.	This ESIA process and project clearance
Local government institutions	REG branch managers in each district	Engineer provides local expertise in terms of electricity supply and availability Their involvement ensures that the project addresses the specific needs of locals	Crop selection, farming practices
	District environment officers	The district environment officers ensure that the project complies with local environmental regulations and that any potential negative impacts are mitigated at the district level.	Environmental and social monitoring at local level
	Sector Land manger	At the sector level, the land manager oversees land use and can facilitate coordination between the project and local landholders, ensuring efficient project implementation and legally compliant.	Land registration, valuation and land ownership
	Local community	Sampled community members and people living where the project will be implemented local people are the primary beneficiaries of the project .	Information on the proposed project including scope, coverage, activities and potential environmental and Social impacts;

Category	Institution/desired person	Relevance to the project	Issue to discuss
			Project appreciation, project proposed mitigation measures, project sustainability, etc.

5.4 Consultation held during the preparation of this ESIA

5.4.1 Consultation with technical, regulator and official at central and local level

In addition to the public consultation meeting, the consultant team conducted one to one interview with different official to discuss the projects and collect their views, concern and recommendation. Consultation conducted also allowed the team to collect different data and information related to the projects like existing laws, standards and policies helped. Below are the key stakeholders consulted.

- Ministry of infrastructure: Environmental and Social Safeguards Specialist for World Bank Funded Projects;
- Ministry of Environment, Water Pollution Control Expert
- Rwanda Environment Management Authority (REMA): In charge of pollution control and in charge of environmental monitoring
- Rwanda Development Board RDB: Environmental Review Specialist.
- EDCL: Project team involved in ESIA and feasibility study for substation upgrade project
- District land officers, District Environmental officers and Districts natural resources offices/directors.

• Key issues identified during consultations include:

- Site to store replaced electrical equipment during rehabilitation work.
- Management of electrical and other waste materials that can be generated during construction and operations activities.
- Noise pollution level during construction and operations activities.;
- Sewage system management at proposed sites site;
- Provision of short-term solutions while the project output will not yet achieve;
- Roles and responsibilities in implementation and monitoring of ESMP/RAP;
- Health and safety management during construction and operations activities.

5.4.2 Consultation at community level

At community level, consultative meetings were held in different localities of the project areas of intervention and gathered local population susceptible to benefit or be affected by project activities. Selection of the areas for interviews were based on the sites to be connected. A total number of 93 people were contacted and among them 67 being male (72%) and 26 being female (28%). the lists of consulted people are presented in Annexes of this report. Local communities of the project sites who will be positively or negatively were provided with relevant and sufficient information on the project prior to its start – up. The figure below illustrates some of the consultation held on site during the conduct of the study. The figure below illustrates some of the consultation held on site during the conduct of the study.





Figure 30: Consultations with local community.

Source: field Consultation

5.5 Outcome of consultation

The key findings of the consultations with relevant stakeholders are summarized below:

Table 70: Summary of discussions with stakeholders

Discussions/ information	Outcomes
Is the project going to cause physical resettlement?	No physical resettlement is expected to be caused by the project. The project aims to connected households to electricity and was designed to pass along the buffer zones of the existing roads located in the project areas. However, some of the properties especially trees and crops may be affected. In that case fair compensation will be provided as the law related to expropriation in public interests.
Are locals allowed to continue cultivating their land?	People are allowed to continue using their land till they are informed by competent authorities about any new change. Before construction of new houses in the grouped settlement construction permit must be requested from competent authority
Will the project provide jobs during construction?	A number of temporally jobs will be available especially during construction period. Contractor will ensure that locals are prioritized when allocating jobs that don't require specific knowledge. However this is not guaranteeing that all local population will be employed by the project during construction works.
Project activities and machinery	Considering the nature of the project activities and location, no heavy tracks and machinery are expected. However, trucks will be used for transport of construction materials and personnel. The use of labour-intensive techniques will be prioritized and is recommended as are more environmentally friendly compared to the use of machinery.
Project line routes and alternative options	The project designs were made to pass all along the buffer zones of existing feeder roads in project areas. Where not possible the MV lines will be passing in agricultural land and the best options to avoid damage and selecting the shortcut will be applied. The implementation of the project has been done in a way that will respect both national and international standards and regulations especially those related to electrical line constructions.
Soil erosion and sedimentation. .	In some areas of the project soil erosion may occur and is anticipated especially during rainy season. Maximum effort will be made to avoid soil erosion especially through the application of the developed mitigation measures to avoid soil erosion and degradation
Soil waste generated from the project	The excavation works will generate waste as construction debris. The soil excavated will be re-used for backfilling the excavated holes. EDCL is experienced in construction of such project. Maximum effort will be made to minimize waste during project implementation
Will some locals be allowed to use their own poles to connect their houses?	No single poles will be allowed except those being used by EDCL. Local community will be connected as per the existing regulation and no commissions shall be charged to get connected. Only poles that meet standards will be used.
Source of construction materials	Project don't require a lot of construction materials. However, those required will be outsourced within the project areas and from certified and approved quarries.
Will all people be connected to the grid	Anyone wishing to be connected will have opportunity to have electricity. However, those living in remote areas could not be connected due to some constraints that shall be discussed during project implementation as by regulation only houses within 37m from wooden pole are connected
Will be there any changes related to land use or/ and prohibitions due to the project?	It is not planned that the project will change the land use of the project areas. However, some crops will not be allowed within the ROW of the electrical line. These are crops of more than 5m of height as per the RURA' s regulation related to the use of right of way.

Discussions/ information	Outcomes
Will be there any land compensation?	The project will pass nearby the existing roads. For the upgrading the existing routes will be used. hence no compensation for land is expected. However, affected crops will be compensated. An agreement of land lease between EDCL and landowners shall be completed before project starts and a fair compensation of crops and trees will be done.
Other discussions on project impacts (both positive and negative) and mitigation measures.	Project impacts were discussed and are detailed in this report and mitigation measures for negative impacts were discussed. It was noted that positive impacts prime on negative impacts and locals wished the project to speed up and be implemented at least before end of the 2023-2024fiscal year.

To conclude, most of the people in living in the project areas are very happy to hear about the upcoming project as this will contribute to the development of their living standards. Most of houses of the project area are not connected to the national grid and have been living around neighbours who are connected for long (these are located in neighbouring villages). The positive impacts of the project outweigh the negative impacts and locals wished the project to be implemented as soon as possible while appreciating it.

6. PROJECT ALTERNATIVES ANALYSIS

The identification, consideration and analysis of alternatives is an essential component of the impact assessment process, with the primary objective being to determine the best environmental and social option. This section elaborates on the alternatives that have been identified, analyses each, eliminates non-viable alternatives and determines those that can be carried forward into the comparative impact assessment.

6.1. Identification of alternatives

The identification of project alternatives includes the consideration of the proponent's 'preferred option', as detailed in the preliminary route design drawings provided on the maps in annexes of this report. The proposed line routes and ROWs were selected among the various options, based on the softness to satisfy the set criteria. No need to mention that environmental soundness was also equally considered than any other technical or financial considerations when selecting the line routings and ROWs. In selecting the proposed route, the over-riding considerations were:

- the avoidance of environmentally sensitive areas and avoiding passing over houses which shall generate houses demolition and hence physical displacement,
- the minimization of the destruction of property,
- easy accesses to construction and operation sites,
- low pollution level by avoiding water sources and marshland's locations
- closer to the settlements to be supplied.

The above aspects are considered, and the alternatives identified for the project are listed and described in Table below:

Table 71: Description of identified alternatives.

No	Alternative considered	Description
1	Preferred Option: Overhead Power Lines	This alternative is as proposed by EDCL, detailed in the preliminary route designs received for the project, involving overhead power lines.
2	No-Go Option	This alternative means that no distribution lines are constructed, and the situation remains as it is.
3	Underground Power Lines	This alternative involves the construction and laying down of distribution lines in the ground.
4	Alternative land use	This alternative involves the use of land designated for agriculture to reduce the use of land for residential purpose, this will allow the landowner where the electrical work will pass to avoid disturbance of the construction and residential activities. The project will use the land dedicated to the agriculture.
5	Construction Methods	This alternative involves the implementation of alternative construction methods, as compared to those proposed in alternative 1 or the preferred option.

6.2. Analysis of alternatives

The alternatives that have been identified are analysed to determine which are viable alternatives to consider for the project. The analysis of alternatives is detailed in Table below:

Table 72: Analysis of alternatives

No	Alternative	Analysis
1	Preferred Option: Overhead Power Lines	EDCL has proposed the construction of overhead power lines as the preferred option. This option remains cost effective and is a well-established method of distributing electricity in rural areas in Rwanda. It is proposed that the specific routes to be used are mostly in the roads reserve, thus significantly reducing the impacts, as well as those resulting from maintaining the RoW when deemed necessary.
2	No-Go Option	The No-Go option goes against the national development objectives of Rwanda, as related to the increase of access to electricity for citizens. This entails missing all the positive impacts or benefits anticipated from the project such as increased access to reliable and safe electricity network without interruption, temporary and permanent employment opportunity from project implementation etc.
3	Underground Power Lines	In some urban areas, distribution and service lines are typically placed underground, for safety and aesthetic reasons and for smaller voltages. Moreover, the proposed length of the project will make the use of underground lines for the entire length very costly and result in extensive earthworks/trenching along the entire route proposed; this can be 3 times costlier than overhead lines. Underground cables are also typically damaged through other future activities involving earthworks. The construction and maintenance cost of this alternative is simply too high, and it is

No	Alternative	Analysis
		thus considered unviable and eliminated from further consideration.
4	Alternative land use	This alternative involves the use of land designated for agriculture to reduce the use of land for residential purpose, this will allow the landowner where the electrical work will pass to avoid disturbance of the construction and residential activities. The project will use the land dedicated to the agriculture
5	Construction Methods and Techniques	The construction methods and techniques proposed in Alternative 1 involve hand work and have insignificant direct impacts that include but not limited to job opportunities, the use of roads buffers to limit vegetation clearance, income generation, consideration of the overhead line, the use of updated technology etc. The consideration of this separate option is thus unnecessary, as it already falls into the preferred option described above.

Therefore, based on the proposed project nature, extend and location and based on the social and environmental assessment of the project site, EDCL's preferred alternative is overhead power lines and this option will be implemented with the application of mitigation measures of the anticipated negative issues as detailed in this report.

The project has identified more positive than negative environmental and social impacts. The identified potential impacts to both social and environment have been found to be at an extent that can be avoided, minimized, or compensated when applying the proposed mitigation measures in the Environmental Management Plan and monitoring plan as developed in this report.

7. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

7.1. Introduction

This chapter describes the potential impacts that may occur as a result of the construction and operation of the proposed design, supply and installation of new MV and LV lines; design, supply, installation and distribution of transformers for distribution network reinforcement; and upgrading the single lines to three phase's lines. This chapter also contains the measures that will be implemented in order to mitigate these impacts. The assessment of impacts has been conducted against Rwandan requirements and applicable international police and standards especially the World Bank Standards and AIB policies and Standards and policies. The potential significant environmental and social impacts of the electrification project are presented and their level of significance evaluated.

7.2. Positive impacts

a) Value addition to the agricultural products and More reliable services and facilities

Grinding mills and other machinery which can process agricultural products will be set up, or operate at a cheaper cost. This will provide value addition to the agricultural products produced by the local farmers there by boosting the economy and the farmer's income.

More reliable services and facilities will be available at the Health Centres, Schools, Trading Centres and other related services along the project area. Currently most of these institutions incur a budget constraint for running generators, thereby limiting certain services, for example operating theatres in health centres. The costs of public administration will also significantly reduce. This will increase efficiency and effectiveness which currently to a certain is hampered due to electricity limitations.

✓ Enhancement measures:

- Ensure that the distribution lines are maintained periodically to reduce on power shutdowns/shortages;
- Consumers should ensure timely payment of electricity bills.

b) Improvement in the standards of living

Standards of living will generally improve within the project area: Positive impacts on health, water sector, education, security, communication and economic activities will be realized. Improved services will bring intrinsic benefits within the population and gradually improve on their quality of life.

c) Support to telecommunications infrastructure operations

Telecommunication booster stations in the project areas are mainly operated through diesel generators on 24-hour basis which makes the services they support to be expensive (Community radios, internet cafes as well as phone charging) in this fast growing sector and the generators also contribute to increased GHG emissions. With steady electrical power supply from the national grid, the costs of operations of telecom companies will significantly reduce, as well as availability of mobile communication. This as well impacts on businesses and social services positively.

✓ Enhancement measures:

- Ensure that the distribution lines are maintained periodically to reduce on power shutdowns/shortages that would interfere with telecommunication
- Telecommunication base stations to be of priority as load centres to be connected;

d) Improved security

Improvement and extension of the electricity will lead to improved security through better street lighting in the urban areas and their environs which will contribute to security of residents and investments. The planned extension of power will provide security lighting in these establishments such as health centers, police posts, schools and trading centers hence improving the general safety in the areas. Improved security through better street lighting in the semi-urban areas and their environs will contribute to development.

e) Creation of employment and better economic livelihood

Creation of employment and better economic livelihood in the project area. During the construction period, employment will be created within the project area. Setting up of small-scale industries such as welding workshops, maize mills, carpentry workshops and other cottage activities will increase leading to further employment after completion of the project. On a short-term, the project will bring about creation of jobs during the construction phase (people in the project areas are likely provide labour force etc.). This impact will benefit the local retail business owners who would mainly benefit from secondary effects of increased incomes and the spending power of construction workers. Employment

opportunities will arise and will benefit both the local community, regional and national community during construction, as well as during operations. Creation of job opportunities during project development, construction and operation will provide a number of employment opportunities for skilled, semi-skilled and unskilled labor. Recruitment of unskilled manual labor should give preference to local people wherever feasible. This impact will be beneficial to both men and women, especially when selling merchandise to workers. From stakeholder comments, some of the benefit to be accrued included:

- Increased radio listening time on account of cheaper electricity as compared to batteries;
- Increased productive hours;
- Eliminate the costs of self- electricity generation by existing commercial and industrial enterprises;

There also positive environmental impacts highlighted by stakeholders. Those include:

- Improved lighting at a cheaper cost, electricity will replace the kerosene lamps that are not only more expensive but also environmentally hazardous;
- The global benefits associated with savings in green house gaseous emissions due to replacement of kerosene and diesel.

✓ **Enhancement measure**

- The community meetings revealed that people are optimistic that the proposed construction works will generate employment opportunities. To prevent conflicts and bad attitudes towards
- The contractors and their workers, it is therefore necessary that the contractors give priority for employment to the local people within the project area with respect to their skills. Workers employed to work at the construction site should be paid in time and issued with appointment letters or signing contracts.

f) Increased number of households' connectivity

The project aims to increase the number of households connected to electricity. However, the number of households to be connected is not exhaustive as new connections will be done from new houses being constructed in the project areas. Hence the implementation of the project will lead to the increased number of households connected to the electricity and hence contributing to the achievement of the fixed country's target to get 100% access to electricity to all resident.

g) Increased public revenues and income

Revenues shall be collected by both the national and local authorities from the procurement of project construction materials and equipment, new business opportunities emanating from project implementation, employees' salaries, VAT on materials and services, among others.

7.3. Anticipated project negative impacts during planning and construction.

The predicted negative impacts for the implementation of the present project were assessed by considering different planned activities and are presented in three main project phases: design and planning phase, construction phase and operation phase. For each negative impact identified, mitigation measures were proposed as described in the next paragraphs of this chapter. The adverse impact will occur later mainly during and after construction and operation phase. For instance, there will be a few activities that include but not limited to excavations, soil disturbance, increased traffic around project sites due to delivery of various project construction materials etc. All these are likely to pollute and degrade the local environment, through mudslides, noise, and dust and air pollution. Potential adverse impacts emanating from the project activities are described in detail here below together with the recommended mitigation measure to avoid or minimize their impacts.

a) Lack of qualified environmental and social risks management personnel and Instruments

This ESIA is prepared when the detail design is not yet conducted and there might be changes and addition information once the design is completed. Thus, it is important that resources are allocated for assessment site specific impacts, prepare and implement contractor management Plans. This requires recruitment of requires qualified people at contractor and supervising consultant to ensure that proposed mitigation measures are implemented and monitored.

✓ **Mitigation measures:**

- Recruitment of an environmental and social risk management expert (2) at EPC contractor and Environmental and Social Risk Management Expert in supervising engineer team;
- Preparation of Contractor - Environmental and Social Management Plans including at a minimum: Occupational

Health and Safety Plan (a general plan is provided in this ESIA), Worker Code of Conduct, Waste Management Plan, Traffic Management Plan and Site Restoration Plan, waste management plan, traffic management plan among others

b) Loss of crops and trees along the Right of Way and at poles foundations

During line route survey and electrical lines construction, there will be environmental degradation especially destruction of natural vegetation, food, and cash crops. Crops and trees in gardens and woodlots are also likely to be affected during pole installation. The vegetation along the lines is categorized as plantation forests. These are of economic value to the local community.

✓ **Mitigation measures**

- Prepare and implement a resettlement plan once the right of Way is identified;
- Project activities shall be implemented after harvest to avoid crops losses and damages;
- Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected.
- Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable;
- Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements.
- Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations.
- Remove as much vegetation as possible by handheld tools and avoid the use of heavy machinery, especially in sensitive areas.
- Where losses of vegetation/crops are inevitable, compensation measures be instituted;
- Ensure the RoW is restricted as much as possible to the road reserve and other public spaces.
- Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations
- Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sensitive areas.
- Establishment and operationalization of community Grievance Redress Mechanism.
- Reforestation where possible to offset loss of flora and fauna

c) Disruption of agricultural activities and restriction under electrical Lines/RoW

The community is mostly involved in crop cultivation and animal rearing at subsistence level. Crops that were observed along the power line routes include maize, cassava, soya beans, sunflower, Sim sim, sweet potatoes, and fruit trees like oranges among others. About 60% of the crops will be cleared to create the RoW, affecting local community food supply and incomes. The crops along the routes were mainly for subsistence use and with only sections of the power line route planted within the 10m RoW to be cleared. Some gardens were observed to be in the road reserve where the RoW has been planned.

❖ **Magnitude**

The magnitude of this impact is considered Moderate.

✓ **Mitigation measures**

- All crops and useful trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve;
- Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops,
- Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.

d) Labor influx/ Labour issues and employee conduct

A number of workers will be engaged by the contractor to ensure completion of works as per schedule. The workers could come from the project area, neighbouring districts or other areas in the country. Up to 20 personnel will be involved in erection of a single pole, with several others in conductor stringing and installation activities. Working conditions including wages, working hours, provision of PPE, use of child labor, provision of medical care, water and food, provision of sanitary facilities, sexual harassment among workers and to the community, and workers' grievances may arise. Further, cases of drunkenness, robbery and insecurity as well as pressure on existing social infrastructure.

❖ **Magnitude**

The sensitivity of receptors is rated high and magnitude of impact medium.

✓ **Mitigation measures**

- Maximum effort shall be made to recruit locals who return to their home after work;
- The contractor will be required to prepare and implement a code of conduct and each employee will sign it;
- Establish and operationalise Workers Grievance Redress Mechanism at all construction sites
- Development and implementation of a Labor Management Plan
- Undertake training and awareness sessions for workers on SH, SEA, HIV/AIDS, STDs and communicable diseases.
- Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism;
- All workers to have contracts and time sheets for casual labourers;
- Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement
- To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly;
- Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff.

e) Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA)

A number of workers will be engaged by the contractor to ensure completion of works as per schedule. The workers could come from the project area, neighbouring districts or other areas in the country. This might pose risks of sexual harassment among workers and to the community, and workers' grievances may arise. Further, cases of drunkenness, robbery, insecurity, Sexual exploitation, and Gender based violence and pressure on existing social infrastructure.

❖ **Magnitude**

The sensitivity of receptors is rated high and magnitude of impact medium.

✓ **Mitigation measures**

- Maximum effort shall be made to recruit locals who return to their home after work;
- The contractor will be required to prepare and implement a code of conduct and each employee will sign it;
- Undertake training and awareness sessions for workers on SH, SEA, HIV/AIDS, STDs and communicable diseases.
- Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement
- Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff.
- Work with Existing GBV and **ISANGE ONE STOP CENTRES** program to address GBV and SEA complaints.
- All workers will sign and comply with code of conduct

f) Injuries or fatalities from improper manual handling

The most common injuries or illnesses connect to similar projects because of manual handling are musculoskeletal disorders in various parts of the body (back, neck, shoulders, or other) and include from sprains and strains to damage to muscles, joints, and vessels. Other injuries include cuts, bruises, lacerations, and fractures due to unexpected events such as accidents caused by manual handling.

❖ **Magnitude**

The impact is rated as moderate impacts given that most of the work will be done manually and it can be mitigated if appropriate mitigation measures are implemented.

✓ **Mitigation measures:**

- The entire project should be insured;
- The contractor will establish health and safety measures that must be implemented at the project site by all workers;
- Provision of appropriate Personnel Protective Equipment (PPE) to all employees;
- Provide and avail permanent First aid kit at the work site;
- Provide health insurance for all workers as means of health affordability;
- Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in

Rwanda;

- Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works;
- The safety plan and measure must be prepared and enforced at the project site;
- Provide sign boards at the project site to prevent accidents and troubles involving site workers.

g) Possible increases of HIV/AIDS and other communicable diseases

Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases (STD) due to the increase of people from outside of the project zone may arise among workers. Though there is no workers camp site planned for this project communicable diseases may be anticipated among workers.

❖ Magnitude:

The impact is moderate given that contractors will use mainly local workers and no workers camp is planned.

✓ Mitigation measures

- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour;
- All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases;
- Toolboxes talks will be conducted on the ways of diseases contamination and prevention.
- Contractor to have in place an HIV/AIDS Prevention and Management Policy.
- Sensitize community and schools about construction hazards as well as HIV/AIDS.
- Provide workers with condoms. Free of charge as means of HIV prevention
- Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities.
- All workers to have access to medical care

h) Child labor, forced labour and discrimination.

The present project is planned to be done in compliance with national and international standards in terms of child labor forced labor and discrimination. Therefore, recruitment procedures and minimum working age should be included in Contractor's Environmental and Social Management Plan.

❖ Magnitude

The impact is rated as low give national policies especially free education and school feeding which have been proved to be a good way to prevent school dropout and subsequently child labour in recent years. Further its very easy to verify age of workers and only recruit those who are legal age only.

✓ Mitigation measures

- Avoid any form of discrimination or exclusion during project activities;
- Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan;
- Protect workers' rights by providing work contract to every project employee;
- Recruitment of project workers shall be done based on the working age.

i) Vandalism of construction material

With the coming of the project, a few infrastructures will be made from metal, steel and concrete. Some people may be involved in vandalism of such equipment's.

✓ Magnitude:

The impacts is moderate given that during construction material will be stored in protected areas

✓ Mitigation measures

- Sensitization of local communities on the project ownership and protection;
- Use community policing as a means of ascertaining security to avoid vandalism;
- Regulations on penalties to perpetrators convicted of vandalism are necessary;
- Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism.

j) Health and Safety issues

Accidents including cuts, pricks and bruises; electrocution from naked electrical cables; falling in uncovered manholes and trenches, from raised places and on slippery could occur; Falls when working at heights accidents; could result from lack of supervision and job training, improper handling of machinery and hand tools and inappropriate carrying out of tasks.

✓ **Mitigation measures**

- Additional mitigation measures to the above detailed are:
- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust;
- Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood;
- Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur;
- Provide workers with appropriate PPE including boots and overalls, safety belts, climbing equipment, insulated gloves etc. call the attention of the operator on the ground before starting the movement; proper locking of the support/implementation of the vehicle with ropes; appropriate locking and stability of the hold of the supports on the ground;
- The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc.
- Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks;
- Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites;
- Clearly display emergency contacts such as ambulance and police at the construction site;
- Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger;
- Apply established precautions to prevent electrocution.
- All litter and debris will be picked up and disposed in a designated disposal site to avoid subsequent injuries during and after the construction work is complete;
- A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules.

k) Loss of on Physical and Cultural Resources

During the consultations with the local community and local leaders, and from high spot surveys, no PCRs or sites of cultural or religious importance were identified to fall within the road reserves. However, PCRs above may be encountered in the region or as the distribution line route is surveyed and constructed. Impacts on physic-cultural resources are likely to occur during clearance of right of way and excavations and access to pole sites, and during pole installations and conductor stringing. Maintainace works may have limited impact if any, and will result from clearing of the right of way. These activities may lead to exposure and destruction of cultural artefacts such as pottery, lithic, bones and iron slag among others. An abbreviated chance find procedures was provided in annex 12 of this report to serve as guing procedures in any case such findings are discovered.

❖ **Magnitude:**

The magnitude of impact is considered minor since excavations will be limited to the pole sites but sensitivity high considering the sacred nature and attachment of communities to PCRs.

✓ **Mitigation measures**

- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW.
- Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner.
- Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance;
- Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district
- In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure. A template is attached in annex 12.
- The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access.

- The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.

l) Loss of vegetation in the right of way and poles foundations.

The alignment of the distribution lines will to the most extent be restricted to the road reserve, pathways and agriculture lands/residential lands. Clearance of vegetation will take place along the RoW, access roads to pole sites, at pole sites, and staging areas among others. Crops and trees in gardens and woodlots are also likely to be affected during pole installation. The vegetation along the lines is categorized as plantation forests, Riverine or streamline vegetation, Open grasslands and fallow vegetation. There are also cultivated areas within the road reserves. Vegetation likely to be disturbed during site clearance for RoW include private woodlots, crops, grass and fruit trees along the roads. These are of economic value to the local community.

Other than clearance of trees in the RoW within the road reserve and access to the pole installation and work sites, additional clearance will be required to avoid tall trees falling on the energized lines, that would cut off power supply, cause economic loss and put the public at risk. Similarly, sections through woodland and thickets have to take into account safety of the lines.. Uncontrolled disposal of construction waste may also impact upon vegetation.

❖ Significance

The clearance and construction activities will result in a moderate negative impact on vegetation and habitats in the project areas given that sensitive and high value ecosystem will not be affected.

✓ Mitigation Measures:

- Tree cutting is unavoidable but will be mitigated through compensation measures which include fair compensation of affected crops and trees;
- Ensure the RoW is restricted as much as possible to the road reserve.
- Ensure that pre-clearance survey is conducted by a qualified environmental officer or botanist.
- The power line RoW to be routed to avoid CFRs (Critical Forest Reserves) and species of conservation concern and commercial value where possible.
- Clearing of trees should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern
- Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations;
- Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas.
- The wetlands, rivers, streams and areas that have surface water should be protected from earth works and contamination, and poles sited away from wet sections of the lines where possible.
- All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.
- Reforestation where possible to offset loss of flora and fauna
- Where losses of vegetation/crops are inevitable, compensation measures be provided using full replacement cost.

m) Loss of flora and fauna

It is well known that transmission lines induce physical hazard to birds and climbing animals. This is likely to be of concern during the operation phase of the project. The impact of a transmission line on fauna is limited taking into consideration that most of the lines will be constructed along the existing roads. Except for birds, most animals are not disturbed by the distribution line.

❖ Magnitude:

The magnitude of impacts is moderate given that sensitive and high value ecosystems are avoided and the distribution lines will be installed in either road reserve and in existing settlements.

✓ Mitigation measures

- The sites clearance should be only done on an area demarcated for project activities and pre-clearance survey will be conducted.
- To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation.
- Pits for poles should be covered everyday
- Ensure that the habitats are not disturbed by limiting the RoW within the road reserve;

- Limit clearance for installation work and inspection to the necessary extent.
- Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited
- Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The herptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away
- Construction workers to be sensitized not to cause harm to wildlife
- Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.
- Limit clearance for installation work and inspection to the necessary extent.
- Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.
- Reforestation where possible to offset loss of flora and fauna

n) Increased traffic in the project area

The electrification project will be implemented in remote and rural areas where traffic is not intensive. In different areas only observed traffics are those temporarily from outside the project area transporting harvest, personnel, and other materials. However, during project implementation period, they will be increased of traffic due to moving vehicles transporting project materials and personnel. Therefore, young people may strike or run over by moving vehicles causing minor to major injuries (fractures, wounds) or death, falling from vehicles, causing injuries or death or vehicles may hit people especially children playing in roads.

❖ Impact Magnitude

The magnitude of the traffic flow impact is anticipated to be Moderate. Other power line routes with low traffic volumes are anticipated to have minor impact magnitude.

✓ Mitigation measures

- Local traffic police will be involved for traffic monitoring;
- Where possible speed limit and other traffic signs shall be installed especially in project working areas.
- Traffic guides will be employed (flagmen) to control traffic;
- Use of safety signage with labels such as “Men at Work” or “Work in Progress” or “trucks turning”.
- Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites;
- Project vehicles will give the right of way to the local vehicles in the project area.

o) Impacts on Soil, hydrology, water and ground water

The works will involve excavations of pole sites and later back filling and if poorly compacted, loose soils may be eroded leading to siltation of natural drainage systems and water courses. The electricity poles will be rammed into the soil a distance of 1.5m and will be held in place, where necessary with concrete. For this reason, impacts will only be limited to the top soils, without significant intrusion to underlying groundwater, bedrock or any geological features. Soils, surface waters and groundwater will be susceptible to contamination from various sources during the poles installation process. The main source of contamination will be from the treated electricity poles which if poorly handled can lead to soil and water contamination. Hazardous materials and wastes include fuels, lubricants, containers and sanitary waste especially at the staging areas along the RoW. The quantity of hazardous materials onsite will be very small so only minor accidental spills might occur. Soil erosion could occur as a result of the removal of vegetation and the disturbance of soils by vehicles or equipment in areas where the distribution lines will transverse, particularly the pole sites. Siting of poles also has to take into consideration local drainage patterns and climate variability, particularly changes in rainfall intensity and the impacts of climate. The poles and distribution networks could be damaged by extreme rainfall events and floods if poorly designed.

❖ Impact magnitude:

The quantity of hazardous materials onsite will be small so only minor accidental spills could occur, resulting in impacts of minor magnitude

✓ Mitigation measures

- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts;
- The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion

- Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas.
- At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary;
- If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites. Furthermore, such storage areas should also have secondary containment adequate to hold the contents of any leaking or ruptured containers.
- The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground
- No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site;
- All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line
- Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works;
- Location of staging areas on steep gradients should be avoided to prevent increased erosion.
- All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes.

p) Soil erosion

During the construction works which will also involve clearing of vegetation, excavation works for holes of poles etc. such activities may result in the increased erosion in areas where vegetation has been removed. This could lead to increased sediments deposition in the project areas.

❖ Magnitude:

The magnitude of impact is moderate given that only limited excavation will be conducted for distribution poles.

✓ Mitigation measures

- During project works, contractor shall only clear areas earmarked for construction;
- Efforts should be made to contain earth movement activities to dry seasons to avoid erosion.
- The excavated soil shall be re-used in backfilling.

q) Poor Solid waste management

During construction, different types of wastes will be generated at the work sites especially staging areas. There will be remains of conductors, conductor drums, left over insulators and other remains of the materials used in construction. Cardboards and other packaging are also expected. Solid and hazardous waste can cause a number of impacts on the surrounding environment and can cause a health hazard in the area. Except for the hazardous fraction of construction waste, the remaining material is likely to be mainly inert and does not pose a threat to human health or the environment. Proper management of inert wastes is required in order to reduce associated secondary impacts such as resource use and habitat destruction at stockpile areas, or at pole sites where concrete mixing will take place. Wastes will also be generated by workers, considering crews of up to 20 persons will be engaged at each pole site.

❖ Magnitude

The magnitude of the impact is anticipated to be minor.

✓ Mitigation Measure

- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered;
- Avoid or minimize the generation of waste materials, as far as practicable;
- Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and;
- Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner;
- Use only waste handlers licensed by REMA to dispose of hazardous waste.
- Provide adequate sanitary facilities for workers especially at staging areas;
- Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately;
- A waste management plan for proper solid waste management.

r) Noise and Vibration pollution

Noise and vibrations will result from construction works, including excavations, concrete mixing and compaction at pole spots, and from vehicles transporting materials, equipment and workers. The receptors of the noise and vibrations include project site workers, project nearby users and residential nearby areas in the vicinity of the proposed power distribution line routes.

❖ **Significance**

Noise and vibration can result in significant impacts of variable magnitude where excessive levels are generated that have the potential to result in impacts upon surrounding fauna and human receptors. However, construction activities typically result in temporary and short term duration increases in the noise levels, particularly during the daytime when construction activities tend to peak. Construction crews are likely to be below 20 per pole work station site, with one truck, and in some cases, an excavator may be required.

✓ **Mitigation measures**

- No night-time works will be undertaken.
- Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers.
- Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided.
- Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A).
- If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance.
- The noise limits in the World Bank General EHSg will be followed. 55 dB(a) daytime and 45 dB(a) nighttime in residential areas.

s) Impact on Ambient air quality and air pollution

During construction, the ambient air quality at local receptors may potentially be affected by increased dust, particularly during construction material haulage, vehicle movements on unpaved roads, dust from uncovered stockpiled powdery materials or truckloads, emissions (e.g. NO_x, SO_x and CO) and particulates from vehicles, diesel generators, heavy plant and other mechanical equipment. The existing air quality in the project areas is not affected by any forms of industrial pollution except by dust associated with vehicular movements on the unpaved road network. Furthermore, 70% of the unpaved roads in the project area are not so busy to add on the effect of project vehicles and cause significant dust emission. The significance of dust impacts from movement of project vehicles is largely based on the proximity of sensitive receptors to the access roads.

❖ **Impact Magnitude**

Particulate Matter and dust are likely to be a temporary nuisance for the local sensitive receptors; thus the magnitude of the impact will be moderate.

✓ **Mitigation measures**

- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards;
- Personal protective equipment like dust masks will be availed to workers whenever needed;
- Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions;
- The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties
- unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles;
- Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust;
- All idle equipment or machinery will be turned off to minimize on gaseous emission;
- Wherever possible, transport through densely populated areas should be avoided.

t) Human waste disposal issues

The construction of the proposed distribution lines will employ over 20 people at each working the construction phase. Sanitary waste will be an issue of concern since most of the workers will be carrying out various activities at the site

throughout the day (8.00am-6.00pm). The sensitive receptors are the water sources from which the local community access water e.g. boreholes, unprotected springs, swamps, Lakes, Rivers and streams. Therefore, water sources are of a high value to the community members. If mitigation measures are not put in place indiscriminate disposal of human waste might occur which can culminate into health issues, including outbreak of diseases such as cholera. Poor human waste disposal will affect the water sources and soil in the project area.

❖ **Magnitude:**

The magnitude of this impact is expected to be moderate since improper human waste disposal may affect water resources in the project area which the community depend on.

✓ **Mitigation measure:**

- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility
- Workers should be made aware of the available sanitary facilities and trained on their use.
- Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address.
- Ensure that separate toilets are availed for both men and women and they should be well labelled.

u) **Water and soil pollution due to oil spillage**

The expected liquid waste might result from leakages of oil from the transformers during its normal operation or defects. However, this impacts temporally and limited depending on the quality and standards of the transformers to be supplied during the project execution.

✓ **Mitigation measures**

- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling;
- Proper maintenance of machinery and equipment is required to avoid leakages;
- Transformers to be supplied must comply with the approved standard;
- The refilling and maintenance should be done with qualified and experienced personnel;

v) **Fall and trip hazards for workers and passers-by during line stringing, mounting of strength electric equipment and Risk of poles failure**

Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure may result in occupational and safety hazards. Thus it is important to protect employees from safety hazards that maybe encountered during erection works and the use of heavy machinery like cranes. All employers involved in pole erection works have complete knowledge of pole election.

❖ **Magnitude**

The impact is rated as substantial given that the project involves

✓ **Mitigation measures**

- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment,
- PPE use and safety equipment;
- call the attention of the operator on the ground before starting the movement;
- proper locking of the support/implementation of the vehicle with ropes;
- appropriate locking and stability of the hold of the supports on the ground;
- controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility;
- Ban on driving under suspended loads;
- adequate stabilization of the crane;
- immediate application of the sling above the center of gravity;
- use of wooden beams to store backup elements or support sections preassembled;
- use of signs and red flags protruding loads into the ends of the poles
- Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard

7.4. Negative impacts during Operational Phase and maintenance

a) **Theft of equipment and Vandalism of power distribution infrastructure**

During operation phase vandalism might lead to electrocution but the magnitude of the impact will be minor if the local community are sensitized on the negative effects of stealing and vandalizing electrical installations. Vandalism will also

deny the local community the benefits of constant power supply due to the resulting disruptions.

✓ **Magnitude:**

The impact magnitude is rated as substantial given that such vandalism impacts on the benefits of constant electricity supply, including improved social services and business productivity.

✓ **Mitigation measures:**

- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure;
- Workers to be employed on site should be vetted or obtain reference letters by their respective village;
- Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation;
- The security firms will be screened and references sought,

b) Electric and magnetic field

Electric overhead lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. The strength of both electric and magnetic fields is a function of the voltage, distance from the conductors to the ground and the lateral distance from the line to the receptor. Many studies published on occupational exposure to Electro-Magnetic Fields (EMF) have exhibited a few inconsistencies and no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields are a threat to human health. However, the EMF decrease very rapidly with distance from source and there should be no potential health risks for people living outside the provided meters under the RURA guidelines on right of way.

✓ **Magnitude:**

The impact magnitude is rated substantial given that distribution lines are installed in existing settlement where people are leaving.

✓ **Mitigation Measures:**

- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines;
- Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation;
- Liaise with local authorities to ensure developments are not approved or occur within the right of way.

c) Risk of bird collision

Once established, the transmission lines may cause increased risk of collision of birds in flight, however this risk is expected to be minimal as the lines don't pass through any documented important bird areas.

✓ **Mitigation measures**

- Conductors along bird's habitat and in bird's migration areas will run horizontal not vertical.
- Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters

d) Pollution from transformer oil spillages

There is potential for accidental spillages from transformer oil at any stage of the project cycle that can be a source of concern i.e. during the preparation, construction stage at the equipment storage yard and during the operation phase when maintaining the transformers. This leakage can pollute soils and water sources. Transformers use oil which if not adequately handled might spill making soils, surface waters and groundwater susceptible to contamination during the installation process. Accidental spills can also be experienced when transporting oil to the sites for purposes of filling transformers that may have leaked their oil during transportation, storage, or installation.

❖ **Impact Magnitude**

The magnitude of the impact is considered moderate considering the extent of pollution given the number of transformers to be used, but the sensitivity of receptors medium.

✓ **Mitigation Measure**

- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage.
- The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation.
- Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species.
- Oil spill kits to be provided for during repair and maintenance of transformers

b) Fire risk

The risk of fire outbreaks during bad weather e.g. storms, winds etc cannot be overruled especially if electrical faults occur in the “mini” substations. Also failure to maintain the ROW could cause the overgrowth of nearby trees that could end up crashing on the lines during poor weather and hence cause fire outbreaks of black outs.

✓ **Mitigation measures**

- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin.
- All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others.
- A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported.
- EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance.

a) Vandalism of the electrical cables and other structures

With the coming of the project, a few infrastructures will be made from metal, steel and concrete. Some people may be involved in vandalism of such equipment's.

❖ **Magnitude**

The impacts is moderate given that during construction material will be stored in protected areas.

✓ **Mitigation measures**

- Sensitization of local communities on the project ownership and protection;
- Use community policing as a means of ascertaining security to avoid vandalism;
- Regulations on penalties to perpetrators convicted of vandalism are necessary;
- Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism.

7.5. Negative impacts of the decommissioning works

a) Waste generation and inappropriate storage of electric equipment's

The lifespan of the proposed transmission lines is expected to be long. At the end of its lifespan, decommissioning of the project would occur. This is because, as with any project, the facilities, such as poles and cables used in this project will have a lifetime after which they may no longer be cost effective to continue operation. During decommissioning, all transmission line structures, and equipment would be dismantled and removed. The physical removal of the line and poles will be the reversal of the construction process. All areas disturbed by the proposed project would be restored to pre-project conditions and/or to conditions acceptable for environmental protection. Potential environmental impacts caused during decommissioning which will be mitigated as per the provided environmental management and social plan are dust and noise to the surrounding environment and public safety.

✓ **Mitigation measures**

- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works.
- Provide protective equipment to site workers as means of impact prevention.
- Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions.
- Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled.
- Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology.
- Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center.
- The wooden poles shall be used as source of energy for cooking by local people.
- Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).

b) Water and Soil pollution from transformer oil spillages

There is potential for accidental spillages from transformer oil at any stage of the project cycle that can be a source of

concern i.e. during the preparation, construction stage at the equipment storage yard and during the operation phase when maintaining the transformers. This leakage can pollute soils and water sources. Transformers use oil which if not adequately handled might spill making soils, surface waters and groundwater susceptible to contamination during the installation process. Accidental spills can also be experienced when transporting oil to the sites for purposes of filling transformers that may have leaked their oil during transportation, storage, or installation.

❖ **Impact Magnitude**

The magnitude of the impact is considered moderate considering the extent of pollution given the number of transformers to be used, but the sensitivity of receptors medium.

✓ **Mitigation Measure**

- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage.
- The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation.
- Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species.
- Oil spill kits to be provided for during repair and maintenance of transformers

c) Air pollution:

Decommissioning impacts on air quality will be similar to construction impacts due to the presence of construction vehicles and trucks. This is considered to be a moderate negative impact as a result of localized dust.

❖ **Magnitude**

The impacts magnitude is rated as moderate given that no big demolitions are expected.

✓ **Mitigation measures**

- Personal protective equipment like dust masks will be availed to workers whenever needed;
- Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions;
- The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission.
- To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties
- unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS

8.1. Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) provides the conditions under which the project must be implemented, upon approval from the Rwanda Development Board (RDB). The provisions of the ESMP must be implemented in final design stages, as well as the construction and operational period of the project. It is thus critical that the provisions of the ESMP be fully implemented to enhance positive impacts and avoid significant negative environmental and social impacts. Given that detailed design has not yet been conducted to provide more information, the contractor will be required to use this report and prepare contractor Environmental and Social Management Plan (C-CESMP) for each surveyed line

It is important to note that the provided ESMP is covering the entire project in western province and considering that it will be implemented in the form of EPC Contract (Engineering, Procurement, and Construction) in each district whereby a contractual agreement between REG-EDCL and winning contractor will be made in a form of contractual framework, this will enable the owner to transfer the complete risk of design, procurement, and construction to the contractor. The contractor will be solely responsible for implementing the project and handing it over to the REG in a turnkey condition and covering all project sites in each district. Preliminary design specifications from an environmental and social point of view were taken into consideration in the assessment and compilation of the ESIA, providing input with regards to possible mitigation measures to reduce environmental and social impacts. Among other necessary and important plans that will be prepared by the contractor and approved by the supervising firm will include the Code of conduct for workers, Waste Management Plan, the Occupational Health and Safety plan, Traffic Management Plan, Labor Management Procedures as well as the Stakeholder's Engagement Plan.

The Environmental and Social Management Plan (ESMP) was developed for all project implementing districts as part of the ESIA report. However, district-specific ESMPs were also prepared. These standalone ESMP for each district are annexed to this report and were developed based on specific bio-physical and socio-economic characteristics of each district project activities such as distance of the lines to be constructed, the estimated number of workers, cost of project materials and associated prices etc. The Next table present an Environmental Management Plan for the EPC of Western Province

Table 73: Environmental and Social Management Plan

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain a qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	(6x700x12) = 57,600 ² (4x800x12) = 38,400 ³
Survey of ROW for medium and law voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	284,100 ⁴
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	40,000
	Disruption of agricultural activities and land use restriction under RoW	- All crops, and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	RAP budget
Clearing all	Loss of vegetation	- Ensure the RoW is restricted as much as possible to the road reserve.	During site	REG-EDCL/	To be

² One EPC contractor for two district (3 contractors in 6 district) was considered with two staff (800US\$ man month for 12 months' implementation period

³ Four staff by province are proposed for 12months period and 800US\$ man Month.

⁴ Estimated based on other projects in western province (to be updated and included in RAPs for each district) estimation is done at 3000 US per 1 km of MV

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
vegetation, felling trees in 6m width of Right of Way	cover in in the right of way and poles foundations.	- The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas. - The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.	clearance	/District REG-EDCL/ Contractor, Districts	included in EPC contract's Budget
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities and should be surveyed by a botanist or qualified environmental specialist before clearing to ensure species of conservation importance are protected.; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism;	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	40,000

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff			
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and Isange One stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	20,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behavior. - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	22,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	35,000(five

Activities	Description of Potential Impacts	Mitigations measures	Implementation on schedule	Responsible for implementation	Budget (USD)
		- Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.			thousands per district)
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighbourhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 14,000 (2,000 per district)
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance;	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure"; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces with adequate secondary containment to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes	Ongoing	EPC contractor, Supervising engineer	Construction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Construction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Developing a waste management plan	Ongoing	EPC contractor, Supervising engineer	Construction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Construction budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided	Ongoing	EPC contractor, Supervising engineer	Construction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	8,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refilling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Construction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure and electrocution	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - Apply established precautions to prevent electrocution. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal	Theft of equipment and Vandalism of power distribution	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure;	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
equipment and Power Distribution through the proposed line	infrastructure	- Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought			
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently	Ongoing	REG-EDCL, District	Operational Budget
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary;	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism			
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled. - Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Water and soil pollution from transformer oil spillages	- The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage or disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during decommissioning.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions;	Once	REG-EDCL, EPC contractor	Decommissioning

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles			budget
	Total budget				559,100

8.2. Environmental and Social Monitoring Plan

The monitoring plan summarizes the surveillance and monitoring activities proposed in the Environmental and Social Management Plan for this project. It also identifies the roles and responsibilities of stakeholders in the implementation as well as the estimated cost of the activities. The overall objective of environmental and social monitoring is to ensure that mitigation measures are implemented and that are effective. Environmental and social monitoring will enable response to the new and developing issues of concern. For this project, the Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented. The contractors shall employ an E&S risk management responsible for implementation of social/environmental requirements.

Environmental monitoring is also an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measures, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. This environmental monitoring plan will operate through all phases of the project implementation namely the pre-construction, construction, and operation phases. It will consist of a number of activities, each with a specific purpose with key indicators and criteria for significance assessment.

The following aspects will be subject to monitoring:

- Encroachment of sensitive areas
- Vegetation maintenance and rehabilitation around project work sites
- Safety measures at the working areas
- Waste management and handling
- Complaints resolution and safety elements

Monitoring of the plan should be undertaken firstly by the contractors at work sites during construction, under the direction and guidance of the supervisor. The monitoring tools include but are not limited to:

- Sampling and regular testing of selected parameters.
- Selection of environmental parameters at specific locations;
- Visual observations;
- Interviews

Periodic ongoing monitoring will be required during the life of the project and the level can be determined once the project is operational.

It is the responsibility of EDCL and the districts to conduct regular internal monitoring of the project to verify the results of the Contractor and to audit direct implementation of environmental mitigation measures contained in the ESMP. The districts through EDCL and MINECOFIN will be responsible for compensation activities of affected trees, and crops will be responsible to undertake regular internal monitoring of the process.

The implementation of this monitoring plan should be based on direct or indirect indicators of emissions, effluents and resource use and the monitoring frequency should be sufficient enough to provide representative data for the parameter being monitored. The following are key parameters to be monitored during this project implementation:

1. Soil erosion monitoring

The excavation of earth for the establishment of poles, will be the responsibility of the Contractor to ensure the implementation and effectiveness of erosion control measures. Focus should be given to work sites where soil is disturbed and its immediate environ as well as along the ROW during and after vegetation clearing.

2. Monitoring of vegetation clearance

Unique stands of indigenous trees (if identified within the project areas) should not be removed for the establishment of poles. The Contractor's environmental inspectors should make sure that the unique tree stands if identified should not be removed. Where not possible, these should be relocated to another area referring to the chance findings procedures. In the other case the re-routing of the line should be conducted.

3. Monitoring of rehabilitation of work sites

The Contractor's environmental inspector should ensure that areas used as materials storage facilities are

progressively rehabilitated after use. Once a site is rehabilitated it should be “signed off”.

4. Monitoring of accidents and incidents

The contractor will make sure that appropriate signs are posted at appropriate locations/positions to minimize/eliminate risk of work incident and accident. In addition, the contractor should make sure that:

- Measures to create awareness regarding sexually transmitted disease and other contaminating diseases are taken;
- Preventive measures to avoid work accidents in project areas are in place and followed appropriately
- All site workers are insured with mutuelle de sante as means of health affordability.
- Non authorized personnel is entering the working areas especially during the cable stringing works
- Maintain safety records and report incidents in accordance with ESCP.

All districts of the project areas will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The following parameters could be used as indicators:

- Presence of posted visible signs on poles
- Presence of sanitary facilities at project sites;
- Level of awareness of communities pertaining to dangers/risks associated with power lines;
- Presence of first aid kit at the project working sites and;
- Records on actual accidents associated with the establishment of the transmission and distribution line

5. Monitoring of waste management

The Contractor shall regularly monitor the management of project generated wastes focusing on:

- **Minimizing waste generation:** during site inspections, ensure that efforts are being made to minimize waste generation at all project sites. This includes assessing whether measures for reducing unnecessary material use and waste production are being implemented.
- **Waste segregation, reuse, and recycling:** monitor whether waste is being properly segregated at the source into categories such as biodegradable and non-biodegradable. Evaluate the extent to which materials are being reused or recycled wherever practical. This includes checking the availability and proper use of dedicated recycling facilities.
- **Adherence to the waste management hierarchy:** conduct regular checks to confirm that the waste management hierarchy is being followed. Ensure that waste prevention and minimization are prioritized, followed by reuse, recycling, and recovery before considering treatment and disposal.
- **Containment and appropriate waste management:** inspect construction sites to verify that all generated waste is adequately contained and managed in compliance with site-specific environmental management plans. Ensure no waste is left unattended or disposed of improperly.
- **Sewage disposal:** confirm that sewage from material storage sites is being disposed of appropriately into sealed pit latrines or other approved sanitation systems. Inspect the sanitation systems to ensure they meet regulatory standards and are maintained properly.
- **Availability of solid waste bins:** ensure that solid waste bins are available at all locations, with at least one bin for each category of waste (biodegradable and non-biodegradable). Check the bins for proper use and maintenance.
- **Avoidance of solid waste burning:** monitor sites to ensure that no solid wastes are being burned. Immediate corrective actions should be taken if waste burning is observed.
- **Ponding of water:** check for ponding of water near waste collection or storage areas,. Ensure that any pooling of water is promptly addressed to avoid environmental or health hazards.
- **Compliance with environmental standards:** ensure that all waste management activities comply with applicable environmental laws and regulations. Any non-compliance should be reported and rectified immediately.

Table 74: Types of wastes to be monitored and their alternative destinations

Waste	Hazardous waste	Destination	Frequency of evacuation
Soils and grass from clearing	No	Will be reused for landscaping	NA

Waste	Hazardous waste	Destination	Frequency of evacuation
Soils & stones contaminated With dangerous substances such as fuel, engine oil and lubricants	Yes	Temporarily disposed them to designated area then or evacuated to the identified local disposal site.	Weekly
Soils & stones not contaminated with dangerous substances	No	Reused for backfilling and landscaping where applicable	NA
Mixed construction & clearing waste containing potentially dangerous substances	Yes	Temporarily disposed them to designated area then or evacuated to the identified local disposal site (approved dumpsite), through an approved waste management company.	Weekly
Mixed construction & clearing Waste not containing dangerous substances	No	Reused for backfilling and landscaping where Possible and excess transported to approved dumping sites by the Engineer	NA
Aggregate /concrete / masonry if any,	No	Reused as hard core where possible and the excess stockpiled on suitable locations approved by the Engineer	NA
Timber	No	Reuse suitable timber and wood for general use on Site or make available to local communities.	NA
Metals	Yes	Temporarily disposed them to designated area then latter given to an authorized person for recycling.	Before project close as part of general site cleaning
Paper / cardboard	No	Dispose to the local disposal or disposed of at licensed landfill facility (no recyclables). Site	Weekly
Plastics including plastic Packaging	No	Temporarily disposed them to designated area then r evacuated to the identified local disposal site.	Weekly
Cables	No	Temporarily disposed them to designated area then or evacuated to the identified local disposal site.	One at project completion
Insulation materials	No	Temporarily disposed them to designated area then or evacuated to the identified local disposal site.	One at project completion
Food waste	No	Temporarily disposed them to designated area then or evacuated to the identified local disposal site.	Twice a week
Plastic, glass and aluminium cans	Yes	The recyclable material is collected weekly by a licensed contractor and transported to a licensed (authorized by REMA) recycling facility for sorting. Printer cartridges are collected for recycling by the supplier at the time of delivery of new supplies	Weekly
Fuel, oil, grease and lubricants from spills.	Yes	Any spills have avoided prior to preventing water pollution. In any case of spill, release into a temporary pit far away from the site (away from the river) before being transported to the authorized landfill.	As soon as it happens

The next table summarizes other item to be monitored as part of the implementation of the overall Environmental and Social Monitoring

Table 75: Environmental and Social Monitoring Plan to be implemented in each district of the province

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops, and trees that will be affected by the project.	Reports for affected crops and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook Project area	Regular	Districts local authorities/ PAPs	5,000 (for Estimated 50 complaints in each district)
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement in each district
Labor influx	Number of workers for the project	Workers logbook by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification in each district
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200 for each district
Soil Waste	Proper management of excavated soil and other soil	Re- used excavated soil	regular	EDCL/ Districts	No cost is required

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	waste generated from the project				
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for MoU signed between each district hospital
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for sign post covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 USD to cater for overall PPE for each staff in each district
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	300 to cater for sanitation facilities in each district
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	1200
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					22,790

8.3. Implementation arrangement and responsibilities

8.3.1. Overall implementation responsibility

The overall responsibility of implementation of this EMP is under Contractor who will be in charge of the line's constructions in different districts of the western Province. Districts will designate a staff in charge of Environmental and Social safeguard who will be responsible for addressing environmental and social issues on a routine basis. The staff will have an oversight of environmental aspects of the construction contracts, including the enforcement of monitoring provisions.

The contractor will also have an Environmental Health and Safety officer to oversee the implementation of project during construction phase. The main duties of the designated Environmental and social staffs will include but not limited to:

- Have an insight on the designs and ensure they adhere to the environmental and social specifications and the requirements of the Environmental and Social Management Plan (EMP).
- Co-ordinate and liaise with government institutions on environmental and social issues and obtaining the necessary clearances from the regulatory authorities.
- Collect and dissemination of relevant environmental documents

8.3.2. Roles and responsibilities of EDCL

EDCL as the proponent of the project, is responsible for the effective implementation of the project, in compliance with all approvals. EDCL must ensure compliance with the conditions inherent to the ESMP approval by RDB. EDCL shall therefore be the entity responsible for monitoring the implementation of the ESMP and compliance with the RDB Certificate of approval. However, EDCL will appoint a construction Contractor, who will be responsible for implementing the proposed construction power lines and hence implement the proposed mitigation measures documented in this ESMP. EDCL should also appoint an Environmental Supervising Consultant to monitor and report on compliance with ESMP, as has been elaborated upon below.

EDCL's Environmental Specialist shall be the responsible for ensuring that the provisions of this ESMP, as well as the Certificate of Approval once/if issued by RDB, are complied with during the planning, construction and operation phase. The staff will be responsible for issuing instructions to the Contractor where environmental and social considerations call for action. The EDCL Environmental Specialist and/or appointed E&S Supervising Consultant/s will be responsible for the monitoring, reviewing and verifying of compliance with the ESMP and conditions of the Certificate of Approval by the Contractor. The EDCL Environmental Specialist and/or appointed E&S Supervising Consultant/s must be fully conversant with the ESMP and Certificate of Approval (once considered and issued) for the proposed construction of the distribution line and ensure compliance with all relevant national environmental legislation and international good practices.

8.3.3. Roles of the Project Coordination Unit

The project coordination Unit shall be responsible for oversight role and the implementation of mitigation measures in this ESMP and general compliance of the project with any permits, licenses and Approval Conditions and related regulations and standards on environment. The Unit will be responsible for ensuring that, the project facilities comply with the environmental and social requirements as shall be detailed in the contract documents as well as with other guiding contractual provisions and documentations.

8.3.4. Roles of contractors

Contractors will be responsible for complying with all relevant legislation and adhere to all mitigation measures specified in this ESIA and its ESMP. EDCL will therefore have to ensure enforcement of mitigation measures which will be enshrined under contractual obligations. The contractors will be obliged to have resources to ensure implementation of environmental and social management obligations in the contract (this ESMP shall be part of the Contract through hiring Environmental and Social Management Specialists to operationalize the environmental and social requirements in the ESMP and supporting documentation.

8.3.5. Roles of supervising consultants

The Supervising Consultants should have in their teams at least Environment and Social Management Specialist who will have overall responsibility of ensuring that, project implementation process complies with this ESMP, RDB's approval conditions as well as contract provisions. The Environmental and Social Risk Management Specialists shall work closely with EDCL Environmental and Social Risk Management Team in supervising the contractor. In addition,

the contractors will conduct scheduled site supervisions to monitor state of environmental compliance as documented or executed by the Contractors' Environmentalists. The Supervising Consultants will have obligation to also oversee compliance and observation of health and safety and labor requirements alongside other cross-cutting issues in the project, review contractors' plans: CESMP, OHP, Waste Management, Traffic Management, etc.

8.3.6. Roles of MININFRA

The Ministry of Infrastructures which is the ministry in charge of energy sector will be the project executing Ministry with the key role of developing and maintaining sustainable power generation and distribution facilities. It has also a big role in coordinating key stakeholders involved in electrical energy transmission and distribution and in general develop policies and guidelines and laws related to energy generation and distribution.

8.3.7. Roles of MINALOC

Under the framework of decentralization, MINALOC oversees the implementation of the decentralization process as well as relevant community and social protection programs. This Ministry is also responsible for environment governance and therefore for mobilizing the public to participate in the management and protection of natural resources. Via districts, MINALOC will oversee if and ensure that the project aims at the local development and that is implemented with zero or less harm to the local community

8.3.8. Roles of REMA

REMA as a lead agency responsible for the protection of the environment in Rwanda. REMA will undertake environmental audits to ensure that the project proponent enforces the ESMP and other environmental regulations. REMA will also conduct monitoring visits to verify if there are any emerging environmental issues arising from the projects activities that were not anticipated by the ESMP.

8.3.9. Roles of districts and other local authorities

During construction of the project, districts will be in position to undertake visits to assess compliance with the ESMP through a district environmental officer. The local authorities will also ensure that the development is in line with the proposed country development plan and the district's goals. They will also play a role of approving the valuation forms and ensuring that documentation in regard to the development are all in order. The district shall have a key in assisting the contractors through census, public consultation in relation to crops and trees inventory etc.

8.3.10. Roles of local communities

The local communities play an important role in the project implementation phases. During the ground-truthing of the final designs, Project Affected Persons (PAPs) can give further input into the specific placement of poles and the proposed route, where it affects them directly. Woodlots and crops that are damaged and/or lost due to the project must be dealt with. Local communities also have an important role to play in compliance monitoring, to make sure to report any non-compliance issues or concerns to the Local Grievance Redress Committee, E&S Supervising Consultant, EDCL, REMA and/or the WB.

8.3.11. Roles of other key stakeholders

Other key stakeholders relevant for the monitoring of health, welfare and education all play an important role of keeping watch on the project, to all contribute in meaningful ways to the monitoring of the impacts, as well as engaging fully with key issues, to better manage undesirable consequences resulting from infrastructure projects throughout Rwanda.

8.4. Grievance Redress Mechanism (GRM)

The implementation the present project will involve limited land acquisition, recruitment of workers and will affect some trees and crops privately owned by local people. Both land acquisition and use of workers are associated with potential grievances for both the community, project affected people and workers. In compliance with ESS2, ESS5 and ESS 10 as well as the Rwanda Expropriation law and labour law, REG-EDCL is required to establish, implement and monitor Grievance Redress Mechanism (GRM) for this project implementation. The GRM will help the project implementing entity to manage all kind of grievances raised by all stakeholders including a workers' GRM under ESS 2 and a community GRM for PAPs under ESS5 as well as while GBV related complaints that will be managed through existing mechanism such as GBV taskforce and existing Isange one stop center establish in each district.

The GRM will enable REG-EDCL and both districts of the intervention to address any grievances against the Project. The establishment of project level Grievance Redress (GR) will integrate with existing GR structures in the respective communities and the implementing agencies; and maintained and strengthened throughout the project lifecycle. The GRM will be closely monitored and reported throughout the project life cycle.

Grievances raised by stakeholders need to be managed through a transparent process, readily acceptable to all segments of affected communities and other stakeholders, at no cost and without retribution. The grievance mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both a proponent/operator and external stakeholders. The mechanism must not impede access to other judicial or administrative remedies.

8.4.1. Objectives of GRM

The main objectives of establishment of GRM within the project implementation are:

- a) **Prompt and fair resolution:** the GRM aims to resolve complaints and concerns efficiently, fairly, and in a timely manner. This ensures that legitimate grievances are addressed and resolved during project implementation.
- b) **Accessibility and inclusiveness:** the mechanism is designed to be easily accessible to all stakeholders, ensuring that everyone affected by the project has an opportunity to raise concerns.
- c) **Minimization of project disruptions:** by addressing grievances early and effectively, the GRM helps prevent interruptions in the project timeline, such as work stoppages, protests, or legal battles, which could delay project completion.
- d) **Continuous improvement:** a well-functioning GRM provides feedback to project implementers, helping them identify areas where improvements are needed. This helps improve the overall quality of project management and implementation.
- e) **Compliance and monitoring:** It ensures that the project complies with national laws, donor requirements, and environmental and social standards. The GRM also helps in monitoring the project's impact on the community and its surroundings.

For the present project, it is proposed to have (i) community grievance redress mechanism that focuses on grievances associated with land acquisition and compensation process, (ii) worker's grievances redress mechanism, and (iii) Grievance redress mechanism for GBV and Sexual Exploitation that will be addressed through existing mechanism.

8.4.2. Community level Grievance Redress Mechanism

The project grievance mechanism will not impede workers or project affected people's access to the legal system. Local communities have existing traditional and cultural grievance redress mechanisms (Abunzi committees) established and regulated by law no 37/2016 of 08/09/2016 determining organization, jurisdiction, and competence and functioning of Abunzi committee (adjudication/mediation committees). These are established at cell and sector levels to solve community-based conflicts and grievances their regulatory body being the ministry of Justice. This mechanism cannot be overlooked by the project. The population can choose to use this channel instead of the project grievance mechanism. The escalation at this level leads to the court process. At any time, the complainant may take the matter to the appropriate legal or judicial authority. The traditional and cultural grievance redress mechanisms can also be used to resolve some project related disputes at the community level, of course with some degree of involvement and support from local leaders, the contractor(s), and project representatives at local level. However, this method cannot handicap the establishment of the GRM at project level.

To support the existing structure and in compliance with expropriation law and the World Bank ESS5, and ESS10 it proposed to establish community grievance redress mechanism which will include a Grievance redress committee at cell level/ site level and an appeal committee at the Sector level. At these levels, potential members of GRC include but not limited to:

- The President of the committee, a community member of affected people residing in the concerned area and preferably, affected by the project,
- The Vice President, also a community member residing in the concerned area and preferably, affected by the project,
- A woman representative, also a community member residing in the concerned area and preferably, affected by the project,
- Vulnerable group representative (if any);
- Village leader for the cell level committee
- A representative of Village leaders (if it is at sector level) and the Executive Secretary of the Cell;
- A representative of the Executive Secretaries of Cells (at Sector level)
- One District official. Cell leaders and the Executive Secretary of the Sector (if it is at the Sector);
- Project representative
- Contractor and supervising firm representative;

Roles and responsibilities of these members are summarized in the next table below:

Table 76: Proposed Members of GRC and their roles under project.

Table 77: Proposed Members of GRC and their roles under project.

No	Member of GRC	Roles and responsibilities
1	PAPs representative	- Chairing meetings; - Give direction on how received grievances will be processed; - Assign organizational responsibility for proposing a response; - Referring cases to next level; - Speaks on behalf of GRC and s/he is the one to report to the cell or the sector administration level; - Represents the interests of aggrieved parties; - Give feedback on the efficiency of GRM.
2	Local administration representative	- Proposes responses to grievances and lead in resolving community grievance - Records and reports all grievances received from village leaders; - Chairs sensitization meeting at the cell level during public consultations meetings; - Assists and guides in identifying vulnerable and disadvantaged groups within the cell; - Signs the valuations sheets for compensation facilitate a proper Resettlement Plan.
3	Women and youth representatives	- Represent the interests of women and youth; - Advocate for equity and equal opportunities; - Help in prevention of sexual harassment and promote wellbeing of the women and youth - Take part in resolution of any grievance related to sexual harassment and any gender domestic violence that may arise; - Mobilize women and youth to be active in income generating activities specifically for opportunities in the project's areas of intervention.
4	Contractor representative	- Receive and log complaints/grievances, note date and time, contact details, nature of complaint and inform complainant of when to expect response; - Handle complaints revolved around nuisance resulted from construction and endeavour to handle them satisfactory; - Inform engineer (supervisor) and GRC of received complaints/grievances and outcomes and forward unresolved complaints/grievance to GRC; - Attend community meetings, respond and react to PAPs complaints raised concerning the contractor.
5	Supervising firm representative	- Represent client (REG-EDCL); - Ensure that all grievances raised have been responded to, and that the contractor responds to the complaints raised concerning them; - Attend community meetings and respond to all concerns related to project from community; - Report on monthly basis the progress of GRM process.

It is expected that all grievance or dispute issues pertaining to the project will be resolved at cell and Sector level committees. Issues that will not be resolved at the level of these committees will be taken to the higher Project Coordination Unit and district management. However, the mechanism will not prevent unsatisfied complainants to resort to the Rwandan judiciary (mediators and courts).

The grievance redress committees will be recording all the grievances. They will be recording when and how they were resolved including cases that got referred to other levels. They will be including these in their regular reporting. The project coordination unit will lead and record all complaints and how they were addressed.

The community grievance redress system will work as follows:

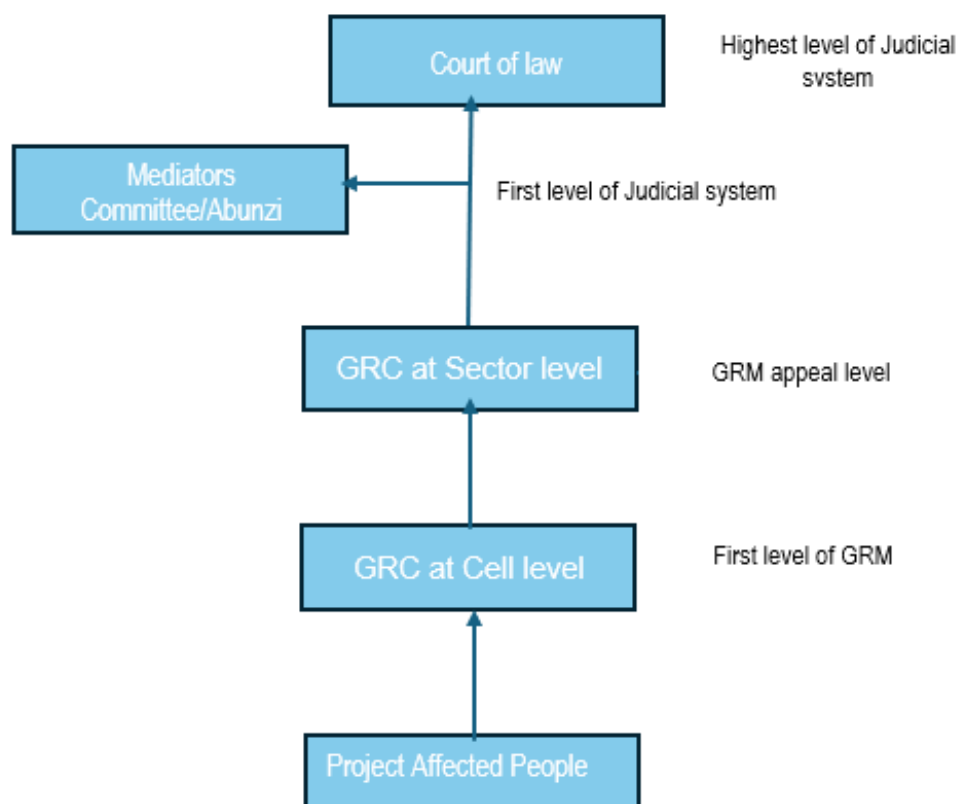


Figure 31: Proposed community GRM flow chart

a) Project Affected Persons

Project affected people (PAP) will be informed and made aware of grievance redress mechanism and encouraged to use these mechanisms. Any aggrieved person will forward his/her grievance to the nearest GRC which will operate at cell level. Papas will also participate in planning and implementing land acquisition and compensation process and provide information required to address grievances lodged by affected people.

b) Grievance redress Committees at site cell level

The GRC established at Cell level will be the first level of grievance redress mechanism. It is recommended to have GR committee at cell level that would comprise at the minimum the following:

- Representative of the cell
- Representative of women council
- Representative of youth
- Representative of affected Villages
- Representatives of PAP by cells (equal gender representation)
- Contractor representative

The Grievance committee would have responsibility for:

- Verifying PAPs.
- Validate inventories of PAPS and affected assets.
- Allocate land, where required, to permanently PAPS.
- Monitor the disbursement of compensations of affected assets/ land.
- Guide and monitor the implementation of relocation (if any)
- Coordinate activities between the various organizations involved in relocation.
- Facilitate conflict resolution and addressing grievances; and
- Provide support and assistance to vulnerable affected households including widows, orphans, and the old people among others (if any)

This committee should meet on a regular basis (as determined by the needs of the project) to ensure PAP grievances are resolved timely. It would be good to have the representative of project Affected people as the president of the committee and the cell community development officer who is a permanent staff as secretary.

c) Sector Grievance Redress committee

An appeal grievance redress committee will be established at sector level and will receive and address all grievances that are not resolved at cell level. The district management will work closely with REG-EDCL in the establishment and training of Grievance redress committee at sector level. The grievance redress committee will include at minimum:

- Sector representative
- Representative of affected cells.
- PAPs representatives.
- Representative of women council at sector level
- Representative of youth council at sector level.
- Supervisor representative.

The committee will be also responsible to address any grievances which is not satisfactorily addressed by Cell level committee. The team will be supported by the project Social Safeguards team based at project headquarters.

At these levels, the aggrieved person should file his/ her grievance, relating to any issue associated with the project implementation, in writing to the subproject. The grievance should be signed and dated by the aggrieved person. REG-EDCL social safeguards officer and the Grievance Committee will consult to determine the validity of claims. If valid, the Committee will notify the complainant, and s/he will be assisted. The Grievance Committee will respond within 14 days during which time any meetings and discussions to be held with the aggrieved person will be conducted.

If the grievance is not resolved at these GRM levels, the relevant Local Administration will then attempt to resolve the problem (through dialogue and negotiation) within 30 days of the complaint being lodged.

d) Court of law

If administrative ways of grievance redress are not enough to address the complaint, then the aggrieved person may refer to judicial system. Based on the nature of complaints and value, the process will start from mediators for grievances estimated at a value below 3 million Rwandan francs and if the value is more than three million, the process will start from intermediate courts, High court and to Supreme Court. The next table summarizes the process for grievance redress mechanism at community level.

Table 78: Grievance Redress Process at community level

Stage	Process	Duration
First level of	If the Aggrieved Party (AP) is not satisfied will take his/her grievance to Cell Grievance Committee which will endeavour to resolve it immediately. Where the AP is not satisfied, the Cell Grievance Committee will refer the AP to the Sector Grievance Committee. For complaints that were satisfactorily resolved by the Cell Committee, the committee will inform the higher level of project management, and they will log the grievance and the actions that were taken and close the grievances	As soon as possible but not exceeding four days after receiving the complaint
Appeal level	If the grievance is not resolve at cell GRC, the aggrieved Party will have the opportunity to appeal at GRC established at Sector level. On receipt of the complaint, the Sector Committee will endeavour to resolve it immediately. If unsuccessful, they will then notify the district and the project management which will attempt to resolve the grievances administratively committee before the case can go to the judicial system.	As soon as possible but not exceeding one week after receiving the complaint
Final stage of grievances redress	Unsatisfied complainants who is not satisfied after all attempts conducted through Grievances committee and administrative channels, will be allowed to take their complaints to the existing courts.	Any time depending on court schedule

8.4.3. Workers Grievance Redress Mechanism

Workplace concerns are usually different from issues raised by project-affected parties and other stakeholders, and therefore call for a separate mechanism to address them. The design of a workplace grievance mechanism includes elements of a grievance mechanism at community level but include features specifically designed to address workplace concerns. The ESS2 and law N° 66/2018 of 30/08/2018 and its amendment of 18/05/2023 regulating labour in Rwanda provisions will be applied for Grievance Redress Mechanism (GRM) for workers. A GRM shall be

established at site level by the contractor to address complaints arising during the project implementation. Project direct workers will be informed about the grievance redress mechanism during meetings at the time of the induction and where training will be provided where required, this will follow the same procedure for grievance management. Contracted workers will be informed about grievance redress mechanism through meetings at workplaces as well as notices to be made available at the workplace. The Grievance Redress Committees (GRCs) to be established as mentioned earlier will also handle the arising grievances. The process pertaining to how to go about grievances handling are documented for further reference.

The workers GRC shall be composed at Site level by the contractor representative, the supervising firm representative, and the workers representative at site level while the GRM at District level shall be composed of Labour inspector at District level as advisor, Workers representative, contractor representative, the supervising firm representative, and at SPIU Level, the committee will be composed of the Social and Environmental safeguards Specialists, Project Coordinator, Human Resource Specialist under SPIU (REG-EDCL), and contractor representative, the supervising firm representative and workers representative.

REG-EDCL will require contractors to develop and implement a grievance mechanism for their workforce including sub-contractors, prior to the start of onsite works. Contractors will prepare their labour management Plans before the start of civil works, which will also include detailed description of the worker's grievance mechanism.

The worker's grievance mechanism will include:

- A procedure to receive grievances such as comment/complaint form, suggestion boxes, email, a telephone hotline;
- stipulated timeframes to respond to grievances;
- A register to record and track the timely resolution of grievances;
- A responsible department to receive, record and track resolution of grievances.

The Supervision firm's safeguards staff will monitor the contractors' recording and resolution of grievances, and report these to the project in their monthly progress reports. The process will be monitored by the GRM Focal Point; the safeguards specialists will be responsible for the project GRM. The direct worker's grievance mechanism will be described in staff induction trainings, which will be provided to the new recruited project workers. The mechanism will be based on the following principles:

- The process will be transparent and allow workers to express their concerns and file grievances;
- There will be no discrimination against those who express grievances, and any grievances will be treated confidentially;
- Anonymous grievances will be treated equally as other grievances, whose origin is known;
- Management will treat grievances seriously and take timely and appropriate action in response.

Information about the existence of the grievance mechanism will be readily available to all project workers (direct and contracted) through notice displaying boards, the presence of "suggestion boxes", and other means of communication as required.

For Worker and Labor contracting issues

- **Individual labour disputes: Article 102 of law n° 66/2018 of 30/08/2018 regulating labour in Rwanda.**

Workers will elect representatives who will form a committee that will act as the Workers Grievance Redress Committee. As mandated by article 102 of the law regulating labour in Rwanda, the employees' representatives amicably settle individual labour disputes between employers and employees. If employees' representatives fail to settle the disputes amicably, the concerned party refers the matter to the labour inspector of the area where the contractor is located (district of the project area of intervention).

If the Labor Inspector at the District fails to settle the dispute due to the nature of the case or the conflict of interests, he/she refers the dispute to the Labor Inspector at the national level stating grounds to refer such a dispute. If amicable settlement fails at the national level, the case is referred to the competent court. In any case, the Project Implementation Unit (PIU) will be informed from the beginning of any worker's grievances and provide insight and mediation if possible. The matter will be referred to the labour inspector only if the PIU fails to do the mediation.

- **Collective labour disputes: LAW N° 66/2018 OF 30/08/2018 regulating labour in Rwanda**

The law requires that collective labour disputes be directly notified to the labour inspector of the area by the worker's representatives. Within this framework, any collective labour disputes that will arise under Project, will be addressed

to labour inspector at District level for assessment and settlement. In case of escalation, the matter will be referred to the national level. Before escalating the collective labour dispute, the PIU through the Social Safeguards Unit will be alerted. Necessary investigations will be conducted, and the contractor will be duly approached. The matter will be referred to the labour inspector only if the PIUs and worker's representatives fail at amicable settlement.

For worker's safety issues

All grievances related to worker's safety will be addressed through the Occupational Health and Safety committee as required by Article 78 of the labour law.

Grievance process for non-labour related issues involving project workers

In the project area there might be other conflicts related to relationships between the workers and the local community. Depending on who is the aggrieved party, the following mechanism will be used:

- **Worker- Against Other Worker:** These grievances will be handled through the Workers Grievance Committee/representatives.
- **Community Member – Against a Worker:** If there is any grievance from a community member against a worker, it will be handled through the Workers Grievance Committees/representatives.
- **Worker - Against a Community Member:** The project will establish a project grievance committee at various levels of the local administration scheme in Rwanda from the Cell, Sector up to the district government. This grievance Mechanism as described in the SEP and ESMF, will have the mandate of solving all complaints and grievances related to project activities and impacting local communities. Any grievance from a worker against a community member will be handled through this committee.

The project grievance mechanism will not impede workers or project affected people's access to the legal system. Local communities have existing traditional and cultural grievance redress mechanisms (Abunzi committees) established and regulated by law no 37/2016 of 08/09/2016 determining organization, jurisdiction, and competence and functioning of Abunzi committee (adjudication/mediation committees). These are established at cell and sector levels to solve community-based conflicts and grievances their regulatory body being the ministry of Justice. This mechanism cannot be overlooked by the project. The population can choose to use this channel instead of the project grievance mechanism. The escalation at this level leads to the court process. At any time, the complainant may take the matter to the appropriate legal or judicial authority.

8.4.4. Gender-Based Violence related complaints

Due to sensitivity and skills required to address gender based violence, the project will rely on existing structure including GBV task force and Isange one stop center. Thus, when GBV related complaint is received at the first or second tier of GRM, the complaint should be kept confidential by the person/persons receiving the complaint. The complaint should be reported to the relevant committee and immediate actions should be taken that is consistent with the wishes and choices, rights and dignity of the complainant. The complainant should be given information in simple and clear terms on the steps for filing complaints and the possible outcomes, the timelines and the types of supports available to be able to make informed decision.

For GBV cases, it is important to ensure that access to the complaints processes is as easy and as safe as possible for the complainant survivor. The recording of incidence should be limited to the nature of complaint put exactly in the words of the complainant, the age of the survivor and if to the best of their knowledge, the perpetrator was associated with the project. The complainant should decide on whether they would like to be referred the above committees and the complainant should give consent to share basic monitoring data. In handling GBV related complaints at all levels the following principles should be observed:

- **Safety & Well-Being:** The safety of the survivor shall be always ensured, including during reporting, investigation, and the provision of victim assistance. Those involved in the management of complaints will need to consider potential dangers and risks to all parties (including the survivor, the complainant if different, the subject of the complaint, and the organizations involved), and streamline ways to prevent additional harm in all the complaint handling process. The survivor is never to blame for reporting an act of GBV and should never be made to feel investigated. On the contrary, it is important that she/he feels that her/his story is heard, believed and valued. The actions and responses of the complaint mechanism will be guided by respect for the choices, needs, rights, and the dignity of the survivor.
- **Confidentiality:** The confidentiality of complainants, survivors, and other relevant parties must be always respected. All GBV-related information must be kept confidential, identities must be protected, and the personal

information on survivors should be collected and shared only with the informed consent of the person concerned and on a strict need-to-know basis.

- **Survivor-Centered Approach:** All prevention and responses action will need to balance the respect for due process with the requirements of a survivor-centred approach in which the survivor's choices, needs, safety, and wellbeing remain at the centre in all matters and procedures. As such, all actions taken should be guided by respect for choices, needs, rights and dignity of the survivor, whose agency and resilience must be fostered through the complaint process.
- **Accessibility and non-discrimination:** The mechanism must be accessible to all potential complainants and sufficient information must be given on how to access it, making the complaints process accessible to the largest possible number of people. This includes identifying and instituting various entry points that are both gender and context sensitive. To facilitate incidents reporting and avoid stigmatization, reports from third parties (witnesses, people suspicious or aware of an incident, etc.) must also follow accountability protocols in case of occurrence, the sanctions stipulated by Rwanda labour law will be applied.

8.4.5. Grievance Logbook

At each level Grievance redress mechanism, the committee should ensure that each complaint has an individual reference number and is appropriately tracked and recorded actions are completed. The log will contain record of the person responsible for an individual complaint, and records dates for the following events:

- Date the complaint was reported;
- Date the Grievance Log was added into the project database;
- Date information on proposed corrective action sent to complainant (if appropriate);
- The date the complaint was closed out; and
- Date response was sent to complainant.
- Any outstanding issues to be addressed; and

A Monthly report, including analysis of the type of complaints, levels of complaints, actions to reduce complaints and initiator of such action.

8.5. Environmental and social safeguards training and capacity building

8.5.1. Environmental and Social training

The Project's environmental and social training programs will include several levels of competency, depending on everyone's level of involvement and responsibility:

- **ESMP induction training and awareness:** this training will be for visitors or individuals who do not have direct roles or responsibilities for implementing the ESMP and will cover basic project environmental and social commitments.
- **ESMP Management Training and Awareness:** this training focuses attention on management, covering key aspects of the ESMP and providing an overview of the Project's environmental and social impact management expectations and the supporting processes and procedures prescribed in the ESMP to meet performance expectations.
- **ESMP Job-specific training and awareness:** job-specific training will be provided to all personnel who have direct roles and responsibilities for implementing or managing components of the ESMP including EPC contractor workers. This training will also include all people whose specific work activities may have an environmental or social impact.
- **Onsite,** these provisions and responsibilities will apply to all contractors and subcontractors. Those responsible for performing site inspections will receive training by drawing on external resources as necessary. Upon completion of training and once deemed competent by management, staff will be ready to train other people. The Project will require a contractor to institute training programmes for their personnel. The contractor and subcontractors will be responsible for implementing relevant and adequate training programmes to maintain the required competency levels. Contractor training programmes will be subject to approval by Project Management and will be assessed to confirm that:
 - Training programmes are adequate;
 - All relevant personnel have been trained; and

- Competency is achieved.

Contractors will be required to report on their training activities, and the Project will maintain records of all training delivered. The table below provides key training to be provided through the project implementation.

Table 79: ESHS training plan

Training course	Unskilled labour	Skilled labour	Supervisors	Drivers	Safety men	Timeframe	Responsible
Introduction to the OHS	x	X	X	X	x	After recruitment and at each site visit	Contractor
Induction training and awareness	x	X	X	X	x	After recruitment and at each site visit	Contractor
Emergency response	x	X	X	X	x	After recruitment	Contractor
Hazards& controls			X			After recruitment	Contractor
Foreman responsibilities			*			After recruitment	Contractor
Managing safely			X			After recruitment	Contractor
Managing rule breaking				X		After recruitment	Contractor
Fire prevention	*	*	X		x	After recruitment	Contractor
First aid	*	*	*			After recruitment	Contractor
Back safety/ lifting safety	x	X	X			After recruitment	Contractor
PPE	x	X	X	X	x	After recruitment	Contractor
Fall protection		*	*			After recruitment	Contractor
Hand safety	x	X	X	x	x	After recruitment	Contractor
Hazard recognition	x	X	X	x	x	After recruitment	Contractor
Health & hygiene	*	*	X		x	On quarterly basis	Contractor
HIV/AIDS and Communicable disease	*	*	X		x	On quarterly basis	Contractor
Environmental awareness	x	X	X		x	On quarterly basis	Contractor
Excavation safety	x	X	X		x	Before excavation work	Contractor
Risk assessment		X	X		*	After recruitment	Contractor
Safe use of chemicals	x	X	X	x	x	Before commissioning	Contractor
Accident prevention	x	X	X	x	x	After recruitment	Contractor
Sexual abuse and sexual exploitation	x	X	X	x	x	On quarterly basis	Contractor
Chance finds procedures	x	X	X	x	x	Before excavations	Contractor

Key: x= compulsory

***=selected personnel**

Training will be provided by ESHS officer in contractor team and outsource qualified expert and sub consultant hired by the contractor. The number of people to be trained for each topic will be known after recruitment of labours and

screen them to define the training appropriate for each category depending on the expertise and knowledge.

8.5.2. Community awareness, outreach, and training

In addition to the ESHS training provided by the contractor, the project will provide training, awareness, and outreach programs to the local communities. Training will be provided to different committees established including the Water users' association and Grievance Redress Committees on conflict resolution and grievances management. Local communities will be also trained on different topics including HIV/AIDS, Sexual Exploitation; Gender Based Violence, water borne diseases etc.

Table 80: Community outreach and training

Training	Targeted group	Estimated budget (\$)
Conflict resolution and Grievances management	Grievances redress committees Water users' association	42,000
HIV/AIDS, Sexual Exploitation; Gender Based Violence, water borne diseases	Local community in three projects	40,000
Total		82,000

9. CONCLUSIONS AND RECOMMENDATIONS

9.1. Conclusions

Access to electricity is one of the primary limitations to the Rwanda economy; providing that such access unlocks economic opportunity. In the context of this project, such opportunity would most likely be taken up by the service and processing industries, which can then rely on stable electricity to build a business on. The positive impacts from this project will result in local economic growth along the transport and trading routes in the concerned Districts. The general findings of this ESIA revealed that most of the potential negative impacts to be generated by the development of the present project are minimal and can be avoided if the recommended mitigation measures are implemented. The sustainability of the proposed electrification project will be ensured by compliance with regulatory legislation regarding the proposed development. Thus, the project will be beneficial to the community and with implementation of proposed Environmental and Social Monitoring Plan, the project will be sustainable.

Social services, including health facilities, schools and other services, like the provision of water, will certainly benefit from improved access to reliable electricity. Care should be taken when determining specific pole locations, during the final design stage to avoid impacts to specific environmental and social features. It is necessary to make sure mitigation measures are implemented continuously through on-site monitoring, reporting and intervention. Various social issues raised during stakeholder engagement, can be better managed, as detailed in ESMP. The specific negative social impacts related to vulnerable groups, like women and children, requires specific attention and exceptional implementation and management.

The pertaining impacts of the project have been assessed and described in detail to gain an adequate understanding of possible socio and environmental effects of the proposed project in all its implementation phases. When the mitigation measures listed in this report are fully implemented, it is no doubt that the project will benefit to both people and the environment. Projects benefits are over balanced than the negative impacts which mitigation plan has been prepared. Furthermore, project developer will carefully consider and apply all acceptable local and international standards/ regulations at all stages of the project implementation.

In terms of resettlement implications, there is no physical resettlement expected from project implementation. However, land easement will be required at the pole's locations and other project structures such as transformer's locations. Further, income loss is expected during project works with loss of trees and crops. A proper planning is recommended to minimize such impacts. In any case potential disputed among workers and local community arise, a project consultation with local leaders is proposed as a dispute resolution mechanism option available to redress grievances and disputes emanating from project activities. Therefore, based on the study findings, the Consultant is of the opinion that most of the potential environmental impacts identified can be mitigated. The proposed Environmental Management Plan and Environmental Monitoring Plan if implemented will safeguard the integrity of the environment. The potential impacts associated with the proposed development are of a nature and extent that can be reduced, limited, and eliminated by the application of appropriate mitigation measures.

9.2. Recommendations

Based on the nature of the project activities, biophysical conditions of the project area and the potential negative impacts, it is imperative that the following be given serious consideration and attention in order to preserve the environment:

- ✓ Before commencing any physical or on-site work, the contractor must prepare the C-ESMP, which must be approved by both the client and the donor. The contractor's Environmental and Social Management Plan shall be site-specific and include detailed information aligned with the project design reports.
- ✓ Before the implementation of the project, EDCL shall secure in full the locations of poles and project facilities such as transformer locations, temporally materials storages sites etc. and this to be accomplished via fair compensation and land easement via negotiations with land owners.
- ✓ The proposed teams for both contractor and supervising engineer should include environmental and Social risk management Experts for the entire duration of the project implementation;
- ✓ A resettlement Plan should be prepared for each districts to provide framework for compensation of affected crops and trees, in the right of way;
- ✓ Environmental monitoring programs for this project should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during construction,

operation and decommissioning phases. Speedy and appropriate actions must be taken on any issues arising through the monitoring results.

- ✓ Occupational health and safety performance should be evaluated against national and /or international standards.
- ✓ Prior to the project implementation, EDCL is required to involve local authorities especially districts and establish a joint monitoring team including, Sectors and cell representatives in order to regularly monitor the implementation of the proposed EMP.
- ✓ The developer of this project is recommended to implement the environmental and social management plan proposed in this report, that will ensure environmental compliance of the operations and also to maintain high quality standards.
- ✓ The working environment should be monitored for occupational hazards relevant to this project.

The negative socio-cultural impacts associated to the project are very low as there is no involuntary settlement that may be associated to the project implementation. Hence, the project developer (EDCL) should work closely with local authorities in raising awareness among local communities for the protection and maintenance of the project infrastructures.

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Annex 1: Terms of References for ESIA for EPC West

TERMS OF REFERENCE FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROJECT OF DESIGN, SUPPLY, AND INSTALLATION OF LOW VOLTAGE AND MEDIUM VOLTAGE LINES AND SERVICE CONNECTIONS IN THE WESTERN PROVINCE- EPCS WEST

1. BACKGROUND

The Government of Rwanda (GoR) envisages transforming the country from a developing country to a middle-income country and it believes that universal access to electricity constitutes a determinant factor to achieve this goal by 2024. Successive documents set out this strategy in increasing levels of detail, running from Vision 2050, the National Strategy for Transformation (NST1), the Energy Sector Strategic Plan, the Rural Electrification Strategy, and the National Electrification Plan 2018- 2024 (NEP) developed by EDCL /REG to guide the investments in electrification and how to achieve the access targets within the framework defined by NST1 and ESSP.

In the implementation of these strategic plans, the Government of Rwanda (GoR) through the Ministry of Infrastructure (MININFRA), with the funding from the World Bank/International Development Association (IDA) and other Development Partners (DP) namely African Development Bank (AfDB), European Investment Bank (EIB), OPEC Fund for International Development (OFID) and Saudi Fund for Development, Korean Economic Development Cooperation Fund (EDCF) and Agence Française de Développement (AFD), is developing a program titled "Rwanda Universal Energy Access Program which comprises two projects namely Rwanda Energy Access and Quality Improvement Project (EAQIP)" financed by World Bank and is expected to be co-financed by AFD (joint co-financing), the OFID (parallel co-financing), SFD (parallel), and the Korean Fund for International Development (parallel); Rwanda Transmission System Reinforcement and Last Mile Connectivity to be financed by AfDB and which will be financed by EIB under parallel financing.

Electrification projects (Power plants for power generation, Transmission and Distribution lines fall under the activities which require full Environment and Social Impact Assessment (ESIA) prior to implementation. Thus, Rwanda Energy Development Corporation Limited which is implementing Rwanda Access Rwanda Universal Energy Access Program wants to conduct Environmental and Social Impact Assessment for the proposed subproject of design, Supply, and Installation of Low Voltage and Medium Voltage Lines and Service Connections in the following Western Province- EPC West.

2. DESCRIPTION OF PROJECT AND ACTIVITIES

The project of design, Supply, and Installation of Low Voltage and Medium Voltage Lines and Service Connections in the following Western Province- EPCs West will be implemented across all seven District in Western Province namely Rubavu, Rutsiro, Karongi, Nyamasheke, Rusizi, Ngororero, and Nyabihu. The project objective is to improve access to energy and efficiency of energy service delivery to households, businesses, and public institutions in Rwanda. This objective will be achieved through upgrading and extension of different MV and LV lines for improved supply, improving Quality of Power Supply in Distribution System and upgrade of single to three phase lines in these districts.

During design phase and planning phase planned activities will consist of surveying and mapping new transmission and distribution routes and site selection to minimize Environmental and Social Risks and Impacts to avoid harming sensitive ecosystems. During the implementation phase key activities will include clearing of the Right of Way (ROW) equivalent to 12m wide, foundation excavations and erection of poles, installation of transformers along the transmission path for stepping down the electricity from MV to LV before distributing to consumers. This electrification project will involve the construction and rehabilitation of aerial MV electrical lines three phase that can be transformable for future industrial zones and three phase for reinforcement of already electrified zones.

3. SCOPE OF THE ASSIGNMENT

This assessment will cover all project phases from design, supply, and installation of MV and LV line and associated distributions structures and will cover all districts in Western Province. The present study will consist of collecting and analysing available data using appropriate techniques to achieve the goals of this consultancy. It will come up with realistic proposals and recommendations after consultations with Ministry of Environment (MoE) and its agencies, Rwanda Development Board (RDB), REMA, REG/EDCL SPIU, District authorities and local communities.

The ESIA study team will also provide a site specific environmental and social management plan including, health and

Safety plan that:

- Prescribes mitigation measures needed to ensure long-term project sustainability, including institutional capacity building for environmental management at all levels, public safety measures during construction and operational phases, and,
- Outlines indicators and sets up a monitoring program to track agricultural and environmental and social performance of the target watersheds and implementation of the mitigation measures for the refinement of future management action as required.

4. REPORTING REQUIREMENT AND ESIA CONTENTS

The terms of reference discussed here are set for developer and the funder satisfaction and should not hinder the firm of experts to follow the recommendation provided by RDB after scoping. These ToRs given by RDB should be strictly followed to get the certificate and comply with ESIA regulations in Rwanda. The firm of experts should make sure that every point in this content is tackled at its fullest satisfaction to the client (EDCL), RDB, development partners and other stakeholders. The following format is suggested, and the ESIA report should contain but not limited to the following key points:

Executive Summary:

- Name and location of the project,
- Name of the developer,
- Name of agency preparing the report,
- Main impacts identified,
- Mitigation recommendations,

Environmental and social monitoring plan.

Introduction:

- Author presentation,
- Developer presentation.
- Objectives of the project.
- Objective of the study.
- Methodology used for the study.

Legislative and Regulatory Consideration:

The firm of experts shall describe the relevant regulations and standards of international, national, regional and local levels that govern environmental and social quality including but not limited to : workers and population health and safety, solid and liquid wastes management, protection of sensitive areas and endangered species, biodiversity conservation, land use control, construction of electrical infrastructure standards or guidelines, resettlement and expropriation, public consultation and information disclosure, etc. The firm of experts will then determine their relevance to the project and identify associated compliance issues. The firm of experts will identify and assess the environmental and social requirements of the funding institution taking into consideration their relevance to the project.

Baseline data: Summary of information on the status of the location

- Project description,
- Location, description of the current use of the location, project size,
- Detailed description of the project, extend in time and space,
- The firm of experts shall document the existing conditions before the project comes into being. These include (i) Physical conditions of topography (soil, climate, hydrology, etc.), (ii) Biological conditions on the status of the flora and fauna, (iii) Chemical state such as the pollution status of the area for air, soil, water bodies, and (iv) socio-economic status of the project locality, including population size, structure and distribution, income, health status, and infrastructure.

Description of prevention and security measures during the site preparation and exploitation phases.

e) Identification and analysis of potential environmental and social impacts of the project and corresponding mitigation measures

The firm of experts will assess the potential significant impacts or changes expected due to the proposed projects during construction and operation phases. These would entail environmental, ecological, and social impacts, both

positive and negative which would result from interaction between the project activities and the environment that are likely to bring about changes in the baseline environmental, ecological, and social conditions discussed.

The firm of experts will perform the tasks below to identify and concisely present the significant environmental and social impacts:

- Explain and justify the methods used to predict potential impacts of the proposed projects on the environment, and on interactions among the project's components.
- Nominate and classify issues that are potentially important in the assessment of impacts and for decision-making in relation to the proposed projects'
- Identify and quantify potential impacts in the construction and operation phases by conducting an impact analysis on the physical, biological, land-use and socio-economic environments, and the interactions among them.
- Assess occupational health and safety risks and impacts during construction and operation phases and propose recommendations on corrective and remedial measures to be implemented.
- Evaluate the impact significance of the project components and activities on the environment and local community.
- Establish that criteria on which the assessment of the impacts will be based on
- Develop a matrix as a means to present assessment of the significant impacts graphically, and specify and discuss positive or negative impacts, direct or indirect impacts, reversible or irreversible impacts, short-term and long-term, and cumulative impacts on the environment and community.
- The firm of experts shall propose mitigation measures and realistic associated implementation costs for each of the identified impact. They will have to justify the basis of the proposed mitigation measures costs. This will serve as a useful reference and basis of the project Environmental and Social Management Plan (ESMP) during construction and operation phases.

Analysis of alternatives:

The firm of experts will systematically compare feasible alternatives to the proposed project site, technology, design, and operation including the "without project" situation in terms of their potential environmental and social impacts.

Assesses the alternatives' feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of alternative mitigation measures, and their suitability under local conditions; the institutional, training, and monitoring requirements for the alternative mitigation measures. When describing the impacts, the firm of experts will indicate which are irreversible or unavoidable and which can be mitigated. Try to quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures.

For each of the alternatives, quantifies the environmental and social impacts to the extent possible, and attaches socio-economic values where feasible.

Mitigation plan:

- Identification and description of environmental adverse impacts and effects of the project,
- Detailed description mitigation and compensation measures proposed
- Plans, equipment, and operational procedures appropriate to respond to these impacts.

(a) Environmental and Social Management Plan (ESMP):

- Detailed description of the modalities provided in the project for the implementation of the proposed mitigation measures to its potential negative impacts including a tentative implementation budget and responsible stakeholders.
- The firm of experts shall propose a plan of actions and indicators to monitor the implementation of the proposed mitigation measures during the construction and operation phases of the project. The firm of experts is required to give specific descriptions and technical details of monitoring measures including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, definition of thresholds that will signal the need for corrective actions, and monitoring and reporting procedures. The firm of experts will provide time frames and implementation mechanisms, staffing requirements and cost outlays for successful implementation of the plan.

(b) Conclusions and Recommendations:

The report should also include all information necessary to the project review such as lists of data sources, project background reports and studies, and any other relevant information to which the firm of experts' attention should be directed.

(c) Appendices must include:

- References—setting out the written materials both published and unpublished, that have been used scientifically.
- Record of consultations, and surveys with stakeholders,
- List of associated reports or plans.

5. STUDY TEAM AND REQUIRED EXPERTISE

The Client has hired the Bureau for Engineering and Environmental Studies/BESST Ltd to conduct this ESIA. BESST LTD is registered under Rwanda Association of Professional Environmental Practitioners (RAPEP) at level of firm of experts and has vast experience in preparing ESIA proven by at least five (5) EIA completion Certificates have worked on different ESIA's for energy development projects funded by international development partners. BESST will avail the following key Personnel with indicated Qualifications and Experience.

S/N	Key personnel	Desired Qualifications and Experience
1.	Environmental (Team Leader)	- At least Master's degree from a Recognized Academic Institution in Environmental sciences, Environmental Management, Natural Resources Management, Environmental Engineering and related fields with at least 5 years of practice/experience in the environment field/studies or bachelor's degree from Recognized Academic Institution in Environmental sciences, Environmental Management, Natural Resources Management, Environmental Engineering and related fields with at least 10 years of practice/experience in the environmental field/studies. - To have conducted at least 3 EIAs, proven by service completion certificates and copy of RDB EIA certificates of approval. - Must be registered in RAPEP as Lead Expert or Associate Expert, proven by a valid RAPEP certificate. - To have worked on at least 2 international donor funded projects such as the World Bank, African Development Bank, European Investment Bank etc proved by 1 completion certificate.
2.	Social Scientist	- At least Master's degree from a Recognized Academic Institution in Social Sciences or related fields with at least 5 years of experience in social sciences or bachelor's degree from Recognized Academic Institution in Social Sciences with at least 10 years of experience in the Social Sciences and related fields such as gender studies. - To have participated in preparation of at least 3 ESIA's, proven by service completion certificates. - To have worked on at least 1 international donor funded projects such as the World Bank, African Development Bank, European Investment Bank etc proved by 1 completion certificates.
3.	Electrical Engineer	- Bachelor's degree from Recognized Academic Institution in Electrical Engineering with at least 5 years of experience working in the implementation of energy projects such as construction of transmission, distribution and access lines. - Must be registered at the national institution of engineers or other recognized foreign institutions (proven by membership certificates) -He/She must have a certificate of License (category) Z in electrical installation issued by RURA.
4.	Civil Engineer	- Bachelor's degree from Recognized Academic Institution in Civil Engineering with at least 5 years of experience working in the implementation of energy projects such as construction of transmission, distribution and access lines. - Must be registered at the national institution of engineers or other recognized foreign institutions (proven by membership certificates)
5.	Health and Safety expert	- Bachelor's degree from Recognized Academic Institution in Environmental health sciences or related fields with at least 5 years of experience working in the implementation of energy projects such as construction of transmission, distribution and access lines. - To have worked on at least 2 international donor funded infrastructure projects such as the World Bank, African Development Bank, European Investment Bank
6.	Surveyor	- Bachelor's degree from Recognized Academic Institution in Surveying and Geomatics Engineering with at least 5 years of experience in the field of Environmental and Social studies. - Must be a member of national association of surveyors.

Annex 2: Environmental and Social Management and Monitoring Plan for Nyabihu District

Environmental and Social Management and Monitoring Plan for Nyabihu District

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain a qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ⁵
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	2,700 ⁶
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	2,000*
	Disruption of agricultural activities and land use restriction under RoW	- All crops and tress that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	RAP budget
Clearing all	Loss of vegetation	- Ensure the RoW is restricted as much as possible to the road reserve.	During site	REG-EDCL/ /District	To be

⁵ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

⁶ Estimated based on other projects in western province (to be updated and included in RAP for each district).

*: Estimates were made based on similar project in the area of intervention and the length of MV lines by district

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
vegetation, felling trees in 6m width of Right of Way	cover in in the right of way and poles foundations.	- The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas. - The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.	clearance	REG-EDCL/ Contractor, Districts	included in EPC contract's Budget
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	2,000*

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff			
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	4,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	5,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works,	Injuries or fatalities from improper	- The entire project should be insured;	Ongoing	EPC contractor, Supervising	

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
excavation, and trenching	manual handling	- The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.		engineer, REG-EDCL	3,000
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 2,000
	Loss of on Physical and Cultural	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW.	Ongoing	EPC contractor, Supervising engineer	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Resources	- Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.		/district	
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites	Ongoing	EPC contractor, Supervising engineer	Construction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Construction budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed;	Ongoing	EPC contractor, Supervising engineer	Construction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided			
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	3,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refilling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - Apply industry standard precautions to prevent electrocutions - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget
	<u>Fire accidents due to inappropriate power usage</u>	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin.	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently			
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled.	Once	REG-EDCL, EPC contractor	Decommissioning budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					23,700

Environmental and Social Monitoring Plan to be implemented in Nyabihu district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops, and trees	Reports for affected crops, and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district
	Complaints associated to the	GRM logbook	Regular	Districts local	3,240 ⁷

⁷ Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	transmission electrical cables located nearby residential houses	Project area		authorities/ PAPs	
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ Districts	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					12,030

Annex 3: Environmental and Social Management and Monitoring Plan for Rubavu District

Environmental and Social Management Plan for Rubavu district

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain a qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ⁸

⁸ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	2,650 ⁹
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	4,000*
	Disruption of agricultural activities and land use restriction under RoW	- All crops and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas.	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget

⁹ Estimated based on other projects in the western province (to be updated and included in RAP for each district) estimation is done at 800 US\$ per 1 km of MV

*: Estimates were made based on similar project in the area of intervention and the length of MV lines

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.			
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly;	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	5,000*

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff			
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	5,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	5,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	3,000

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.			
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 2,000
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner.	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure"; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	4,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refiling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads;	Ongoing	EPC contractor, Supervising engineer	Operational budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety			
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation.	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers			
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently	Ongoing	REG-EDCL, District	Operational Budget
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of	Waste generation and inappropriate	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works.	Once	REG-EDCL, EPC contractor	Decommissioning

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
electrical cables, poles and transformers	storage of electric equipment's	- Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled. - Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			budget
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during decommissioning.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					30,650

Environmental and Social Monitoring Plan to be implemented in Rubavu district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops, and trees	Reports for affected crops, and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook Project area	Regular	Districts local authorities/ PAPs	3,180 ¹⁰
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required

¹⁰ Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					11,970

Annex 4: Environmental and Social Management and Monitoring Plan for Karongi District

Environmental and Social Management Plan for Karongi district

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain a qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ¹¹
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of Way and poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	37,200 ¹²
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	12,000*
	Disruption of agricultural activities and land use restriction under RoW	- All crops and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	To be included under RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected. - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget

¹¹ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

¹² Estimated based on other projects in the western province (to be updated and included in RAP for each district) estimation is done at 750 US\$ per 1 km of MV

*: Estimates were made based on similar project in the area of intervention and the length of MV lines

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		- Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas. - The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.			
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly;	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	15,000*

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		- Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff			
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	10,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	11,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	8,000

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		- Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.			
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 6,000
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure;	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		- The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes	Ongoing	EPC contractor, Supervising engineer	Constructio n budget
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion.	Ongoing	EPC contractor, Supervising	Constructio n budget

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		- The excavated soil shall be re-used in backfilling.		engineer	
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constructio n budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Constructio n budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided	Ongoing	EPC contractor, Supervising engineer	Constructio n budget

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	8,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refilling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constructio n budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all` safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Constructio n budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure;	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
Power Distribution through the proposed line		- Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, , staging areas, and during materials transportation; - The security firms will be screened and references sought			
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contactor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently	Ongoing	REG-EDCL, District	Operational Budget
	Vandalism of the	- Sensitization of local communities on the project ownership and protection;	Ongoing	REG-EDCL,	Operational

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
	electrical cables and other structures	- Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism		District	Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled. - Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and	Once	REG-EDCL, EPC contractor	Decommissioning budget

Activities	Description of potential impacts	Mitigations measures	Implementati on schedule	Responsible for implementation	Budget (USD)
		disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during decommissioning.			
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					107,200

Environmental and Social Monitoring Plan to be implemented in Karongi district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops and trees	Reports for affected crops and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook Project area	Regular	Districts local authorities/ PAPs	44,640 ¹³
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at	When necessary	Contractor / supervisor	Under construction budget

¹³ Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
		the site			
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ workers/ project local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					53,430

Annex 5: Environmental and Social Management and Monitoring Plan for Ngororero District

Environmental and Social Management Plan for Ngororero district

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ¹⁴
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	10,500 ¹⁵
	PAPs complaints about their crops and	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and	2,000*

¹⁴ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

¹⁵ Estimated based on other projects in the western province (to be updated and included in RAP for each district) estimation is done at 750 US\$ per 1 km of MV

*: estimates are based on similar project in the area of interventions.

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	trees affected by survey team			District, Districts	
	Disruption of agricultural activities and land use restriction under RoW	- All crops, and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	To be included under RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected. - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas. - The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.			
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	3,000*
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	3,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	2,000

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care			
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	2,000
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site;	Ongoing	EPC contractor, Supervising engineer /district	2,000

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules			
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure"; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas.	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A).	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance			
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	4,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refiling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane;	Ongoing	EPC contractor, Supervising engineer	Operational budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety			
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently	Ongoing	REG-EDCL, District	Operational Budget
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled.	Once	REG-EDCL, EPC contractor	Decommissioning budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					28,500

Environmental and Social Monitoring Plan to be implemented in Ngororero district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops, and trees	Reports for affected crops and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district
	Complaints associated to the	GRM logbook	Regular	Districts local	12,600 ¹⁶

¹⁶ Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	transmission electrical cables located nearby residential houses	Project area		authorities/ PAPs	
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					21,390

Annex 6: Environmental and Social Management and Monitoring Plan for Nyamasheke District

Environmental and Social Management Plan for Nyamasheke district

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ¹⁷

¹⁷ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of way and poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected. - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	8,250t ¹⁸
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	3,000*
	Disruption of agricultural activities and land use restriction under RoW	- All crops and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	To be included under RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas.	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget

¹⁸ Estimated based on other projects in western province (to be updated and included in RAP for each district) estimation is done at 750 US\$ per 1 km of MV.

*: estimates are based on similar project in the area of interventions.

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.			
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	5,000*

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	4,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	4,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	3,000

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.			
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 2,000
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance;	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure"; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions;	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided			
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	3,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refiling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget
	<u>Fire accidents due to inappropriate power</u>	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin.	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	usage	- All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently			
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled.	Once	REG-EDCL, EPC contractor	Decommissioning budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during decommissioning.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Total budget				32,250

Environmental and Social Monitoring Plan to be implemented in Nyamasheke district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops, and trees	Reports for affected crops and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook Project area	Regular	Districts local authorities/ PAPs	9,900 ¹⁹
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital

¹⁹ Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					18,690

Annex 7: Environmental and Social Management and Monitoring Plan for Rusizi District

Environmental and Social Management Plan for Rusizi district

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ²⁰

²⁰ One EPC contract was considered for two district. The cost under this activity will be covered under the EPC.

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	supervising engineer				
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	9,750 ²¹
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	4,000*
	Disruption of agricultural activities and land use restriction under RoW	- All crops and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	To be included under RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected. - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible; - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget

²¹ Estimated based on other projects in the western province (to be updated and included in RAP for each district) estimation is done at 750 US\$ per 1 km of MV.

*: estimates are based on similar project in the area of interventions.

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by hand held tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas. - The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.			
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The reptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilization and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	5,000*

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff			
	Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Undertake training and awareness sessions for workers on SH, SEA, and GBV - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepare and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centers program to address GBV and SEA complaints	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	3,000
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	4,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	5,000

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site; - Provide sign boards at the project site to prevent accidents and troubles involving site workers.			
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighborhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 2,000
	Loss of Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner.	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district; - In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure"; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion. - All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed;	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
		- Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles; - Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided			
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	5,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refilling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	Construction budget
Operational & Maintenance Phase					
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of Potential Impacts	Mitigations measures	Implementation schedule	Responsible for implementation	Budget (USD)
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance. - Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently	Ongoing	REG-EDCL, District	Operational Budget
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regularly	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical	Waste generation and inappropriate	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention.	Once	REG-EDCL, EPC contractor	Decommissioning budget

cables, poles and transformers	storage of electric equipment's	- Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled. - Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people. - Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal. - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during decommissioning.	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					37,750

Environmental and Social Monitoring Plan to be implemented in Rusizi district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Pre-construction and project mobilization phase					
Securing of the RoW	Fair compensation for affected crops and trees	Reports for affected crops and trees	Once before project activities	Districts/ local Authorities/ property valuer	To be determined under A-RAP for each district

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook Project area	Regular	Districts local authorities/ PAPs	11700 ²²
Construction phase					
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /Districts local traffic police	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ Districts	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ Districts	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ districts	5,000 for signing MoU with district hospital

²² Costing is based on estimation of 3 complaints by 1km of MV and 300 USD by complaints

Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	Districts/ EDCL	Cost for signposts covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ Districts district / workers	40 to cater for overall PPE for each staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ DISTRICTS District	500
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ Districts	No cost required
Operation phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ Districts district/ local authorities/ local residents	Continuous: To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	2,000
TOTAL					20,490

Annex 8: Environmental and Social Management and Monitoring Plan for Rutsiro District

Environmental and Social Management Plan for Rutsiro District

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
Design and Construction Phase					
Environmental and Social risk management	Lack of qualified environmental and social risks experts and E&S instruments for contractor and supervising engineer	- Recruit and maintain a qualified environmental Expert, a social expert at contractor level; - Recruit and maintain a qualified environmental and social Expert for the supervising engineer for each district; - Preparation and implementation of Contractor Environmental and Social management Plans including at Minimum Occupational Health and Safety Plan(a general plan is provided in this ESIA), Waste Management Plan, Traffic Management Plan and site restoration plan etc.	Ongoing	EPC contractor Supervising engineer Contractor &supervising firm	Under the cost of EPC's contract ²³

²³ One EPC Contractor for two districts was considered. The cost of implementation of environmental and social risk management is to be implemented under EPC and not by district

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
Survey of ROW for medium and low voltage lines routes and Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of crops, and trees along the Right of Way and Poles foundations	- Prepare and implement a resettlement plan once the right of Way is identified; - Project activities shall be implemented after harvest to avoid crops losses and damages; - Local community and project beneficiaries must be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable; - Priority in job allocation shall be given to the affected local people as an alternative income source to sustain their domestic requirements. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations. - Ensure the RoW is restricted as much as possible to the road reserve and other public spaces. - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations	Before site works	REG-EDCL/EPC Contractor and District, Districts	8,000 ²⁴
	PAPs complaints about their crops and trees affected by survey team	- Establishment and operationalization of community Grievance Redress Mechanism	Ongoing	REG-EDCL/EPC Contractor and District, Districts	6,000
	Disruption of agricultural activities and land use restriction under RoW	- All crops and trees that are likely to be affected by the proposed project shall be compensated for except those which are in the road reserve; - Notify local community on works schedule for not planting in areas to be affected but also to harvest mature crops, - Continuous sensitization of the communities through the District Authorities is recommended. There should be signed agreements between the Community and districts on restriction in the Right of Way.	Ongoing	REG-EDCL/EPC Contractor and District, Districts	RAP budget
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of vegetation cover in in the right of way and poles foundations.	- Ensure the RoW is restricted as much as possible to the road reserve. - Conduct a preclearance survey by qualified environmental specialist to ensure flora and fauna of conservation concern are protected - The power line RoW to be routed to avoid CFRs and species of conservation concern and commercial value where possible. - Clearing of trees and crops should be for only those that are more than 2m high within the RoW, and the tall trees and branches adjacent the power lines that are of safety concern - Limit clearance for access, installation work and maintenance to the necessary extent, mainly at pole locations; - Remove as much vegetation as possible by handheld tools and avoid the use of heavy machinery, especially in sloping areas and sensitive areas.	During site clearance	REG-EDCL/ /District REG-EDCL/ Contractor, Districts	To be included in EPC contract's Budget

²⁴ Estimated cost for RAP preparation after project designs approvals.

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- The wetlands, rivers, streams and areas that have surface water should be avoided and protected from earth works and contamination, and poles sited away from wet sections of the lines where possible. - All workers to be sensitized against unnecessary destruction, trampling and clearance of flora, blocking drainage and dumping wastes in swamps or water courses.			
	Loss of flora and fauna species	- The sites clearance should be only done on an area demarcated for project activities; - To minimize the environmental impact, it is recommended that clearing be done manually as much as possible with no burning of the cleared vegetation. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve; - Limit clearance for installation work and inspection to the necessary extent. - Given the slow nature of amphibians and mammals, they should be scared away and allowed to escape prior to works once sited - Any amphibian and reptiles encountered during the construction phase that cannot flee on its own accord should be relocated. The herptiles should be relocated to a suitable area immediately outside the construction footprint area but under no circumstance to an area further away - Construction workers to be sensitized no to cause harm to wildlife - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve. - Limit clearance for installation work and inspection to the necessary extent. - Ensure that the habitats are not disturbed by limiting the RoW within the road reserve.	During design and Site clearance	EPC contractor	Mobilisation and Operational Budget
Recruitment and employment	Labor influx/ Labour issues and employee conduct	- Establish and operationalize Workers Grievance Redress Mechanism at all construction sites - Development and implementation of a Labor Management Plan - Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Contractor to have in place a Labour Force Management Plan, in line with the Labour Act and OHS Act. Labour Force Management Plan to address issues of workers' welfare, child labour, workers code of conduct, sexual harassment among workers, compensation in cases of accidents, payments and contracts, a grievance management mechanism; - All workers to have contracts and time sheets for casual labourers; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - To mitigate negative impacts arising from recruitment of labour from distant places, the contractor should hire local labour mainly; - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, District labour inspector/	6,000
	Risk of Gender	- Undertake training and awareness sessions for workers on SH, SEA, and GBV	Ongoing	REG/EDCL,	5,000

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
	Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	- Maximum effort shall be made to recruit locals who return to their home after work; - The contractor will be required to prepared and implement a code of conduct and each employee will sign it; - Persons seeking employment will have to be screened, including references from the local Council Chairpersons of their villages of origin before engagement - Both men and women will be given equal employment opportunities and that there will be fair treatment and non-discrimination among staff. - Work with Existing GBV and isange one stop centrES program to address GBV and SEA complaints		Supervising Engineer, EPC Contractor, Health Centers, Districts, Isange One stop center	
	Possible increases of HIV/AIDS and other communicable	- Contractor to have in place a worker's code of conduct to address abuse of women and girls that may lead to broken marriages, early pregnancies, sexual exploitation, spread of HIV/AIDS and all kinds of risky and inappropriate behaviour; - All project workers shall be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases; - Toolboxes talks will be conducted on the ways of diseases contamination and prevention. - Contractor to have in place an HIV/AIDS Prevention and Management Policy. - Sensitize community and schools about construction hazards as well as HIV/AIDS. - Provide workers with condoms. Free of charge as means of HIV prevention - Communities will be encouraged to report cases of illicit sexual behaviour by contractor workers to REG and local authorities. - All workers to have access to medical care	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Health Centers, Districts,	6,000
	Child labor, forced labour and discrimination.	- Avoid any form of discrimination or exclusion during project activities; - Mitigation measures against child labor, forced labor, discrimination and abusive dismissal should be clearly included in contractor labor management Plan; - Protect workers' rights by providing work contract to every project employee; - Recruitment of project workers shall be done based on the working age.	Ongoing	REG/EDCL, Supervising Engineer, EPC Contractor, Districts,	Operational Budget
Foundation works, excavation, and trenching	Injuries or fatalities from improper manual handling	- The entire project should be insured; - The contractor will establish health and safety measures that must be implemented at the project site by all workers; - Provision of appropriate Personnel Protective Equipment (PPE) to all employees; - Provide and avail permanent First aid kit at the work site; - Provide health insurance for all workers as means of health affordability; - Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda; - Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste to prevent any accidents during the construction works; - The safety plan and measure must be prepared and enforced at the project site;	Ongoing	EPC contractor, Supervising engineer, REG-EDCL	5,000

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- Provide sign boards at the project site to prevent accidents and troubles involving site workers.			
	Vandalism of construction material	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget
	Health and Safety issues	- Avoid excavation works in areas with loose materials in extremely dry weathers to prevent dust; - Reduce cases of trespass and theft; and control entry and exist in working areas to avoid conflicts between people at the site and the people in the neighbourhood; - Have a fully always equipped First Aid Kit at the site and ensure that trained first aid personnel are available to handle any incidents that may occur; - Provide workers with appropriate PPE including boots and overalls etc. The PPE must be worn in all situations where the body and skin are potentially exposed to hazards such as harmful dusts, infectious wastes, sharp objects etc. - Ensure adequate clean water supply that keeps to the minimum chances of disease outbreaks; - Provide hazard notifications, signage and warnings to warn visitors and staff of potential dangers that may exist in different areas of the project sites; - Clearly display emergency contacts such as ambulance and police at the construction site; - Warning signs will be expected to be displayed next to dangerous points and machines to restrict the movement of unauthorized personnel on site during construction and to warn heavy load vehicles that will be at the site against possible danger; - A safety officer will be at the construction site during the construction phase, always to make sure a first aid kit is always available and that the skilled workers are aware of the safety rules	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget 4,000
	Loss of on Physical and Cultural Resources	- At the local level, additional consultations will be carried out prior to commencement of works by the contractor, particularly on sites of cultural importance along the RoW. - Where cultural resources are encountered, compensation will be provided including support for relocation, such as graves, where applicable in a culturally acceptable manner. - Excavation of sites of known archaeological importance should be avoided, and the routing of distribution lines should be designed to avoid graveyards or sites of historical or spiritual importance; - Construction workers and managers should be trained in basic skills of how to identify and handle archaeological materials/artefacts before commencement of work. Such training should be administered in liaison with district;	Ongoing	EPC contractor, Supervising engineer /district	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- In the event of any chance finds of significance by the contractor, following the discovery of possible PCR, the Contractor will be required to follow a "chance finds procedure; - The Contractor will be required to stop works and contact local Authority to inform the Department of Museums and Monuments. The Contractor should have the artefacts secured or protected, and prevent any access. - The museum and district authority will then undertake investigations, and works will only resume once authorization is provided.			
	Increased traffic in the project area	- Local traffic police will be involved for traffic monitoring; - Where possible speed limit and other traffic signs shall be installed especially in project working areas. - Traffic guides will be employed (flagmen) to control traffic; - Use of safety signage with labels such as "Men at Work" or "Work in Progress" or "trucks turning". - Sensitize drivers on traffic management measures, good conduct while on public roads, and enforce speed limits for crew of up to 30 kph near construction sites; - Project vehicles will give the right of way to the local vehicles in the project area	Ongoing	EPC contractor, Supervising engineer	Operational Budget
	Impacts on Soil, hydrology, water and ground water	- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses; change impacts; - The contractor to ensure disturbed sites, particularly the pole sites are restored immediately after works, and sediment control measures are in place for sites prone to soil erosion - Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas. - At the staging areas clearance of vegetation will be limited to only those areas where it is absolutely necessary; - If the storage of hazardous chemicals (i.e. fuels, lubricants) onsite cannot be avoided, these will be stored on raised locations such as paved ground surfaces to prevent leakage into the ground. The storage areas and the containers will be inspected daily and any spills immediately cleaned; Contractors however should consider use of mobile fueling tankers other than fuel storage on sites - The movement of hazardous liquid chemicals will be done on drip trays to avoid spillage to the ground - No hazardous materials (e.g. fuel or lubricant drums) will be stockpiled on site; - All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized, and sites restored after works; - Location of staging areas on steep gradients should be avoided to prevent increased erosion.	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- All vehicles and equipment to be serviced in designated areas, preferably at garages in urban Centers along the line routes			
	Increased risks of soil erosion	- During project works, contractor shall only clear areas earmarked for construction; - Efforts should be made to contain earth movement activities to dry seasons to avoid erosion. - The excavated soil shall be re-used in backfilling.	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Poor Solid waste management	- Waste management hierarchy (3 or 4Rs – reduce, reuse, recycle (and recover) which is an acceptable guide for prioritizing waste management practices should be considered; - Avoid or minimize the generation of waste materials, as far as practicable; - Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and; - Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner; - Use only waste handlers licensed by REMA to dispose of hazardous waste. - Provide adequate sanitary facilities for workers especially at staging areas; - Provide labelled waste bins at work sites for segregation of waste into biodegradable, no biodegradable and hazardous streams, and dispose appropriately; - Consider developing a waste management plan for proper solid waste management	Ongoing	EPC contractor, Supervising engineer	5,000 Constriction budget
	Noise and Vibration pollution	- No night-time works will be undertaken. - Activities with highest noise emissions will be undertaken at less sensitive times, especially near schools and health centers. - Vehicles delivering construction materials will be prohibited from waiting near sites with their engines running. The movement of heavy vehicles during the night will be avoided. - Where appropriate, noise barriers /attenuation will be employed to ensure that the maximum noise level at 1 m distance from a single source does not exceed 85 dB(A). - If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and retail shops) will be informed of the timing and duration of the nuisance	Ongoing	EPC contractor, Supervising engineer	Constriction budget
	Impact on Ambient air quality and air pollution	- Regular vehicle maintenance and confirmation of compliance with Rwandan emissions standards; - Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles;	Ongoing	EPC contractor, Supervising engineer	Constriction budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- Trucks transporting materials likely to emit dust will be well covered with appropriate material e.g. tarpaulins to prevent them from emitting dust; - All idle equipment or machinery will be turned off to minimize on gaseous emission; - Wherever possible, transport through densely populated areas should be avoided			
	Human waste disposal issues	- Put in place mobile toilets for use by workers during construction and ensure their periodic emptying by a licensed cesspool provider to any waste disposal designated facility - Workers should be made aware of the available sanitary facilities and trained on their use. - Ensure regular inspection of the worksite and the distribution line routes to identify sanitation non-conformances and ensure timely re-address. - Ensure that separate toilets are availed for both men and women and they should be well labelled	Ongoing	EPC contractor, Supervising engineer	7,000
	Oil spillage	- Careful handling of oils and other liquids will be done to prevent oils spillage during refilling; - Proper maintenance of machinery and equipment is required to avoid leakages; - Transformers to be supplied must comply with the approved standard; - The refilling and maintenance should be done with qualified and experienced personnel;	Ongoing	EPC contractor, Supervising engineer	Constriction budget
Poles erection, Stringing works, line energising and installation of transformers	Fall and trip hazards for workers and passers-by during mounting of strength electric equipment and Risk of poles failure	- Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment, - PPE use and safety equipment; - call the attention of the operator on the ground before starting the movement; - proper locking of the support/implementation of the vehicle with ropes; - appropriate locking and stability of the hold of the supports on the ground; - controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility; - ban on driving under suspended loads; - adequate stabilization of the crane; - immediate application of the sling above the center of gravity; - use of wooden beams to store backup elements or support sections preassembled; - Use of signs and red flags protruding loads into the ends of the poles. - More details are included in Occupational health and safety	Ongoing	EPC contractor, Supervising engineer	Operational budget
	Risk of accidents during lifting equipment to position, erection of poles, stringing and wiring as well as connection.	- All vehicles containing heavy lifting equipment will be instructed to follow traffic norms strictly; - Ensure all' safety measures to workers and public including provision of protective safety equipment specific to works; - First aid box and emergency medical coverage will be provided to workers.	Ongoing	REG-EDCL/Contractor and Districts	No cost required
Operational & Maintenance Phase					

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
Maintenance of electrical principal equipment and Power Distribution through the proposed line	Theft of equipment and Vandalism of power distribution infrastructure	- Sensitize the community through local radio projects and messages through places of worship (churches and mosques), and posters in public places on the negative effects of vandalizing electrical infrastructure; - Workers to be employed on site should be vetted or obtain reference letters by their respective village; - Contractor to engage a reputable security firm to provide security at sites, storage site, staging areas, and during materials transportation; - The security firms will be screened and references sought	Ongoing	REG-EDCL, District	Operational Budget
	Health and safety issues due to Electric and magnetic field	- Sensitization of communities to avoid activities and putting up developments along the right of way of the distribution lines; - Sensitization of communities on electromagnetic fields, level of exposure and their impacts to avoid speculation; - Liaise with local authorities to ensure developments are not approved or occur within the right of way; - Evaluation of the potential exposure to EMF against the reference levels developed by International Commission on Non-Ionized Radiation Protection (ICNIRP)	Ongoing	REG-EDCL, District	Operational Budget
	Risk of bird collision	- Conductors along wetlands and in bird's migration areas will run horizontal not vertical. - Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters	Ongoing	REG-EDCL, District	Operational Budget
	Pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and installation. - Damage to native grasses and low shrubs vegetation onsite during construction/installation shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Ongoing	REG-EDCL, District	Operational Budget
	Fire accidents due to inappropriate power usage	- A robust fire prevention program and fire suppression system should be developed by the contractor for use in each cabin. - All of the cabins site must contain firefighting equipment of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others. - A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported. - EDCL should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance.	Ongoing	REG-EDCL, District	Operational Budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly - Public education to raise awareness of electricity danger and how to utilize the system safely; - Improve supervision of field workers and conduct system maintenance regularly and diligently			
	Vandalism of the electrical cables and other structures	- Sensitization of local communities on the project ownership and protection; - Use community policing as a means of ascertaining security to avoid vandalism; - Regulations on penalties to perpetrators convicted of vandalism are necessary; - Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism	Ongoing	REG-EDCL, District	Operational Budget
	Disruption of electrical supply due to encroachment of the RoW and plantation of high trees under electrical lines	- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines - Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision	Ongoing	REG-EDCL, District	Operational Budget
	Workers safety	- Provide adequate PPEs to all maintenance technicians and operator - Put in place all precautions to prevent electrocution - Ensure that operators and maintenance workers are adequately trained - Establish and communicate regular maintenance plans	Regulary	REG-EDCL	Operational budget
		-			
Decommissioning Phase					
Removal and disposal of electrical cables, poles and transformers	Waste generation and inappropriate storage of electric equipment's	- A decommissioning plan for permanent closure of the project shall be developed prior to the decommissioning works. - Provide protective equipment to site workers as means of impact prevention. - Specific actions shall be identified and scheduled to restore the project areas to acceptable conditions. - Measures to minimize effects on surface water, groundwater, and other resources during decommissioning phase, and identify how project materials would be recycled. - Most of the decommissioned materials shall be recyclable such as steel structures and cabling. The recycling or reuse of materials, such as scrap metal, would depend on the market and existing technology. - Materials such as insulators, concrete foundations etc. shall be disposed of at a formal waste disposal or recycling center. - The wooden poles shall be used as source of energy for cooking by local people.	Once	REG-EDCL, EPC contractor	Decommissioning budget

Activities	Description of potential impacts	Mitigations measures	Implementation schedule	Responsible entity	Budget (USD)
		- Proper disposal of uninstalled electrical equipment's in site approved by Rwanda Environment Management Authority (REMA).			
	Water and soil pollution from transformer oil spillages	- All transformers in the equipment storage yard should be placed on wooden platforms laid in high-density polythene bags spread with sawdust to soak away and contain oil leakage. - The Contractors shall also be required to develop and implement Standard Handling Procedures for Transformers to take care of any oil spillage during transportation, storage and disposal - Damage to native grasses and low shrubs vegetation onsite during decommissioning shall be minimized. If there are areas where the natural vegetation has been severely damaged, these will be restored using native species. - Oil spill kits to be provided for during repair and maintenance of transformers	Once	REG-EDCL, EPC contractor	Decommissioning budget
	Ambient air pollution	- Personal protective equipment like dust masks will be availed to workers whenever needed; - Ensure regular servicing of vehicles and machinery likely to produce excessive gaseous emissions; - The speed of haulage trucks and other vehicles will be limited 30km/hr to reduce dust emission. - To ensure this, speed humps will be erected and the drivers of vehicles will be made to adhere to speed limits through sensitization and enforcement of penalties - unpaved access roads will be sprinkled with water (using water browsers); to minimize dust emissions caused by movement of vehicles	Once	REG-EDCL, EPC contractor	Decommissioning budget
Total budget					43,000

Environmental and Social Monitoring Plan to be applied in Rutsiro district

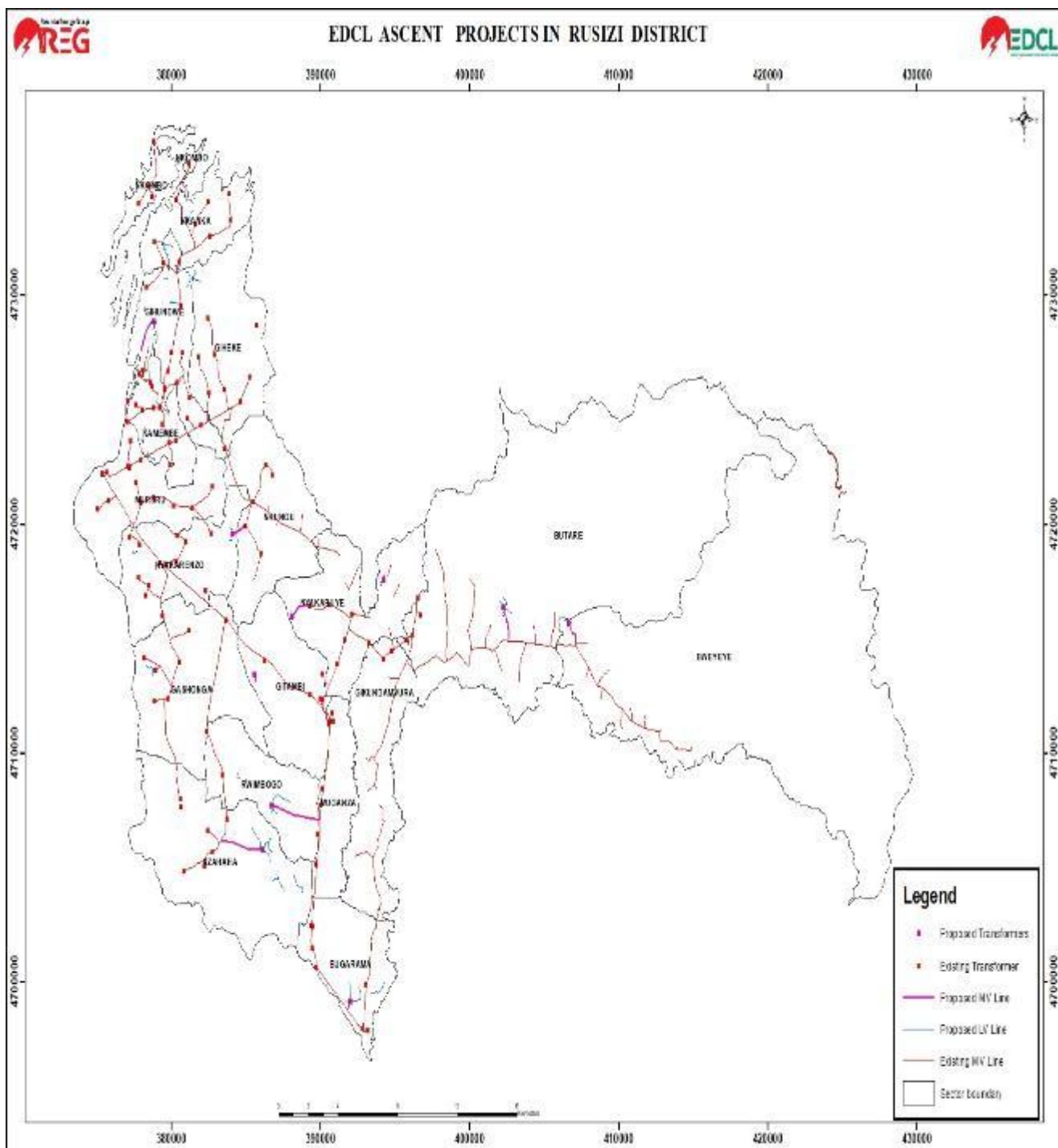
Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Planning and construction Phase					
Securing of the RoW	Fair compensation for affected crops and trees	Reports for affected crops and, trees	Once before project activities	District/ local Authorities/ property valuer	To be determined under A-RAP
	Complaints associated to the transmission electrical cables located nearby residential houses	GRM logbook	Regular	District local authorities/ PAPs	To be determined based on the final design and RAP budget ²⁵
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	When deemed necessary	EDCL /District local traffic police, Supervising consultant	no cost required for recording
Labor influx	Number of workers for the project	Workers log book by sex and by area of origin	Permanent	Contractor	No budget required to register

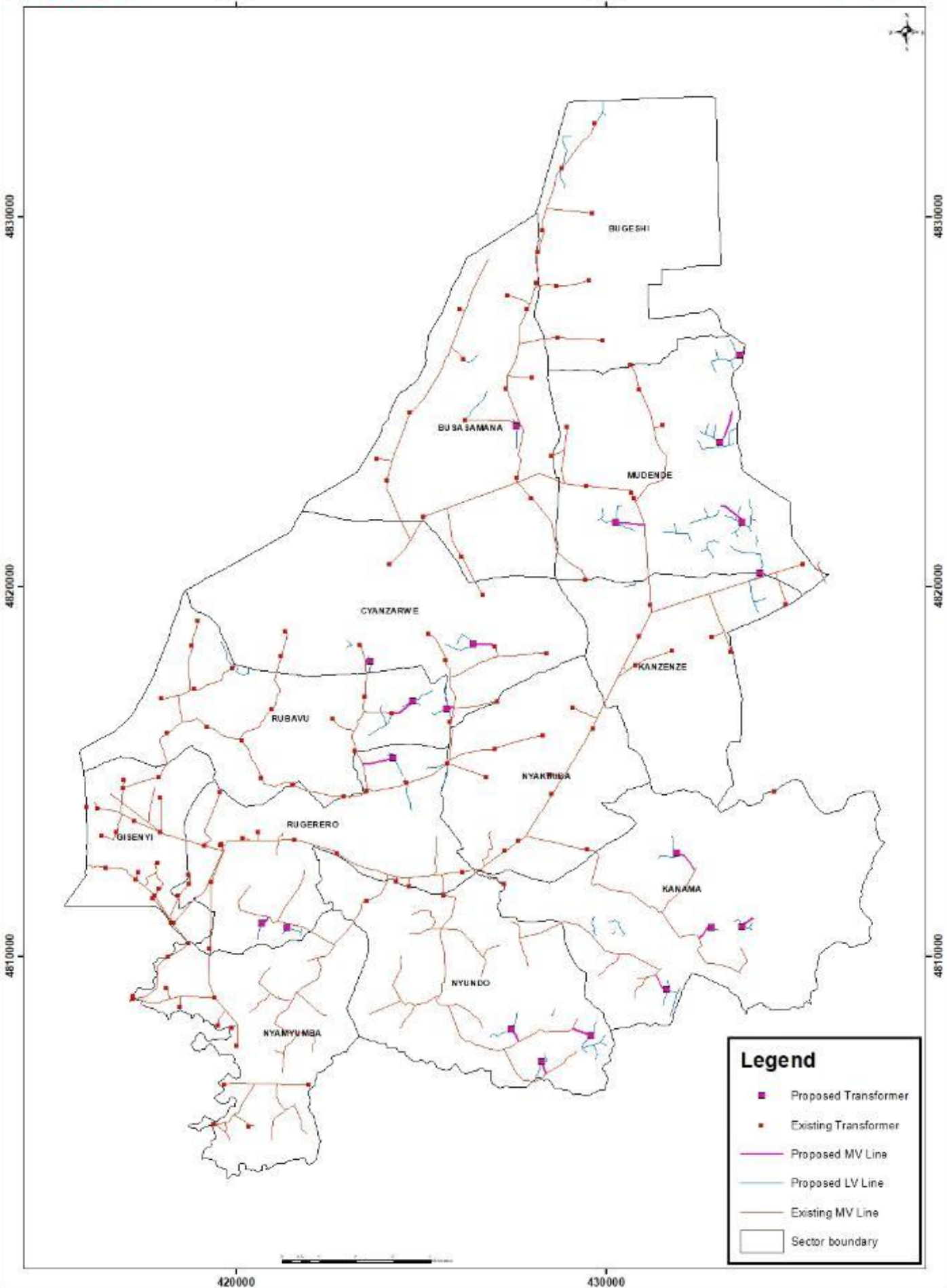
²⁵ The total length of MV and LV is not yet determined. The estimation shall be based on the final designs and length of the project. Other estimates are based on similar project in the area

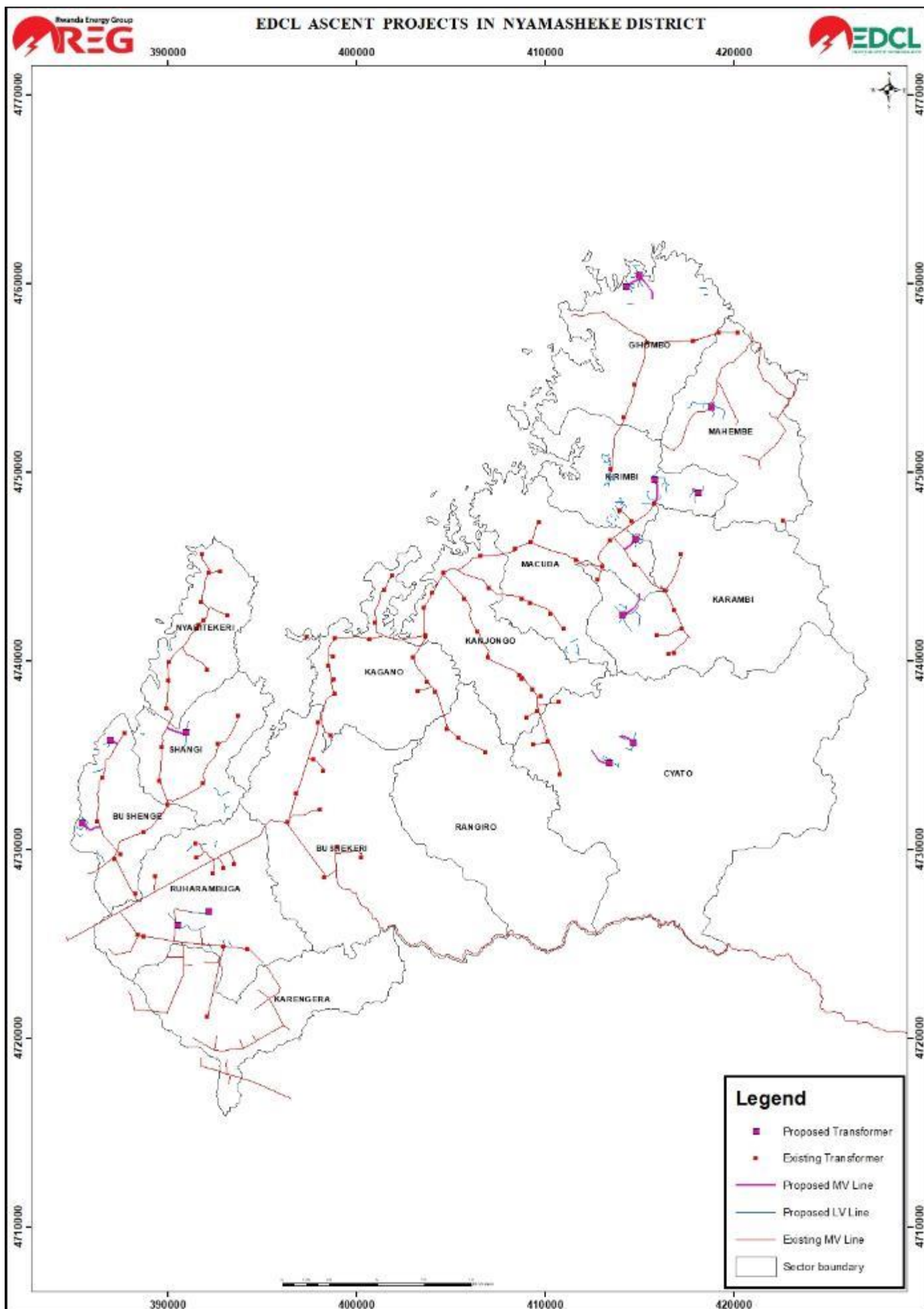
Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Increased traffic in the project area	Availability of traffic management plan	Availability of traffic management plan	Before project start	Contractor / supervisor	Budgeted for under ESMP
	Number of the traffic accidents	Report on traffic accidents	Monthly	Contractor / supervisor	No cost required for recording
	Flagmen at the construction site	Presence of Flagmen and traffic signals at the site	When necessary	Contractor / supervisor	Under construction budget
Risk of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),	Number of complaints related to GBV	Training reports and awareness minutes of SH, SEA and GBV	During project works	Contractor / supervisor	Under construction budget
		GBV complaints resolution reports	As appropriate	Contractor / supervisor	Under construction budget
		Availability of Code of conduct	Permanent	Contractor / supervisor	budgeted for under ESMP
Noise and vibrations	Noise and vibrations	Noise level (in dB) and vibrations levels	during project works	Contractor/ supervisor	300 for noise measurement
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	As appropriate	Contractor/ traffic police	750 for automobile certification
Soil erosion	Presence of soil erosion barriers at the project sites	Soil erosion and Turbidity in storm water	Daily	EDCL/ District	200
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	regular	EDCL/ District	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	After project implementation	Locals /local authorities /EDCL/ District	cost for restauration to be included in project construction budget
Working conditions	Occupational health and Safety	Availability at site of OHS Plan	Permanent	EDCL/ District	Cost covered during the preparation of OHS plan
	Awareness on social, health and safety	Number of awareness conducted	Daily	EDCL/ district	5,000 for MoU signed between district hospital
	Incidents and accidents at the project site	Presence of warning and reminding sign posts at the site	daily	District/ EDCL	Cost for sign post covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	daily	EDCL/ District / workers	40 USD to cater for overall PPE foe staff
HIV/ AIDS and other contaminating diseases	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	regular	EDCL/ District	300 to cater for sanitation facilities
Child and forced labor	Minimum working age and working condition	Employment record by age	regular	EDCL /Local authorities/ project workers/ local population	No cost is required

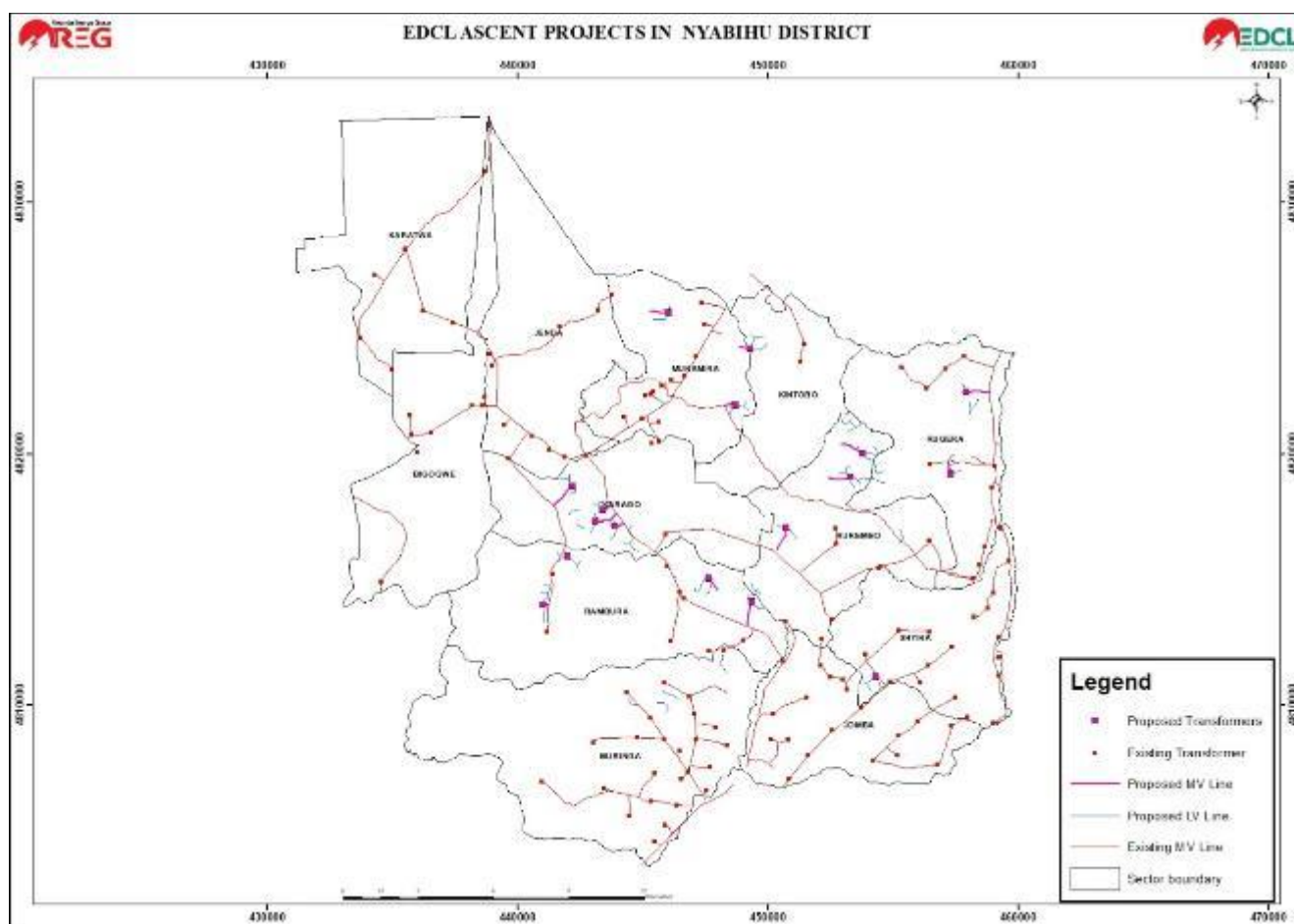
Environmental items	Monitoring item	Parameter/Indicator	Frequency	Responsible	Budget (USD)
Tree removal (deforestation)	Areas of the project with cleared trees	Number of trees removed at by district	Once	EDCL / Contractor/ District	to be covered under project construction budget
Operation and maintenance Phase					
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Regular	EDCL/ District/ local authorities/ local residents	To be included under line RED-EDCL operation and Maintenance budget
Degraded sites by the project activities	Rehabilitated areas after project activities	Areas rehabilitated after project works	Once	Contractors/ EDCL	Under project construction budget
Total Monitoring Budget					16,590

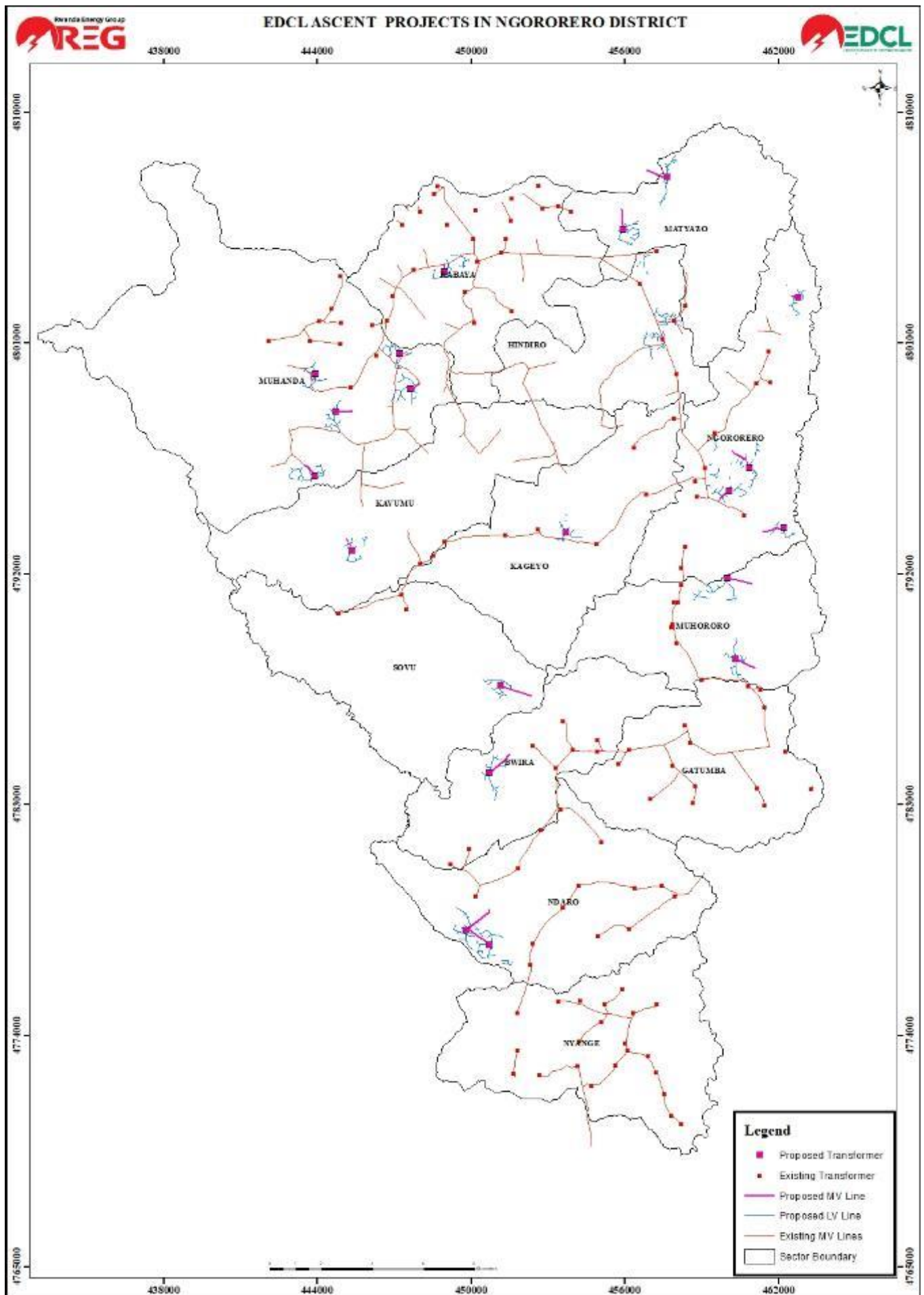






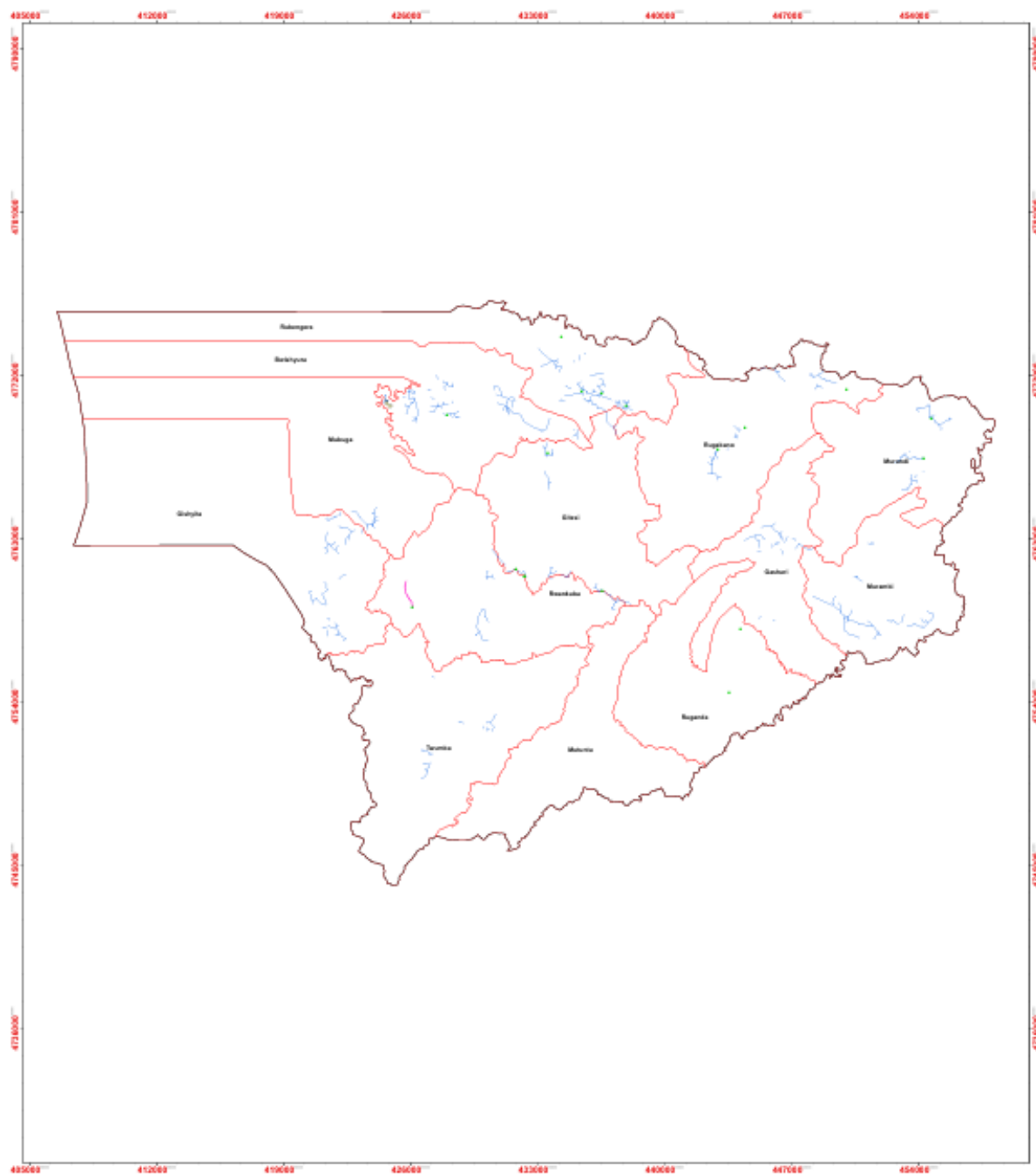








EDCL PROJECTS KARONGI DISTRICT



1:70,000

9,900 4,950 0 9,900 Meters

Legend

- SINGLE PHASE TRANSFORMER KARONGI_DISTRICT
- SINGLE PHASE MV LINES KARONGI_DISTRICT
- SINGLE PHASE LV LINES KARONGI_DISTRICT
- KARONGI_DISTRICT SECTORS
- KARONGI_DISTRICT SUB_STATION
- KARONGI_DISTRICT

Annex 10: Guidelines of the Right of Way for electrical power lines



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ht-Of-Way_for_Pow (please double click on the icon to open it)

Annex 11: List of contacted persons

LIST OF CONSULTAED STAKEHOLDERS AT TECHNICAL LEVEL

Names	Institutions	Position	Contact
NTIRUSHWA Jean Pierre	EDCL	Project manager	0788469519
BORAMUNGU Apophia	EDCL	Senior Environmental safeguards specialist	0782537195
NZAYIRAMYA Zacharie	EDCL	Social Safeguards specialist	0785098772
Cedric	EDCL	GIS surveyor	0788919861
MBONERA Michel	EDCL	C.E. Transmission	0788517995
Peace KOBUSINGYE	MINENFRA	Donor coordinator	0788312898
Patrick NZABAMWITA	RSB	Electrical engineer	0788256810
Florien GUMYUSENGE	RURA	GM/EWATSAN	0784463232
BYUMUGABO Morice	EDCL	Senior Engineer substation	0788834953
RIMENYANDE Patrick	EDCL	Design engineer	0788995290
IRUTABYOSE Jean Paul	EDCL	Substation engineer	0788705788

Source: BESST LTD, 2024

List of stakeholders who participated in consultation members in the Western Province

1	NZANZIMANA Sylvestre	Western province	Director of planning& Budgeting	nsanzimanasyvestre32@yahoo.fr
2	TWAGIRAYEZU Jean	KARONGI District	Director of planning , Monitoring & Evaluation/PME	johnntawa7@gmail.com
3	MURANGWABUGABO Jean Claude	RUBAVU District	Dir of Agriculture and natural Resources/ANR	jamurangwabugabo@gmail.com
4	SEBAGENI Etienne	RUBAVU District	Ass Director of Planning, Monitoring and Evaluation/PME	etiennesebageni@gmail.com
5	NZEYIMANA Felicien	NYABIHU District	Director of planning , Monitoring & Evaluation/PME	nzeyifeli2015@gmail.com
6	MUSANGO Didace	NYABIHU District	Director of Agriculture &natural resources/ANR	musadix6@gmail.com
7	GAHUTU MBABARIRA Anastase	KARONGI District	Director of Agriculture &natural resources/ANR	anastasemb@yahoo.fr
8	NIZEYIMANA Jean Pierre	NYAMASHEKE District	Director of Agriculture &natural resources/ANR	jpnizeyimana@nyamasheke.gov.rw
9	KAYITSINGA Jean	NGORORERO District		jean.kayitsinga@ngororero.gov.rw
10	TURAMYE Servlie	RUTSIRO	Ass Director of Agriculture &natural resources/ANR	turamyeserv@yahoo.com
11	KABERA Deogratias	RUTSIRO	Planning , Monitoring & Evaluation Officer/PM&E	d.kabera@rutsiro.gov.rw
12	RAFIKI Josue	western province	HRM	rjos1818@gmail.com
13	NAYIGIZIKI Eulode	NGORORERO District	As Director of Agriculture &natural resources/ANR	nayigizen20@yahoo.fr
14	NSABIMANA Jean Leonard	MINECOFIN/W	LG Planning &Budgeting	
15	SENGAMBI Albert	NYAMASHEKE District	Director of Agriculture &natural resources	asenganliallet@yahoo.fr
16	NGABIRINDA Aimable	RUSIZI District	Environmental Officer	aimablengabirinda@gmail.com
17	NYABYENDA Emile	Rusizi District	Director of planning , Monitoring & Evaluation/PME	emile.nyabyenda@rusizi.gov.rw

SN	Names	Institution /Organization	Position	Telephone
1	Harelimana Innocent	Rubavu District	Environment officer	0788776202
2	Benoit NTIRIZINDUKA	Rubavu District	Director of Planning	0788872758
3	NIYIBESHAHO Ananie	Nyamasheke District	Environmental Officer	0788857817
4	Jean Paul Birorimana	Ngororero District	Director of Planning	0788606188
5	Emile Nyabyenda	Rusizi District	Director of Planning	
6	Imanishimwe Bernard	Karongi District	Director of Planning	0783325294

Consulted people at community level

consulted Stakeholders during Onsite investigation of EPCs (Western province)

No	Names	District	Sector	Position	Telephone	Signature
1	Imoliratozo Kamuk	RUSIZI	KAMUKA	Reg. Tech. supervisor	078555065	[Signature]
2	Nyomana Damascene	Rusizi	Gihurwe	Umuturaga		[Signature]
3	Tonatha Nyentumi	Rusizi	Gihurwe	Umuturaga	0788511613	[Signature]
4	Felix Kayihura	Rusizi	Gihurwe	Umuturaga	07	[Signature]
5	Habiyambere Nestor	Rusizi	Gihurwe	Umuturaga	0785231460	[Signature]
6	Daniel Habiyambere	Rusizi	Gihurwe	Umuturaga	0783829906	[Signature]
7	Yusuf Nyamamuna	Rusizi	Gihurwe		0783150846	[Signature]
8	Josua Bayizera	RUSIZI	Gihurwe	T. Gendakirenda	0781103584	[Signature]
9	Jean Pierre Ndayituma	NYAMASHURU	Ruhengeri	Operator Ndayez. S.	078558330	[Signature]
10	Emmanuel Silamuna	NYAMASHURU	Ruhengeri	Umuturaga	078517866	[Signature]
11	J. N. Ndayimuna	NYAMASHURU	Ruhengeri	Umuturaga	0780709043	[Signature]
12	Banyuni P. K. J. M.	NYAMASHURU	Ruhengeri	Umuturaga		[Signature]
13	IRATIMWE D. de Brier	NYAMASHURU	KAMUKA	Operator Kamuk. S.	0788215820	[Signature]
14	MUSABYIMANA Edouard	NYAMASHURU	Ruhengeri	Edouard	0781475364	[Signature]

23	Michael Nyabakungu	Nyabiku	Kabaka	Umuturaga	08949002	~~23~~
24	Nashimona JDC	Nyabiku	Kabaka	Umuturaga	0791122333	~~24~~
25	Perinta Nyamugamba	Nyabiku	Kabaka	Umuturaga	0733881365	~~25~~
26	Augustin Sgaturuki	Nyabiku	Kabaka	Umuturaga	078761661	~~26~~
27	Alexis Mukobikwari	Nyabiku	Kabaka	Umuturaga	07 -	~~27~~
28	Emmanuel Thagari	Nyabiku	Kabaka	Umuturaga	078738976	~~28~~
29	Gervais Elien	Nyabiku	Kabaka	Umuturaga	078951413	~~29~~
30	Kassapa Jem Justin	Nyabiku	Kabaka	Umuturaga	0787230821	~~30~~

consulted Stakeholders during Onsite investigation of EPCs (Western province)

No	Names	District	Sector	Position	Telephone	Signature
1	Andreas Mwanjama	Karongi	Bushyiro	Branch Manager	0788646464	[Signature]
2	Theresa Mwanjama	Karongi	Bushyiro	Technical Expert	0788423001	[Signature]
3	Mthembu Mwanjama	Karongi	Bushyiro	Umuturaga	078840556	[Signature]
4	Mthembu Mwanjama	Karongi	Bushyiro	Umuturaga	0788426350	[Signature]
5	Mthembu Mwanjama	Karongi	Bushyiro	Umuturaga	0788426350	[Signature]
6	Emmanuel Mwanjama	Karongi	Bushyiro	Umuturaga	0788429556	[Signature]
7	Mthembu Mwanjama	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
8	Gaspard Mwanjama	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
9	Mthembu Mwanjama	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
10	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
11	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
12	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
13	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
14	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
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21	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
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25	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
26	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
27	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
28	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
29	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]
30	Jonathan Sibana	Karongi	Bushyiro	Umuturaga	0793334444	[Signature]

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consulted Stakeholders during On-site investigation of EPCs (Western province)

No	Names	District	Sector	Position	Telephone	Signature
1	MITALI Adeline	Rubavu	Gisuruyi	Technical-Sup	078868190	[Signature]
2	MUTAGAZWA Victor	RUBAVU	GISENTE	Bf manager	0788526944	[Signature]
3	Babarukhoraye Naramu	Rubavu	Uyangwe	Umutungu	078473546	[Signature]
4	HAKIZIMANA Claude	Rubavu	Kamukama	Umutungu	0785611430	[Signature]
5	UMUKUNYISE RUMUNIR	Rubavu	Kamukama	Umutungu	078043300	[Signature]
6	HAKIZIMANA Augustin	Rubavu	Kamukama	Umutungu	078804663	[Signature]
7	Samuel Ndimukumwabo	Rubavu	Gisenye	election	0788379570	[Signature]
8	Mwita Mutabaruka SHAKA	Rubavu	Mukamira	Branch manager	0778405515	[Signature]
9	JOSCAL UWAMUNGO	NYABITU	Mukamira	technician	0788706558	[Signature]
10	BARAKA John	NYABITU	Mukamira	R.F secretary	078860056	[Signature]
11	Ntshagangwenye Sernadi	NYABITU	Mukamira	Umutungu	—	[Signature]
12	MUTAGAZWA MATHA N. Claude	NYABITU	Mukamira	A.SOC/Umutungu	078560320	[Signature]
13	KHIMIMIMANA ERISA	NYABITU	Jamba	Umutungu	0788435203	[Signature]
14	BATIMENYERA Leonard	NYABITU	Jamba	Umutungu	078582600	[Signature]
15	Ndabirukema FORTUNE	NYABITU	Jamba	Umutungu	0786720611	[Signature]
16	Kirimana Francis	NYABITU	Jamba	Umutungu	078245263	[Signature]
17	Ndabirukema Edouard	NYABITU	Jamba	Umutungu	078162635	[Signature]
18	Ndabirukema Asen	NYABITU	Jamba	Umutungu	0788452185	[Signature]
19	Ntshagangwenye Sernadi	NYABITU	Jamba	Umutungu	0785277674	[Signature]
20	Ndabirukema Edouard	NYABITU	Jamba	Umutungu	0789102000	[Signature]
21	Satoru Ndimukwabo	NYABITU	Jamba	Umutungu	078319453	[Signature]
22	Jacqueline Ndimukwabo	NYABITU	Jamba	Umutungu	0786155760	[Signature]

No	Names	District	Sector	Position	Telephone	Signature
1	KUSENIRAMA Samir	Karongi	Burishyamba	Branch manager	0788646044	[Signature]
2	THAMBARUKA EUGEN	Karongi	Burishyamba	Technical Supervisor	078872302	[Signature]
3	Ndimukwabo Casper	Karongi	Burishyamba	Umutungu	0783040576	[Signature]
4	Uwamungu Felicien	Karongi	Burishyamba	Umutungu	0784269350	[Signature]
5	Miyonsabo Christine	Karongi	Burishyamba	Umutungu	0784269350	[Signature]
6	Emmanuel Itapichaka	Karongi	Rubengera	Umutungu	0784995563	[Signature]
7	Nyigana Bernard	Karongi	Rubengera	Umutungu	0793340194	[Signature]
8	Caspar Ndumyimana	Karongi	Rubengera	Umutungu	07 —	[Signature]
9	Ndimukwabo Daniel	Karongi	Rubengera	Umutungu	0791169751	[Signature]
10	Innocent Bibana	Karongi	Rubengera	Umutungu	0798820846	[Signature]
11	J. Bosco Bamukoko	Karongi	Rubengera	Umutungu	—	[Signature]
12	Jacques Uwiringiyimana	Karongi	Rubengera	Umutungu	0782052053	[Signature]
13	Sibomana Gertrud	Karongi	Burishyamba	Umutungu	0785955874	[Signature]
14	Johni Iradukunda	Karongi	Burishyamba	Umutungu	—	[Signature]
15	John Iradukunda	Karongi	Burishyamba	Umutungu	—	[Signature]

Annex 12: Physical Cultural Resource (PCR) and Chance Finds Procedure

In the case of a Physical Cultural Resource (PCR) chance find, the following procedures shall be followed:

1. Stop the construction activities around the chance find;
2. Delineate the discovered site or area;
3. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present, until the responsible local authorities and the responsible Institution take over;
4. Notify the supervisory Project Engineer and EDCL, who in turn will notify the responsible local authorities and the responsible Institution (within 24 hours or less);
5. The responsible Institution would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the Technicians and Specialists of the responsible Institution (within 24 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to historical, socio sensitivity and cultural heritage;
6. Decisions on how to handle the finding shall be taken by the responsible Institution. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
7. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the responsible Institution;
8. These procedures must be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Project Engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed;
9. Construction work will resume only after authorization is given by the responsible local authorities and the responsible Institution concerning the safeguard of the heritage; and
10. Relevant findings will be recorded in Implementation Supervision Reports and Implementation Completion Reports will assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.
11. The Chance Finds Procedures should identify the responsible institution(s) to be contacted depending on the type of cultural heritage found on site. The following table provides an indicative list of some of the authorities that can be contacted:

Type of cultural heritage	Responsible agency/authority
Grave	Local authorities
Mass graves	Local authorities
Genocide memory/memorials	Ministry of National Unity and local authorities
Archaeological items	Rwanda Cultural Heritage Academy

Annex 13: Typical Dominant fauna and flora species of the project areas

Plant species recorded in the project areas

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
13	Alismatales	Araceae	<i>Colocasia esculenta</i>	Yam	Iteke	LC
19	Arecales	Arecaeae	<i>Phoenix reclinata</i>	Palm	Umukindo	-
20	Asparagales	Asparagaceae	<i>Agave sisalana</i>	Sisal	Umugwegwe	LC
14	Asparagales	Dracaenaceae	<i>Dracaena afromontana</i>	Dragon plant	umuhati	LC
21	Asterales	Asteraceae	<i>Aspilia pluriseta</i>	Wild sunflower	Icyumya	-
22	Asterales	Asteraceae	<i>Bidens pilosa</i>	Black- Jack	Inyabarasanya	-
23	Asterales	Asteraceae	<i>Blumea brevipes</i>		Igitabitabi	-
24	Asterales	Asteraceae	<i>Crassocephalum vitellinum</i>	Fireweed	Isununu	-
25	Asterales	Asteraceae	<i>Guizotia scabra</i>		Igishikashike	
26	Asterales	Asteraceae	<i>Helianthus annuus</i>	Sunflower	Igihwagari	LC
27	Asterales	Asteraceae	<i>Lactuca inermis</i>		Ikinyamata	-
28	Asterales	Asteraceae	<i>Melanthera scandens</i>	Snow squarestem	Kimari	
29	Asterales	Asteraceae	<i>Sonchus luxurians</i>	sow thistles	Rurira	-
30	Asterales	Asteraceae	<i>Tagetes minuta</i>	Mint marigold	Nyiramunukanabi	
31	Asterales	Asteraceae	<i>Vernonia amygdalina</i>	Bitter leaf	Umubilizi	-
32	Asterales	Asteraceae	<i>Vernonia lasiopis</i>		Igiheriheri	-
34	Brassicales	Brassicaceae	<i>Brassica oleracea</i>	cabbage	Ishu	-
35	Brassicales	Caricaceae	<i>Carica papaya</i>	Papaya	Ipapayi	-
36	Brassicales	Cleomaceae	<i>Cleome gynandra</i>	Shona cabbage	Isogi	-
16	Cucurbitales	Cucurbitaceae	<i>Zehneria scabra</i>	Wild cucumber	umushishiro	LC
39	Cucurbitales	Cucurbitaceae	<i>Cucurbita pepo</i>	Courgette	Igihaza	LC
7	Fabales	Fabaceae	<i>Phaseolus vulgaris</i>	Common beans	Igishyimbo	LC
8	Fabales	Fabaceae	<i>Glucine max</i>	Soybean	Soya	LC
33	Lamiales	Bignoniaceae	<i>Markhamia lutea</i>	Nile tulip	Umusave	LC
11	Malpighiales	Euphorbiaceae	<i>Manihot escuranta</i>	Cassava	Imyumbati	LC
17	Malpighiales	Euphorbiaceae	<i>Euphorbia tirucalli</i>	Milk bush	umuyenzi	LC
37	Myrtales	Combretaceae	<i>Combretum collinum</i>	Bushwillow	Umukoyoyo	-
40	Poales	Cyperaceae	<i>Cyperus papyrus</i>	Papyrus	Urufunzo	
1	Poales	Poaceae	<i>Oryza sativa</i>	Rice	Umuceri	LC
2	Poales	Poaceae	<i>Zea mays</i>	Maize	ikigori	LC
18	Poales	Poaceae	<i>Saccharum officinarum</i>	Sugar cane	Igisheke	LC
12	Proteales	Proteaceae	<i>Grevillea robista</i>	Silky Oak	gereviliya	LC
3	Sapindales	Anacardiaceae	<i>Mangifera indica</i>	Mango	umwembe	LC
4	Sapindales	Rutaceae	<i>Citrus lemon</i>	Citrus	indimu	LC
5	Sapindales	Rutaceae	<i>Citrus sinensis</i>	Orange	icunga	LC
6	Sapindales	Rutaceae	<i>Citrus reticulata</i>	Mandarin orange	Mandarina	LC
38	Solanales	Convolvulaceae	<i>Ipomoea batatas</i>	Potato	Ikijumba	-
15	Solanales	Convolvulaceae	<i>Ipomoea batatas</i>	Sweet potato	Ikijimba/imigozi	LC
9	Solanales	Solanaceae	<i>Solanum melongena</i>	Egg plant,	urutoryi	LC
10	Solanales	Solanaceae	<i>Solanum lycopersicum</i>	Tomato plant	Inyanya	LC

Bird species recorded in the project areas

No	Order	Family	Scientific name	Common name	Vernacular	IUCN
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					name	status
1	Columbiformes	Columbidae	Streptopelia semitorquata	Red-eyed dove	Inuma (intungura)	LC
2	Galliformes	Phasianidae	Pternistis hildebrandti	Hildebrandt's Francolin	inkware	LC
3	Passeriformes	Nectariniidae	Hedydipna collaris	Collared sunbird	Umununi	LC
4	Pelecaniformes	Threskiornithidae	Threskiornis aethiopicus	Waterbird	nyirabarazana	LC
5	Gruiformes	Gruidae	Balearica regulorum	Grey Crowned Crane	Umusambi	EN
6	Passeriformes	Corvidae	Corvus albus	Pied Crow	Icyiyoni	LC
7	Passeriformes	Passeridae	Passer griseus	House sparrow	igishwi	LC
8	Accipitriformes	Accipitridae	Buteo augur	Common buzzard	icyanira	LC
9	Passeriformes	Leiothrichidae	Turdoides jardineii	Arrow-Marked Babbler	Ikijwangajwanga	LC
10	Apodiformes	Apodidae	Apus caffer	white-rumped swift	Intashya	LC
11	Pelecaniformes	Ardeidae	Bubulcus ibis	Cattle Egret	Inyange	LC
12	Hemiptera	Pseudococcidae	Planococcus citri	Mealybugs	utumatirizi	LC
13	Passeriformes	Muscicapidae	Cossypha heuglini	White-browed Robin-chat	Inyombya	LC
14	Passeriformes	Ploceidae	Ploceus pelzelni	Slender-Billed weaver	Isandi	LC
15	Cuculiformes	Cuculidae	Centropus superciliosus	White-browed Coucal	Ikibiribiri	LC
16	Pelecaniformes	Threskiornithidae	Threskiornis aethiopicus	Sacred Ibis	Nyirabarazana	LC
17	Charadriiformes	Charadriidae	Ardea melanocephala	Black-Headed Heron	Uruyongoyongo	LC
18	Pelecaniformes	Scopidae	Scopus umbretta	Hamerkop	Injongo	NA
19	Coraciiformes	Meropidae	Merops persicus	Blue cheeked Bee-eater	Umusure	LC
20	Accipitriformes	Accipitridae	Milvus migrans	Black kite	Sakabaka	LC
21	Passeriformes	Passeridae	Passer melanurus	Cape sparrow	Uruhuri	LC

Reptile species recorded in the project areas

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
3	Squamata	Agamidae	<i>Lacerta agama</i>	Agama	Icyugu	LC
5	Squamata	Agamidae	<i>Trachylepis striata</i>	African striped skink	Umuserebanya	LC
4	Squamata	Colubridae	<i>Philothamnus heterolepidotus</i>	African Green Snake	Incarwatsi	NA
1	Squamata	Lamprophiidae	<i>Boaedon lineatus</i>	Striped house snake	Ikiryambaba	LC
2	Squamata	Lamprophiidae	<i>Psammodromus sibilans</i>	Striped sand snake	Imbarabara	LC

Amphibian species recorded in the project areas

No	Order	Family	Scientific name	Common name	IUCN status
5	Anura	Bufoniidae	<i>Sclerophrys regularis</i>	African common toad	LC
6	Anura	Bufonidae	<i>Amietophrynus kisolensis</i>	-	LC
3	Anura	Dicroglossidae	<i>Hoplobatrachus occipitalis</i>	Crowned bullfrog	LC
1	Anura	Pipidae	<i>Xenopus muelleri</i>	Müller's clawed frog	LC
4	Anura	Ptychadenidae	<i>Ptychadena guibei</i>	Guibe's Grassland Frog	-
2	Anura	Ptychadenidae	<i>Ptychadena nilotica</i>	Nile Ridged Frog	LC

Mammal species recorded in the project areas

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
5	Artiodactyla	Hippopotamidae	<i>Hippopotamus</i>	River hippopotamus	Imvubu	VU

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
			<i>amphibius</i>			
2	Carnivora	Canidae	<i>Canis adustus</i>	Side Striped Jackal	Imbwebwe	LC
3	Carnivora	Felidae	<i>Felis lybica</i>	African wildcat	Inturo	LC
1	Lagomorpha	Leporidae	<i>Lepus victoriae</i>	African hare	Urukwavu rw'agasozi	LC
4	Rodentia	Nesomyidae	<i>Cricetomys gambianus</i>	Gambian rat	Isiha	LC

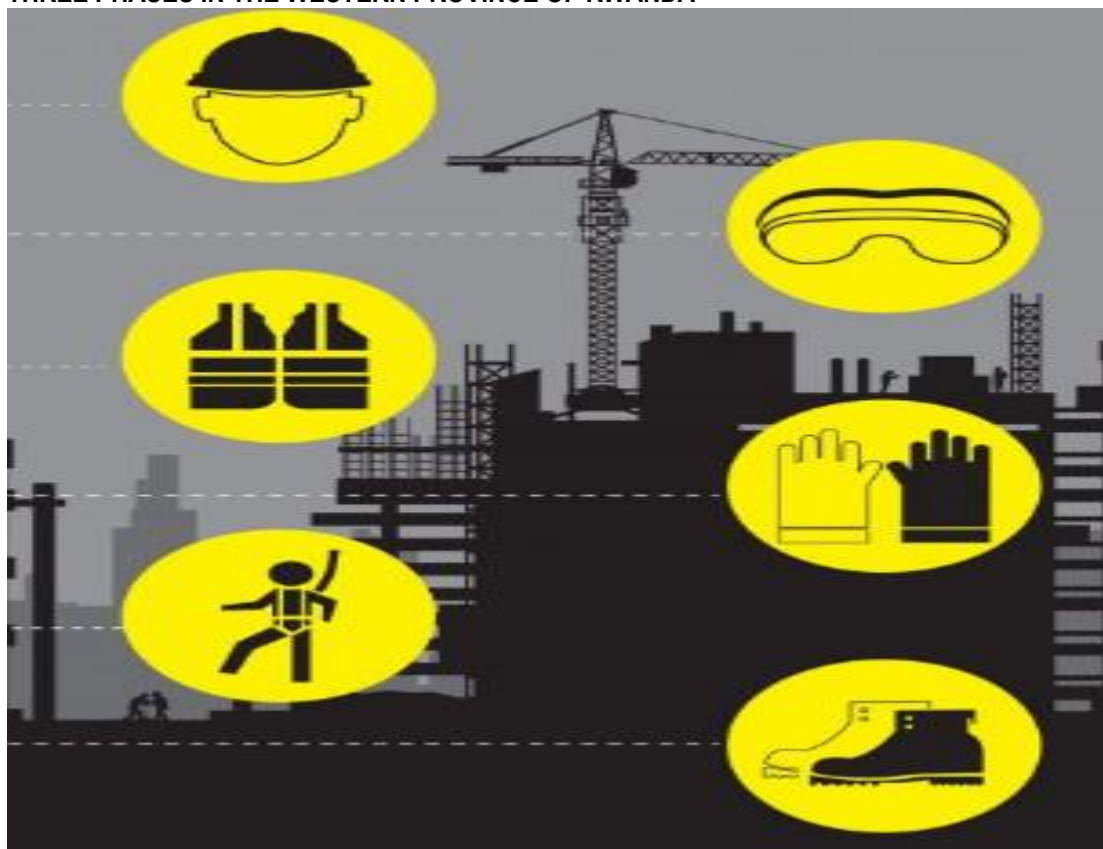
Fish species recorded in the project area

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
1	Cichliformes	Cypridae	<i>Oreochromis niloticus</i>	Nile Tilapia	Ingege	LC
2	Dipnoi	Lepidosirenidae	<i>Protopterus aethiopicus</i>	Lungfish	Imamba	LC
3	Siluriformes	Clariidae	<i>Clarias gariepinus</i>	African Catfish	Inkube/Inshonzi	LC

Annex 14: Contractor Environmental Social Health and Safety Plan



OCCUPATIONAL HEALTH, AND SAFETY PLAN FOR THE DESIGN, SUPPLY, AND INSTALLATION OF MEDIUM AND LOW VOLTAGE LINES, SERVICE CONNECTIONS, AND UPGRADING THE SINGLE-PHASE LINES TO THREE PHASES IN THE WESTERN PROVINCE OF RWANDA



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ACRONYMS AND ABBREVIATIONS

ASCENT	: Accelerating Sustainable and Clean Energy Access Transformation
BESST	: Bureau for Engineering and Environmental Studies
EDCL	: Energy Development Corporation Limited
EPC	: Engineering Design, Procurement and Construction
ESF	: Environmental and Social Framework
ESHS	: Environmental, Social Health and Safety Plan
ESIA	: Environmental and Social Impact Assessment
ESS	: Environment and Social Standards
ESS	: Environmental and Social Standard
GoR	: Government of Rwanda
HSP	: Health and Safety Plan
IFC	: International Finance Corporation
MININFRA	: Ministry of Infrastructure
MoE	: Ministry of Environment
OHS	: Occupational Health and Safety
OS	: Operational Standards
PPE	: Personal Protective Equipment
PS	: Performance Standard
RDB	: Rwanda Development Board
REG	: Rwanda Energy Group
REMA	: Rwanda Environment Management Authority
WBG	: World Bank Group
WMP	: Waste Management Plan

1. INTRODUCTION

This Occupational Health and Safety Plan (OHSP) has been developed to design, supply, and install medium and low voltage lines, service connections, and upgrade single-phase lines to three phases in the Western Province of Rwanda. OHSP has been prepared in compliance with Rwanda regulations especially law no 48/2018 of 13/08/2018 on environment and law no 027/2023 of 18/05/2023, the World Bank Environmental and Social Standards.

The OHSP delineates and details actions to be implemented to identify not only general risks but also potential hazards specific to the project and establish the procedures to mitigate them. The plan is established to assist the Project implementing entity in achieving its "Zero Accidents" objective. It serves to inform and define the OHS regulations that must be adhered to by all Contractors, subcontractors, and workers, involved in project activities.

1.1. Objective of Occupational Health and Safety Plan

The objective of OHSP is to define the set of measures for the prevention of risks likely to arise from the execution of different activities on site. The OHSP encompasses a package of protection/prevention measures complementing the context of the ESMP and emphasizing health and safety issues to be considered during the overall project cycle.

Specifically, the Occupational Health and Safety plan:

- ✓ Provides instruction and guidance to the Project team, including contractors and subcontractors, on the development and implementation of project-specific Health and Safety requirements;
- ✓ Guides on how to identify and incorporate safety considerations as related to detailed design and construction;
- ✓ Guides how to identify coordination and collaboration arrangements of the detailed design and execution phases of the project;
- ✓ Provides the minimum requirements of safety in the subproject site to be achieved;
- ✓ Guides how to ensure compliance with all relevant statutory requirements;
- ✓ Inform contractors and subcontractors in advance of the Occupational Health and Safety requirements that shall be strictly enforced on the Project;
- ✓ Informs the Consultant Firm, of the content of the project's Environmental, Social, Occupational Health and Safety program and relevant responsibilities under current Regulations;
- ✓ Establishes a framework for the implementation and sequencing of Occupational Health and Safety initiatives across the various phases of Construction activities;
- ✓ Establishes roles and responsibilities associated with the Occupational Health and Safety Management Manual;
- ✓ Eliminates and prevent any health, safety, community, and any OHS related hazards within the working environment, and control the hazard at its source as possible;
- ✓ Promote safety consciousness among all employees, contractors, subcontractors, and visitors within the project premises.

1.2. Scope of application

This OHSP must be applied to the entire project cycle of design, supply, and installation of medium and low voltage lines, service connections, and upgrading single phase lines to three phases in the Western Province of Rwanda as well as, employees and subcontractors. This document must be considered as a minimum requirement, and the application of this plan is the direct responsibility of the EDCL management and all employees, subcontractors, and Contractors involved in its day-to-day operation.

1.3. Project Location and Activities

This OHSP is for the design, supply, and installation of medium and low voltage lines, service connections, and upgrading single phase lines to three phases in all districts of the Western province namely Rubavu, Karongi, Nyabihu, Nyamasheke, Ngororero, Rusizi and Rutsiro to improve the rate of access to electricity supply countrywide. The main component of the present project is the construction of electrical distribution networks in different sectors and service connections to the local population. The focus is to connect households and public institutions (schools, administration offices, health centers, etc) and productive users (small industries where applicable). During the project implementation, different activities will be done, and these are divided into 4 phases: (i) Design and Planning phase, (ii) Construction Phase, (iii) Commissioning Phase, and (iv) Operation Phase.

1.3.1. Design and construction phases.

During the Design and Planning Phase, there will be a process of survey and mapping for new transmission and distribution routes and transformer locations to avoid harming sensitive ecosystems. There is no land acquisition for MV and LV lines as there will be passing in land for agriculture; only, it will be a compensation process for the crops and trees damage.

✓ ROW Clearance

During the construction phase, it will be the process of clearing the Right of Way (ROW) as the initial activity that will occur during the construction phase. This is done to create the vertical and horizontal clearance required when constructing power lines. The clearance will be done on 12 meters large (6 m each side from the center line). However, only trees and crops that can grow to more than 3 meters in height will be cleared on 12 meters; the short crops will be damaged by the passengers only and it is expected to be minimum like not more than 2 meters large. The asset valuation will be done to 12 meters and will cover all trees and crops on that surface. In case a residential house is found within the 6 m will be relocated and fair compensation will be done. However, maximum efforts will be made during the line route design to avoid houses under the RoW.

1.4. Foundation excavation and pole erection

Foundation excavations and erection of poles will consist of creating the foundations for erecting poles. The general outlines of the poles may be varied but the general dimensions, phase spacing, clearances, and the configuration of the conductors and earth wire are those applied to similar projects being implemented countrywide.

✓ Installation of transformers.

MV/LV transformers will be installed at different sites along the transmission lines. These transformers will play the role of stepping down the electricity from MV to LV before distribution to consumers.

1.5. Operation phase and Maintenance of the RoW

During the operation phase, it will be operation and maintenance of the transformers and the lines that will have been installed during the construction phase. It is important to note that REG will no longer use transformers containing PCBs (as commonly used in old equipment) which are harmful to the environment and humans.

Just as for the line, maintenance for the transformers is required. It must provide for the regular replacement of coolants and lubricants for transformers. However, this is not frequently done unless where it is required to be. REG has indicated that they would use no more transformers containing PCBs because of their toxicity against the environment and human beings.

1.5.1. Decommissioning phase

During the decommissioning phase, it will be dismantling and removing all the structures from project construction sites, dismantling the supporting infrastructures and all those structures that were associated with the project implementation. The project also will rehabilitate the damaged sites to their former status or near what they were before the project was commissioned.

The transmission line requires clearing a permanent ROW. Its width generally is 12 m wide. Trees along the ROW must also be cleared for the safety of the lines.

The regular maintenance of the ROW will be done to maintain clearance, among poles, conductors, and all the vegetation or structures. Those maintenance operations will normally take place twice a year but may vary according to the local conditions of the project areas.

2. POLICY STATEMENT, ROLES, AND RESPONSIBILITIES

2.1. Occupational Health and Safety Policy Statement

It is EDCL's policy to manage its business affairs safely and to ensure the safety and well-being of all personnel involved in the project. This is reflected in this Health, Safety, and Environment(OHSP) plan that EDCL has adopted for all its project activities.

EDCL recognizes the following obligations and principles:

- Each employee has a right to work in an environment that will not adversely affect his or her health and safety;
- Is committed to providing safe workplaces for all its employees;
- Is committed to protecting the health and safety of its contracting parties and the public;
- Will diligently carry out the duties contained in the OHSP plan;
- Will minimize the risk of occupational injury, illness, and property damage;
- Monitors the continuous implementation of OHSP programs;
- Ensures that contractors, managers, and supervisors identify and control workplace hazards and communicate information about those hazards throughout the workplace.

Every employee has a personal responsibility to become involved in solving OHSP hazards. To achieve this, all employees must work together to identify and control situations that could cause harm. It is EDCL's priority to integrate OHSP practices into daily activities headed by project personnel, from project managers to site managers, to foremen, to linesmen, to maintain an engrained OHSP culture throughout the organization.

2.2. Zero accident policy

The creation of an "Incident Free" environment within the project requires a thorough understanding and acceptance of the principles explained in the OHSP plan. EDCL will stand for activities free from incidents to be consistent in delivering safe, productive, and efficient project deliverables prioritizing a zero-accident performance. EDCL will ensure the implementation of the following principles:

- ✓ The immediate identification and elimination of unsafe work practices and conditions at any workplace.
- ✓ Elimination of human error as a source of incidents, irrespective of rank or position in the organization.
- ✓ Building a team safety mentality where each worker contributes to the effort and each supervisor is fully aware of the capabilities and limitations of their team either individually or collectively.
- ✓ A culture in which everyone accepts responsibility and accountability for their own and each co-worker's safety and health.

2.3. Incident readiness

It is the personal responsibility of each employee to ensure that the action taken by them does not endanger the health and safety of other colleagues. The person to be contacted and the relevant telephone number, in case of any incident, shall be known to all personnel.

They must ensure and be made aware that:

- ✓ Being familiar with the location of first aid boxes and fire extinguishers in the areas in which they work
- ✓ Providing support within their competence
- ✓ Calling for further help if necessary
- ✓ Coordinate Search and Rescue Teams.
- ✓ Determine the need for medical assistance.
- ✓ Administer first aid as needed.
- ✓ Keep a record of types of injuries and aid provided.
- ✓ Mitigate emotional trauma.

2.4. Personal initiative empowerment

It is the personal responsibility of each employee to ensure that the action taken by them does not endanger the health and safety of other colleagues. They must ensure and be made aware that:

- ✓ They and the company are responsible for their safety and health and for other personnel on site;
- ✓ They should understand potential hazards and their likely effect;
- ✓ They must report any accident immediately to their supervisor;
- ✓ They must always keep the workplace in a clean and tidy condition and must not interfere with or misuse any protective equipment that has been provided for the safety site personnel;
- ✓ They must use all personal and mechanical protective equipment provided for them by the company for their safety and well-being;
- ✓ They must report any unsafe conditions and practices to their supervisor;
- ✓ They must always comply with all statutory and client requirements;
- ✓ They must assist the company management in achieving the goals and objectives of the safety plan;
- ✓ They must understand the safety plan its objectives and its support activities where no item of safety shall be ignored or deferred.

2.5. Continuous Improvement

EDCL is dedicated to the concept that all accidents are preventable. Accordingly, EDCL has adopted and committed to achieving and sustaining a “ZERO ACCIDENT” culture through continuous improvement practices. This applies also to its contractors and subcontractors who should:

- ✓ Strive to eliminate all occupational injuries and illnesses;
- ✓ Promote health, safety, and environment program objectives as a constant value in designing, planning, training, and executing work;
- ✓ Spread ownership for health, safety, and environment program effectiveness throughout the company's organization;
- ✓ Increase employees' consistent use of safe practices in their daily work activities;
- ✓ Optimize the use of continuous improvement practices as the basis for zero accident initiatives;
- ✓ Promote the opportunity for employees and affected communities to submit concerns about OHSP through feedback channels to collect possible complaints.

2.6. OHSP Management team and responsibilities

Project managers, site managers, site supervisors, foremen, linesmen, etc. shall be familiar with the OHSP rules, regulations, and laws that apply to the project. They shall document all actions taken to ensure compliance with this OHSP plan. Site personnel and its management will participate in scheduled project activities, site audits, and safety walks, and will implement and document all required corrective actions.

The site management team will attend and will communicate OHSP expectations and will conduct orientation sessions for all employees, selected suppliers, and subcontractors working in/with the project site. The specific responsibilities and authority of OHSP management are detailed as follows:

2.6.1. Project Manager

- Demonstrate ownership, and leadership and actively participate in all phases of the OHSP Plan
- Provide management support necessary to carry out OHSP system requirements;
- Participate and support OHSP initiatives and preventive actions;
- Lead by positive example
- Communicate personally with direct reports on OHSP issues related to their area of responsibility;
- Inspection of OHSP documentation and working places

2.6.2. Site Manager

OHSP role/function is an area for which the Project Manager is fully responsible, it is allocated to the Site Manager who will ensure that OHSP practices are implemented by the Site Supervisors. The Project Manager is responsible for the overall Project OHSP and the site manager is responsible for the on-site OHSP management of the project.

The site manager is responsible for:

- ✓ Familiarization with and assist in the interpretation of all local, national, and international laws that apply to project operations;
- ✓ Prioritizing and producing a strategy for implementing the various elements of the OHSP plan and ensuring that it is being communicated effectively throughout the project organization and subcontracting companies;
- ✓ Reporting continuously to the management team on implementation progress, points of concern, and topical points of issue regularly;
- ✓ Being the custodian of the OHSP plan;
- ✓ Ensure that EDCL personnel and subcontractors comply with the required Personal Protection Equipment (PPE) as required by the OHSP plan;
- ✓ Seeking assistance from the project manager for specific parts of the OHSP plan;
- ✓ Updating and giving feedback to the OHSP plan based on observed circumstances;
- ✓ Establishing and maintaining a professional relationship with the employer's representative and with the subcontractor company's representatives to ensure that OHSP practices are implemented during daily operations;
- ✓ Providing direction as necessary to attain safety management standards and goals required by the safety program;
- ✓ Ensuring that sufficient training and daily induction of all personnel is being provided and maintained;
- ✓ Developing the safety awareness of all personnel employed on the project via the various OHSP programs, and ensuring their participation in all aspects OHSP program;
- ✓ Overall safety administration and resources for the entire duration of the project;

- ✓ Identification of all hazard-related activities and development of specific contingencies in preventing any work-related accidents;
- ✓ Define a program for visits and safety inspections of work sites, storage areas, and fabrication yards;
- ✓ Report procedures and keep records for loss prevention.
- ✓ Preparation, monitoring, review, and updating of the Environmental Plan;
- ✓ Assist the Project Manager with environmental problems;
- ✓ Verify the implementation of the Environmental Plan and the Work Environmental Plan;
- ✓ Determination and reporting of the principal causes of Environmental problems to the EDCL Project Manager;
- ✓ Participate actively in OHSP promotional activities;
- ✓ Conduct daily Pre-Job Briefings on-site (Toolbox meetings) to ensure all OHSP guidelines are understood and followed.

2.6.3. Site Supervisors/ Foremen

The Supervisors/Foremen reports to Site Manager, and he is responsible for:

- ✓ Be familiar with, explain, and enforce OHSP regulations that apply to project operations;
- ✓ Ensures that safety devices and PPE are used by persons under his supervision;
- ✓ Instructs and trains all persons within the area of responsibility in job OHSP requirements, including hazard recognition and avoidance, and requires compliance by workers with the safety rules established;
- ✓ Conducts as often as needed safety briefings with all workers under his supervision;
- ✓ Conducts informative toolbox talks every day before the start of activities;
- ✓ Ensures that injuries are treated promptly and reported properly;
- ✓ Investigates all accidents/incidents, obtains all pertinent data, and initiates corrective action;
- ✓ Conducts frequent and regular safety and health inspections of his work areas and ensures that no unsafe conditions exist in responsibility.
- ✓ Reports to the Project Manager/OHSP Manager on any corrective actions needed which are beyond his control;
- ✓ Ensures that adequate inspection and maintenance of the equipment has been carried out;
- ✓ Identifies defects and incidents and ensures that corrective action is taken;
- ✓ Stops the operation whenever an unsafe condition is identified;
- ✓ Ensures the completion of the work method statements and procedures.

2.6.4. Subcontractors

Being consistent with contractual obligations, all subcontractors shall fully comply with the Contractors' E&S commitments, subcontractors are responsible for:

- ✓ Subcontractor management promotes, supports, and actively participates in the "Zero Accident" philosophy.
- ✓ Implementing the sub-project OHS Plan as well as the subcontractors' own OHS plan;
- ✓ Identifying the hazards of their work, assessing the risks arising from these hazards, and informing how these risks will be controlled.
- ✓ Providing a safe and healthy work environment for their personnel;
- ✓ Complying with local OHS legislative requirements;
- ✓ Providing OHS information to the workers;
- ✓ Issuing to any lower-tier subcontractors a copy of the health and safety plan and any other applicable safety and health procedures;
- ✓ Developing and maintaining risk assessments for all site construction activities.

2.6.5. Workers

Each worker/ who is performing their working duties is responsible for assuring the safety for themselves; Safety for fellow employees; protection for the public; and protection for sub-project property and for public and private property.

Workers will be in charge of the following:

- ✓ It is the responsibility of each worker to notify his senior or the designated OHS Officer or the Construction Project Manager once an unsafe condition or act is witnessed on the job.
- ✓ When a worker is requested to perform duties under unsafe conditions, the worker should not perform those duties without first notifying the person in charge of the unsafe conditions. On the other meaning, no one should be in unsafe conditions. Rather than risky work, there should be certain safety measures that should be provided and followed to minimize the risk and ensure the safe implementation of the activity. It's the responsibility of the contractor to provide and request the workers to use the PPEs;
- ✓ It is the responsibility of each worker to attend safety training and meetings where possible and to take an active

part in safety work. It is the responsibility of each contractor to ensure workers know and understand the safety rules of this Plan Manual, and the sub-project OHS Plan, which will apply to the work being performed.

3. OCCUPATIONAL HEALTH AND SAFETY PROCEDURES

3.1. Identification and Evaluation of Risks

3.1.1. Risk identification.

To identify the risks to the safety of the persons present on and near the site, the following rules shall be applied;

- Analysis of the work activities foreseen in the method statement. The Method Statement analysis shall be carried out before the commencement of the works, by the Resident Site Manager and the OHS officer to evaluate the risks related to the work activities,
- Identification of potentially dangerous activities,
- Risk factors identification,
- Risk evaluation based on the probability that the event (accident) will occur (probability) and the effects on the health of persons involved (damage) based on the experience held by the Contractor's similar projects or work conditions,
- Checking safe work procedures.

3.1.2. Method of evaluation

To evaluate the safety of the persons, present on and near the site, the following rules shall be applied;

- Analysis of the work activities foreseen in the method statement. The Method Statement analysis shall be carried out before the commencement of the works, by the Resident Site Manager and the Safety Officer to evaluate the risks related to the work activities,
- Identification of potentially dangerous activities,
- Risk factors identification,
- Risk evaluation based on the probability that the event (accident) will occur (probability) and the effects on the health of persons involved (damage) based on the experience held by the Contractor's similar projects or work conditions,
- Checking safe work procedures.

3.1.3. Hazard identification

The following risks have been identified because of the analysis of the work activities together with the tools, equipment, facilities, and dangerous or potentially dangerous materials that shall be used or present on site;

Risks for safety have therefore injuries or physical damages:

- **People falling to the ground:** Slides and falls on the plane of the job, provoked by the presence of oil, grease, or dirt on the points of grip (in the case of slope on means or cars), tripping hazards in the workplace, (for example miscellaneous debris or cords) or from bad conditions of the pedestrian visibility created by poor lighting.
- **People falling from high places (higher than 2m):** People fall from high places, due to the loss of equilibrium of the worker and/or to the absence of suitable protections (collective or individual), slips or trips, from improperly constructed temporary work, crane or within overly steep excavations, lifting or transport vehicles, or from any other higher job posting;
- **Drop of materials or tools:** Materials, tools, or objects dropped down from higher working places or fallen during transport with trucks, cranes, or other lifting means. Materials projected by blasting;
- **Running down by vehicles:** Personnel being rundown by improperly operated vehicles or allowing personnel to be in restricted areas or by personnel error;
- **Blows, knocks, impacts & compressions:** caused by violent contact with equipment, structures, or other object present in the workplace;
- **Pricks, cuts & abrasions:** cuts, punctures, and abrasions to the hands; bruises and traumas to the whole body without a specific location, for contact with the used utensil or consequent to bumps with any kind of object present in the work yard;
- **Heat, flames:** the accidental contact with parts or tools at high temperatures (welding tools, grinders, parts of engines, etc.), flames or materials (bitumen, hot liquids, etc.), the prolonged exposure to the heat or sunlight causes burns;
- **Electrocution or Fulguration:** Electrocution for direct or indirect contact with under-tension parts of the electric line or equipment;

- **Jets, squirts:** Lesions in any part of the body during the jobs performed by hand or with utensils, with material, substances, products, and equipment that can cause jets or squirts dangerous for the health. Lesions concerning any part of the body consequent to the projection of splinters or fragments during workmanship performed directly or in neighbouring postings of the job;
- **Hurling of particles into eyes:** Lesions at the eyes consequent to the projection of splinters or fragments during workmanship performed directly or in neighbouring postings of the job;
- **Fire explosion:** Lesions provoked by fires and/or consequent to the explosion due to the combustion of containers or reservoirs containing fuels, gasses, or chemical substances highly deflagrating or to the blasting of explosives;
- **Vehicle accident:** includes accidental contact between two or more vehicles or between a vehicle and a person.

Risks for health that need long exposure to the risk:

- **Vibrations and Noise:** damages to the skeletal and muscular apparatus caused by the vibrations transmitted to the worker by equipment, tools cars, or parts of them; damages to the auditory apparatus caused by the prolonged exposure to the noise produced by the processing, tools, equipment, or plants;
- **Dust, fibres:** Damages to the respiratory apparatus and in general to the health of the worker, consequently to the exposure to fine course materials, or materials releasing minute fibres;
- **Non-ionizing Radiations:** prolonged exposure to non-ionizing radiations as electromagnetic fields with extremely low frequencies, radio frequencies, microwaves, infrared, etc.;
- **Mineral Oils, hydrocarbons:** Dermatitis, coetaneous irritations, allergic reactions, or damages to the respiratory apparatus caused by the contact with mineral oils or hydrocarbons or inhalation of the vapours developed during the process;

Other risks are caused by an incorrect organization of the job site.

- **Loads manual handling:** Lesions to the skeletal and/or muscular apparatus during the manual handling of loads, because of their excessive weight or dimension or due to the incorrect position assumed by the worker during the handling;
- **Ergonomics:** Muscular pains because of wrong positions assumed during the use of the equipment;
- **Interferences:** Presence of different activities in the same or near the working area which can interfere and transfer risks of one activity to the workers engaged in another.

3.2. Risk assessment and Management.

3.2.1. Safety Inspections

Safety inspections will be made continuously by the site manager or appointed representative to identify any situation that could result in possible hazardous conditions before the start of work and as needed throughout the work. Where a safety representative finds evidence of a situation that could result in possible hazardous conditions, exposed employees will be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

3.2.2. Job hazard analysis

Job hazard analysis is a procedure that serves to identify risks associated with activities that need to be performed during the project implementation. The analysis identifies risks and control measures are defined to ensure that such risks do not materialize when conducting the work. Based on the output of the analysis, activities shall be planned so that they are carried out under specified conditions to control the risks.

The project manager, site manager, and site supervisor shall prepare a Job Hazards Analysis for all important and higher-risk construction works. The job hazard analysis will assess the risks of the task to ensure that the health, safety, and environmental risks posed by the project activities are as low as reasonably possible. The job hazard analysis shall be a complement of the work method statements where local conditions for the project implementation will take place, these shall include:

- ✓ Reference to work method statements that describe the sequential steps of the task including before, during, and/or after the task;
- ✓ Hazards and risks posed by the task to people performing the task and to third parties;
- ✓ The need for PPE;
- ✓ Any limitations on other activities posed by the task and/or by adjacent activities;
- ✓ Any emissions to the environment resulting from the task.

The assessment will be performed early enough to allow any changes to the proposed task to be incorporated as necessary. For repetitive low-risk tasks, a generic job hazard analysis may be used.

3.2.3. Stop work authority.

Everyone involved in the project and site activities will have the responsibility and authority to ensure that all personnel at the site always comply with the safe operation resulting in zero accidents. At the project site, everyone is authorized to stop work that does not comply with a safe operation. EDCL guarantees that there will be no repercussions for the persons who stop the work for any given reason.

3.3. Personal Protective Equipment

Personal protective equipment (PPE) protects employees from the risks of injury by creating a barrier against workplace hazards.

3.3.1. Appropriate personnel protective equipment

PPE must be used when the eyes, face, hands, extremities, or other parts of the body are exposed to workplace hazards that cannot be controlled by other means.

- **Head protection** will be worn on job sites when there are potentials of falling objects, hair entanglement, burning, or electrical hazards;
- **Eye protection** will be worn when there are potentials of hazards from flying objects or particles, chemicals, arcing, glare, or dust;
- **Protective footwear** shall be worn to protect from falling objects, chemicals, or stepping on sharp objects. Athletic or canvas-type shoes shall not be worn;
- **Body protection like overalls**, raincoats, etc. shall be provided and worn in all those activities where risks for the body (acids or corrosive substances, burns, pricks, cuts, abrasions, etc.) are present;
- **Appropriate respiratory masks** shall be provided to prevent damage to the respiratory apparatus in the presence of dust, gasses, or other substances;
- **Protective gloves** or clothing shall be worn when required to protect against a hazard;
- **Harnesses and lanyards** shall be utilized for fall protection as required;

The use of other PPE shall be evaluated from time to time and provided and worn to the workers involved in the activity or exposed to the risk.

3.3.2. Distribution of PPE

All new employees, before starting their activities, shall be provided with all the protective equipment needed in connection with the risks they can be exposed to in the course of their duties. Special PPE will be given to the workers in case of activities to be carried out. At the act of the delivery of the PPE, each worker shall be informed and trained on the correct way to use and conserve them. Each worker will sign for receipt of the PPE. Records of all the PPE given to each single worker, including any replacement, shall be kept, using individual cards, from the safety Department. The PPE will be replaced periodically or whenever they are damaged in a way to is useful for safety purposes. Checks shall be carried out on the existence, use, and condition of the personal protections assigned to each worker. Each worker who is found on site without the PPE will not be allowed to work and shall be sent out of the job site and sanctioned. If the item is misused, misappropriated, or lost, the worker shall be strictly sanctioned.

3.3.3. Type of Personal Protective Equipment (PPE)

Personnel at the project site shall wear appropriate PPE according to their area of work. PPE shall include but not be limited to:

- ✓ Head Protection / Hard hat with chin strap;
- ✓ Eye Protection / Safety Glasses with side covers;
- ✓ Foot Protection (Safety Boots);
- ✓ Hand Protection (Hand gloves);
- ✓ Flame, electrical and mechanical Resistance (Hand Gloves, Sleeves, boots, etc...);
- ✓ Face Protection (face shield);
- ✓ Fall protection (harness and fall protection equipment);
- ✓ Protective Clothing;
- ✓ High visibility safety Vest;
- ✓ High visibility clothing with reflecting bands;

The minimum required PPE includes a hard hat with a chin strap, a high visibility safety vest, and safety boots with steel caps and ankle support. The PPE is to be used all the time. Employees are expected to report to work in adequate and appropriate construction clothing. Long pants and a T-shirt, both in good condition, are the minimum acceptable. Going shirtless is prohibited.

The distribution of PPE will be controlled with a form that will be filled during the distribution of the equipment. PPE distribution will be accompanied by a related training focusing on the correct use, maintenance, fault detection, disposal, and storage of each type of PPE. The site manager will keep control of the PPE required on-site and used by the workers. The project will have an adequate number of the above PPE for the replacement of damaged and out-of-standard PPE.

3.3.4. PPE for working at Heights.

Working at heights represents one of the most critical risks in the project. In addition to work preparations) special PPE shall always be used when conducting any activity under these circumstances. It is working at heights when the work implemented is 2 meters or more from the ground level.

- **Harness:** including hardware must be capable of withstanding a tensile loading without cracking, breaking, or taking a permanent deformation
- **Lanyard:** The lanyard must be a rope or shock-absorbing web lanyard. The lanyard and all its components in a fall arrest system must have a tensile strength. Locking-type snap hooks shall be used to connect the lanyard to the harness. The lanyard may be retractable allowing freedom of movement but protects the worker should a fall occur. A shock-absorbing lanyard will substantially reduce the force created during a fall. The maximum lanyard elongation when resisting a fall must not exceed 1.06 m in length.
- **Lifeline:** The lifeline can be horizontal or vertical. Vertical lifelines may only support one worker.
- **Rope Grabs:** A person may be connected to a lifeline using a rope grab or by a rope grab and lanyard combination. The lanyard must be less than 1.8 m long to restrict the overall fall to 1.8 m or less. The lifeline size must be stamped on the rope grab, and only that size and type of line used.
- **Anchorage:** The strength of any fall protection system is dependent on a secure attachment point.
- **Rigging:** Anchor points should be as high as possible, but never lower than the connection point on the harness. Workers must be tied off in a manner that ensures no lower level, or other surfaces are struck during a fall.

3.3.5. PPE maintenance and storage

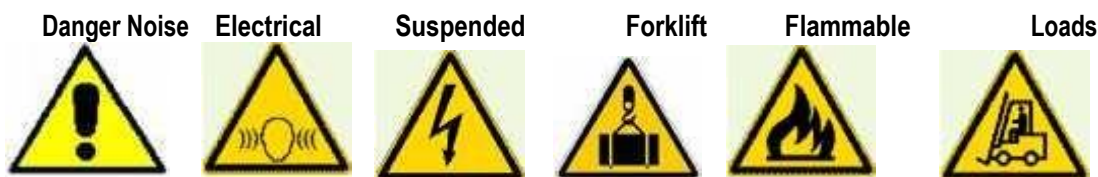
The site manager and/or personnel allocated with the responsibility will ensure that reusable PPE is regularly inspected and tested under the manufacturer's specifications and the relevant Standards.

- ✓ All persons have a responsibility to verify the conditions of PPE before and after use to detect defects.
- ✓ All persons using a fall protection system must be trained on the safe use of the system including Proper fit, wear, inspection, limitations, and care of the system. Fall protection systems must be inspected before use, at intervals as established by the manufacturer.
- ✓ Cleaning agents or equipment will be supplied by the site manager to enable employees to clean reusable PPE as required.

3.3. Signs and markings

Signboards indicating the obligation to wear PPE, or other safety measures, as well as dangers or hazards, will be placed at the entrance and in the proximity of each working area. There are three major types of signs and markings, the samples of which shall be established in due time.

Warning signs: are used to properly identify and warn of possible hazards. They should have a triangular shape, black text on a yellow background, and should always include a pictorial symbol.





Falling from High places



Welding



Battery acids



Explosion radiation



Mandatory signs: indicate that a particular course of action must be undertaken. They should have a round shape and a white pictorial symbol on a blue background.



Generic



Helmet



Ear
Protection



Respiratory
Protection



Eye
Protection



Protective
Gloves

Prohibition signs: are used to properly give a clear message that a certain action is prohibited. They should have a round shape, black pictorial symbol, white background, red border, and 45-degree red diagonal band across the symbol (from upper left to lower right).



Do not
Smoke



Not drinkable
Water



Halt



Do not use
in case of fire

Safety signs: are used to properly identify the locations of emergency equipment. They have a green background with white pictorial symbols.



Emergency Exit



First Aid



Meeting Point

Fire-fighting signs: Each item of Fire-fighting equipment should be marked with the appropriate symbol. Where various types of equipment are stored at one location, 'Fire Point' signs may be used. When equipment is stored in a recess or cupboard, a panoramic sign, mounted well above head height, should be used to enable the equipment to be identified from a distance.



Fire Extinguishers

The proper use of these signs and the appropriate compliance with their indications shall prevent potentially dangerous situations

and accidents.

3.4. Incident and accidents management

3.4.1. Incident Notification and Reporting

Contractors will notify the Project immediately following any environmental or social incident. The project will ensure that all environmental and social incidents are appropriately documented that the relevant parties are notified and that reporting requirements around the incident are met.

3.4.2. Injury and accident management

In case of injury, accident, or near miss, the workers involved must immediately report it to their Foreman, regardless of the seriousness of the event. Based on the nature/sources of the event (related to environment, health, or safety), the Foreman must implement promptly the emergency management procedure and inform the assigned Supervisor and the OHS Officer, for safety as soon as practicable. The OHS officer in collaboration with the Supervisor must immediately fill out the "notification report" and submit it to the SE. The SE must transmit it to the responsible persons based on the magnitude of the event. In case of a high-level injury/accident, the PM must be immediately informed by the SE. The PM must inform OIA management, the client, and the supervising engineer. The form filled by the OHS Plan shall include the following details;

- Description of the event;
- Causes of the event;
- Damages;
- Injury;
- Personnel or equipment involved in the event;
- Time of the Event;
- Place of the Event;
- Witnesses;
- Corrective Actions;
- Further information/attachments.

Whenever needed the OHS officer will request persons involved in the event or witnesses to provide input in the investigation form. The completed form must be then sent to the SE and subsequently to the PM for approval. Special attention to:

- Corrective measures identified and carried out with the designation of the responsible for corrective action and estimated date of closure;
- Proposed additional corrective measures with the designation of the responsible for corrective action and estimated date of closure.

Accident cases must be discussed during specific Safety Talks, called as soon as possible by the OHS Officer and involving at least the Supervisor, SE, and the foreman having witnessed the event. Record of the meeting must be prepared by the OHS Officer and transmitted to all the participants. At the estimated scheduled corrective action date of closure, the OHS officer checks the implementation of the action. In case the required actions have not been fulfilled the OHS officer requires the support of the PM and calls a Safety Talk involving at least one Supervisor.

The OHS officer must fill out the "Monthly Injury Report and HS metrics" In addition, after any injury/accident/near miss event, the OHS officer must update the "record book". The PM, according to information contained in the Monthly Injury Reports and injury/accident reports, must fill monthly overall reports that must be sent to the Site Client Representative.

3.4.3. First Aid and Emergency Medical

Provisions shall be made so that response times are not exceeded.

- ✓ An injured person will be treated by a first aider **within 5 minutes of the incident**.
- ✓ A seriously injured person will be treated by a medical professional **within one hour of the incident**. This will normally be at the hospital, or a suitable health Center.

Numbers of First Aiders

Where 5 – 50 workers there should be at least one qualified first aider present all the time. A further first aider is required for every additional 50 workers. A team member can act as a first aider if he/she holds adequate training.

It may be that additional qualified first aiders are required to achieve the response times detailed in this sheet. Also, if there are additional hazards and risks.

First Aid Kits on Site

- ✓ All projects and work areas must have at least one first aid kit. With additional kits for each 50 workers.
- ✓ First aid kits shall be constructed of resistant material, dustproof, and of sufficient size to store the required contents. They must be capable of being sealed and have a handle for emergency transport.
- ✓ The exterior of the first aid kit must be labelled in a manner that will identify, for example - "First Aid".
Contents of the kits shall be suitable and sufficient for the site.

3.4.4. Incident report and notification

WORK-RELATED INCIDENT	The incident happens at EDCL-controlled work sites or at time	EXAMPLES: All work-related travel and transportation by EDCL rented vehicle / All activities at company worksite and office.
NOT WORK-RELATED INCIDENT	Incident which does not happen at EDCL controlled situation	EXAMPLES: Travel from home to office / Injure at accommodation / Social events and customer entertainment / Sports supported by company / Transport by vehicle that is not dedicated to project use (bus, taxi).
	Actions	Notes
FATAL or LIFE-THREATENING ACCIDENT	Immediately 24/7 by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	Ensure that the message goes through. You must send additional detailed information by email within 12 hours of the accident.
ENVIRONMENT, MAJOR ROAD or OTHER ACCIDENT	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	An accident that affects many people. You have to send additional detailed information by email within 12 hours of the accident.
LOST TIME INCIDENT (WITH BODILY INJURIES)	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	The incident resulted in more than one day's absence from work. For example, when a person is taken to hospital and is not able to work the next day. E.g. a tool fell from a pole and hit a ground man's head that requires stitches.
RESTRICTED WORK	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	When a person suffers an injury but is relocated to work with alternative works E.g. a person injures his arm and can't do site work, the person is sent to do office work
MINOR INCIDENT (WITH BODILY INJURIES)	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	When first aid is provided, the injured person can return to regular work the following morning or can do substitute work during the recovery period. NOTE: When only a third party is injured, this is treated as a Near Miss. E.g. a tool fell from a pole and hit the hand of a person on the ground causing a minor wound that is treated with plaster
NEAR MISS (NO BODILY INJURIES)	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	An incident that occurred already but it did not cause any personnel injury. E.g. a tool fell from a pole but did not hit anybody or hit a helmet without injury.
POTENTIAL INCIDENT (NO BODILY INJURIES)	Daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	An event that could happen in the future if it is not prevented by preventing action. E.g. a tool could fall because it is not put properly into the tool pocket. E.g. car tires are slippery and may not be safe if rains.

3.4.5. Contact information:

A list of contact persons in case of emergency will be disclosed to all site workers. This includes contact for the site manager, EHS staff project manager, a nearby hospital, nearby Police Station Traffic, and Road Safety; Fire Brigade, Traffic Accidents; Child-Help Line; Anti-GBV; Anti-Corruption; and Ambulance only to mention but a few.

3.4.6. Communication

EDCL recognizes that the objectives of OHSP can only be achieved with effective communication. With this in mind, numerous mediums will be used to educate, raise OHSP awareness, motivate and stimulate participation. These may include:

- ✓ Safety Bulletins;
- ✓ Clear meeting agenda and meeting minutes;
- ✓ Bulletin boards, posters, or banners
- ✓ E-mail communication;
- ✓ Reports and Campaigns;
- ✓ Toolbox talks;
- ✓ Job hazard analysis.

3.5. Material and works handling.

3.5.1. Electrical facilities and installation

- Electrical connections and related works must be performed by qualified electricians, or under strict supervision of qualified professionals.
- Electrical systems shall comply with the local regulations on High and Low Voltage Facilities.
- The distribution centers shall consist of standard steel cabinets, with a mounting plate at the rear, readily accessible from the outside. They have doors fitted with thumb latches and triangular keys and are suitable for the installation of padlocks.

In addition, they are provided with the following:

- Automatic sectionalizing switch;
- Grounding network (the resistance of the grounding network shall not be greater than that against which it protects, depending on the sensitivity of the differential breaker);
- Differential circuit-breaker.

The differential circuit breaker shall have medium sensitivity in the usual case that the equipment and machines are connected to the ground network and the resistance of said equipment does not exceed 20 Ohms. To protect against overloads and short circuits, the provision shall be for automatic fuses of the magneto-thermal type. From these general distribution centers, connections shall be made for the secondary circuits, which, in turn, shall be provided with cabinets fitted with watertight inlets, with the power being supplied always through a female socket. Such secondary boards shall be provided with a general ground terminal, a standard Omni-pole circuit breaker (with circuits calibrated for each of the taps, a maximum of three), and a high-sensitivity differential breaker (30 mA). Where portable devices are used in high-humidity areas, provision shall be made for safety transformers, with a maximum rating of 220 volts, or a safety voltage shall be used (24 V).

As a rule of thumb and nail, the following precautions shall be taken about these facilities:

- Both the board and equipment terminals shall be protected with insulating tape;
- The cables that supply power to the equipment and tools shall be provided with protection covers, which shall be of the humidity-proof kind and shall not touch, or be laid, on the floor in passage areas;
- It is strictly forbidden to use cables with bare tips unless properly connected. Plugs should be used;
- All power lines shall be disconnected by switching the breakers off;
- Periodic servicing of all the facilities is essential. This servicing shall be thorough and conducted by specialized personnel;
- Notices shall be used to indicate all electrical risks, as well as the performance of servicing work;
- In case of ongoing electric shock that has not been controlled by switch-breakers, the cable giving electricity has to be disconnected immediately without touching the part of the cable/appliance that is causing the accident.

3.5.2. Load handling.

Load handling implies potential hazards, with high-risk levels for both operators and labor working in the handling area; also, the handled load could get damaged. This activity requires especially trained personnel and lifting/harnessing equipment in mint conditions and adequate for the load to be handled. The basic elements are the load to be handled and the handling operation to be carried out. In function of the load and of the type of handling, you must carry out a careful selection of handling and harnessing equipment.

- **Load to be handled and handling operation**

- All the selected personnel must know the following load characteristics:
- Typology;
- Weight;
- Centre of gravity;
- Harnessing points.

All the selected personnel must know and evaluate the following details of the handling operation:

- Distance and gradient between harnessing point and landing point;
- Transport route and possible obstacles to overcome;
- A complete view of the operation;
- Difficulties related to final positioning;
- Details of the equipment to be used to move the load.

- **Typology**

- Typology means the shape and physical characteristics of the load to be handled. The shape can be regular or irregular, and this can imply stability or instability. The shape can have a small or big volume and/or it can be quite long (for ex. piping), and this can make handling easy or hard due to narrow spaces, hindrances, or external actions (for ex. wind). The load physical and characteristics are very important:
- A fragile solid (for ex. glass) also requires precautions as an accidental bump can damage the entire load;
- A load placed inside a package also requires precautions; if the materials placed inside are not correctly secured, they can create a displacement of the center of gravity due to oscillation;
- Flexibility of the materials must be considered.
- The transport of people using lifting devices is forbidden unless specific qualified equipment (basket) is used.

- **Weight**

Knowing the weight of the load to be moved is essential. The weight must be recorded on the documents supporting the load or on the product manufacturing drawings. In their absence, it is necessary to assess the weight that must be estimated in excess (For ex. a metal body with a cavity must be evaluated as if it were a full solid).

- **Centre of gravity**

The center of gravity of the load to be handled is a critical element. This element is fundamental also for storage operations (load stability). Depending on where an item's center of gravity is located the item at rest may be in a stable or unstable condition. When the item is to be moved it is important to review the positions of the lifting points about the item's center of gravity.

The center of gravity, if not identified on supporting documents, products, or manufacturing drawings, is quite easy to determine on a regular body, but very hard on irregular bodies or packages that have not been inspected. In such a case, the lifting initial stage is fundamental to identifying the center of gravity (the lifting device hook always tends to position itself in correspondence with the center of gravity).

- **Harnessing points**

In many cases, load feature harnessing points are included during the product design stage, and in such cases, identified during the manufacturing. It is important not to mix these harnessing points with those of the single components forming the product. In other cases, the products have threaded holes for installing eyebolts or shackles: such harnessing points must be included during design and identified on the manufacturing drawings. In many cases, the hook-up man decides the harnessing points, and in this case, the choice must be carried out with extreme attention, and in particular:

- Harnessing points must guarantee a firm hooking and grip also in the event of a bump or loosening of the harnessing equipment;
- The center of gravity must be below the harnessing points;
- The center of gravity must be vertical compared to the lifting hook.

3.5.3. Lifting equipment

Where no particular requirements are specified, the following general safety requirements are considered sufficient:

- All lifting operations must be directed by only a single crane operator standing in a safe position;
- All the lift equipment and means must be following the Rwandan and international law and standards;
- Before starting to use lifting equipment, the SE must ensure that there is no wind speed faster than 40 km/hour;
- Before starting any lifting/translating operation, a sound alarm must be activated to advise all present persons of the beginning of the operations;
- Before starting any lifting activity all safety devices such as limit-switch devices and brakes, must be checked;
- Before every use the lifting device is given a reasonable visual inspection to check that the equipment looks to be in good repair and then every 3 months a more thorough visual inspection is performed for every chain, rope, hook, shackles, brakes, etc....;
- The lifting means and equipment and materials to be lifted must not be used unless it is of good construction, sound and suitable material, adequate strength, free from patent defect, and properly maintained;
- All the lifting equipment must be tested and examined by or on behalf of the manufacturer or by an authorized person and a certificate of the test and examination specifying the safe working load, signed by or on behalf of the manufacturer or by the authorized person is obtained and kept available for inspection;
- No guards of safety devices shall be disabled or removed.
- All the lifting equipment must be provided with a schedule with a load diagram that shows the load that is possible to lift including safe lifting loads as a function of the length of the boom;
- Use steps and handholds when mounting or dismounting any machine;
- Clean any mud or debris from steps, walkways, or work platforms before using them;
- Always face the machine when using steps, walkways, and handholds;
- Never transport persons inside buckets (unless specifically designed for personnel), on walkways, or platforms;
- Never stand near the operating machine while lifting or transporting materials;
- Drivers and operators must always keep safety belts fastened while operating;

3.5.4. Walking and working surfaces.

Walking and working surfaces shall be kept free of debris and other tripping hazards. Holes and ground openings, such as those created for the casting of foundations, shall be marked with demarcation procedures and material approved by local regulation and customer requirements such as caution tape, flagging, or local material such as thornbushes. This fulfills the goal of stopping intruders, persons, or animals, from accidentally falling into these openings.

3.5.5. Ladders handling

Except where either permanent or temporary stairways, ramps, man hoists, or runways are provided, ladders meeting these requirements shall be used to provide access to all elevations.

✓ Portable Ladders

The design, construction, use, and maintenance of portable ladders shall comply with the next safety requirements for "Portable Wood Ladders", and "Portable metal Ladders".

- Portable ladders used for access in the absence of fixed ladders, these shall be secured against accidental displacement at the top and bottom.
- Portable ladders shall rest on a firm foundation capable of supporting the load without displacement in any direction.
- Ladders shall be equipment with safety shoes, spurs, spikes, tread feet, or other approved slip-resistant devices at the base section of each rail. The devices shall be designed to foundation at the specified angles of inclination and on the type of surface available.

Ladders General Instructions.

- All portable ladders shall be always kept in good condition;
- A competent person shall inspect ladders at intervals not greater than two weeks;
- Any ladder found defective in any way must be returned to the contractor's store and thereafter destroyed.

Use of portable ladders should be restricted to when:

- It is impossible or impracticable to use other, safer means of access;

- Access is required irregularly and for a short term;
- There is only a need for one person at a time to use the ladder;
- There is no need to carry loads exceeding the carrying capacity of one man;
- The ladder is not required to exceed the maximum height of 10 m between landings (in all cases it should be supported to prevent any undue sagging);
- Ladders must be inspected before use for cracked or split stiles, missing, broken, lost or damaged rungs, and splinters. To facilitate inspection, ladders should be kept free from dirt and grease. Timber ladders must not be painted, but may be treated with a preservative, which does not obscure defects;
- Ladders must be of adequate length to enable them to extend to at least 10 m above the platform or working point unless other suitable handholds are available.

It is dangerous:

- ✓ To use ladders that are too short to provide access and handholds, when work is to be carried out from the ladder;
- ✓ To use short ladders spliced together;
- ✓ To place ladders on insecure supports (loose bricks or other loose packing) to obtain extra height;
- ✓ When using extension ladders an overlap of two rungs is recommended for a length of 5 m and four rungs for a 7 m long ladder.

Note: The use of ladders in a horizontal position as scaffolding is forbidden.

3.6. Work at heights

3.6.1. General requirements

Working at heights represents one of the most critical risks in electrification projects. In addition to work preparations, special PPE shall always be used when conducting any activity under these circumstances. It is working at heights when the work implemented is 2 m or more from the ground level.

- ✓ **Harness:** including hardware must be capable of withstanding a tensile loading without cracking, breaking, or taking a permanent deformation
- ✓ **Lanyard:** The lanyard must be a rope or shock-absorbing web lanyard. The lanyard and all of its components in a fall arrest system must have tensile strength. Locking-type snap hooks shall be used to connect the lanyard to the harness. The lanyard may be retractable allowing freedom of movement but protects the worker should a fall occur. A shock-absorbing lanyard will substantially reduce the force created during a fall. The maximum lanyard elongation when resisting a fall must not exceed 1.06 m in length.
- ✓ **Lifeline:** The lifeline can be horizontal or vertical. Vertical lifelines may only support one worker.
- ✓ **Rope Grabs:** A person may be connected to a lifeline using a rope grab or by a rope grab and lanyard combination. The lanyard must be less than 1.8 m long to restrict the overall fall to 1.8 m or less. The lifeline size must be stamped on the rope grab, and only that size and type of line used.
- ✓ **Anchorage:** The strength of any fall protection system is dependent on a secure attachment point.
- ✓ **Rigging:** Anchor points should be as high as possible, but never lower than the connection point on the harness. Workers must be tied off in a manner that ensures no lower level, or other surfaces are struck during a fall

3.6.2. Safety while working at heights and permanent attachment.

OHS staff will train project employees in the hazards and control measures associated with working at heights, will make sure that personnel is permanently attached, and will make maximum use of primary fall protection systems, such as scaffolds, aerial lifts, personnel hoists, etc. The contractor will use safe work procedures and enforce, among others, the following prevention/protection measures:

- ✓ Evaluate all overhead work for fall exposures and pre-plan and install required fall protection systems before assigning the work to employees;
- ✓ Adopt a 100% fall protection policy that makes provision for secondary fall protection for all employees who are working more than 2 m above ground or other solid objects.
- ✓ All fall protection devices will be manufactured and used by a recognized international standard;
- ✓ Review work to identify the methods to achieve 100% fall protection before commencement of such work;
- ✓ Require the inspection of fall protection equipment before each use;
- ✓ Defective equipment will be removed from service and destroyed;
- ✓ Contractor shall ensure that each & every activity has fall protection rescue plan;
- ✓ All lifeline equipment (cable, connectors, supports, etc.) shall be part of the system and will only be used for fall protection;
- ✓ Ensure that persons working at height will have their safety helmets secured by chinstraps to retain the helmet on

the head;

- ✓ Ensure systems are in place to prevent tools, materials, and other objects from falling from height.

3.7. Fire prevention and protection.

Fire protection and prevention shall be followed throughout all phases of the construction and dismantling. This is to be followed by the project team and its subcontractors.

As fire protection requirements occur, there shall be no delay in providing the necessary equipment. The following points are suggested for the prevention of fire.

- Know the place of work, fire hazards, and the location of firefighting equipment;
- Keeps all the firefighting equipment clear of obstructions.;
- Provide easy access to firefighting equipment to save time and minimize any damage due to fire;
- Keep the place of work clean and tidy;
- Do not smoke in 'No Smoking' zones. Do not carry lighted cigarettes hot substances or any sources of ignition where flammable materials are used or stored;
- Avoid the contact of oil, grease, or paint with oxygen cylinders. There may be an explosion due to oxidation;
- Switch off the main supply if electrical equipment is not in use;
- Never throw lighted cigarettes and burning sticks into dust bins, they may ignite and create a fire when you are not there;
- Special purpose electrical equipment shall only be used at storage places for hazardous/flammable material;
- Training will be provided to employees in the proper use of fire extinguishers, fire prevention, and fire precautions.

3.8. Site roads and transport of material

One of the first causes of injuries on site is vehicular accidents. Site roads shall be:

- Wide enough to allow the free circulation of the vehicles in both ways. In case the ground morphology does not permit the realization of a double-way road, then lay-by shall be foreseen;
- Maintained always in good condition, clean of mud and free stones, and free of holes;
- Speed reducers like bumps or trenches shall be done across the roads before dangerous curves, bottlenecks, or dangerous areas; this procedure shall follow the Traffic rules of the Project.

The following rules shall be followed inside the site area:

Maximum speed for all the vehicles shall be fixed unless otherwise specified in the traffic management rules:

- 50 km/h on-site roads;
- 30 km/h in the proximity of working areas;
- Overtaking between trucks in busy work areas is not allowed;
- Any vehicle descending a downhill road shall give way to the one rising.

Outside the project area, the country traffic rules shall be respected. Anyone found not respecting the above rules will be subject to disciplinary measures.

3.8.1. Work on roads.

Most of the project work will be done closer to the local roads. Risk shall be assessed before the start, and a written method statement submitted to the project manager or site manager for approval. The method statement shall detail controls including, speed restrictions, warning signs and cones, barriers, and type. Where significant risk of traffic collision vehicle blocks shall be used. Under specific circumstances, in case of an existing overhead crossing of a conductor above a road, adequate scaffolding shall be installed based on EDCL's best practices.

3.8.2. Driving, traffic, and transport Safety

Driving and traffic are regarded as the most dangerous part of the job, not only because of the potential bodily injuries but also because of the high frequency of occurrence. To minimize the impact and frequency of occurrences, the next guidelines are to be followed. Make sure all cars and trucks are equipped with working safety belts in all seats.

- ✓ Seat belts must be used all the time;
- ✓ All vehicles should be equipped with a first aid kit and fire extinguisher;
- ✓ Monthly inspections of vehicles including General, Fluids, Lights, and Safety.
- ✓ Do not drive if you are tired;
- ✓ Separate bags and boxes from passengers;
- ✓ Do not engage in reckless driving and do not exceed the speed limits;
- ✓ Do not use the mobile phone while driving, not to make calls, nor for texting;

- ✓ Being intoxicated when driving or operating machinery will lead to dismissal;
- ✓ Make inspections of cars, trucks, and driving behavior part of all safety walks;
- ✓ Minimize driving in the dark.

3.8.3. Heavy motor vehicles

Heavy motor vehicles are intended to be used mostly at the project sites to transport project materials including transformers and poles. Specific competency is needed to operate heavy motor vehicles, as well as adequate training and a fit-for-purpose driving license. In addition to this, some requirements are needed to make the project utilization safe:

- ✓ Heavy construction equipment should have a reverse signal alarm;
- ✓ The reverse alarm should be checked, and defective alarms will be replaced;
- ✓ A flagman, warning signs, or other controls will be provided when operations or equipment on/or adjacent to street traffic create a traffic hazard;
- ✓ All drivers must always keep valid Driver Licenses;
- ✓ Seat belts shall be always worn when in vehicles;
- ✓ The speed limits shall be strictly observed;
- ✓ Traffic violations beyond a simple speeding ticket shall be reported to your supervisor;
- ✓ Before loading, unloading, or conducting any activities around a vehicle, the vehicle shall be placed in park or gear, the vehicle shut off, and the parking brake set;
- ✓ On inclines, vehicles shall be chocked, and the wheels turned into the curb;
- ✓ When being loaded or unloaded by a fork truck or other piece of equipment, the vehicle wheels shall be checked to ensure that no movement occurs;
- ✓ Passengers are not allowed to ride in the back of pickup trucks together with bags or boxes;
- ✓ Riding as a passenger on any equipment is prohibited unless the equipment has the safe capability of transporting personnel and was intended for such use.

3.8.4. Light vehicle operations

The following rules concerning vehicles will be implemented:

- ✓ Only licensed drivers shall be allowed to operate vehicles;
- ✓ Seat belts shall be always worn when in vehicles;
- ✓ The speed limits shall be strictly observed;
- ✓ Before loading, unloading, or conducting any activities around a vehicle, the vehicle shall be placed in park or gear, the vehicle shut off, and the parking brake set.
- ✓ When being loaded or unloaded by a fork truck or other piece of equipment, the vehicle wheels shall be checked to ensure that no movement occurs.

3.9. Housekeeping, Tools, and equipment handling

3.9.1. Housekeeping

Good housekeeping practices will be maintained on all work sites. Before leaving for the day, personnel will ensure that all equipment is secured, trash and debris are removed from the site, and adequate safety indications are installed to avoid harm to members of the public. The foreman must conduct a final walk-through of the job site before leaving to inspect for any tripping, foot penetration, or fire hazards.

All personnel's eating and sanitary facilities will always be maintained in a clean and sanitary condition. Contractors will provide the necessary resources to accomplish this, including adequate washing facilities unless mutually agreed with the subcontractors. In this case, contractors will ensure that sub-contractors fulfill adequate requirements.

3.9.2. Slips, trips, and falls

Site personnel will ensure that any instances of poor housekeeping resulting in the creation of tripping, slipping, or other hazards are corrected immediately. It will be ensured that work areas are orderly and regularly maintained. They will be maintained clear of debris, waste, and other rubbish. To minimize any incidents to bystanders, site personnel shall identify work areas through clear demarcation signs to avoid access to restricted zones:

3.9.3. Tools and equipment

To ensure a safe operation, the following guidelines are described:

- ✓ All tools are used by the manufacturers' recommendations; have required guards in place; and, are maintained

- in good working order as per manufacturer's recommendations;
- ✓ All vehicle/equipment operators are competent and licensed;
- ✓ All equipment used follows certification and legislation requirements;
- ✓ Powered tools and equipment will only be used by operatives trained in their use;
- ✓ Tools and equipment have been inspected before use on-site, including hired tools and equipment. The inspection shall be carried out by a competent person. For electrical tools this will be done by a qualified electrician;
- ✓ Major equipment is individually numbered, labeled, and registered;
- ✓ No modified equipment is brought on-site unless the modification has been approved by a competent person (i.e. typically the equipment supplier or vendor or an engineer);
- ✓ Inspection systems meet the manufacturer's or supplier's specifications.

Heavy equipment shall be thoroughly inspected before use. The foreman will inspect the equipment, using an approved checklist, when the equipment is first placed at the job site and whenever the equipment is demobilized and successively placed back on the job site.

All repairs on machinery or equipment shall be made at a location that will ensure the safety of the mechanics, e.g. heavy machinery, equipment, or parts thereof that are suspended or held apart by the use of slings or jacks shall also be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

Any guard or safety device removed or made ineffective for any piece of equipment used at the site or during repair or maintenance shall be replaced or restored to safe operation condition, immediately after completion of the repair that requires its removal.

3.9.4. Hazard material awareness

Whenever in use of hazardous materials and chemicals, the following measures will be adopted:

- ✓ Material containers will be labeled as to contents and hazards;
- ✓ Material Safety Data Sheets will be available, on-site, for review by employees;
- ✓ A Material Safety Data Sheet will be on-site before any hazardous material is brought onto the job site;
- ✓ All employees shall be trained in the recognition, proper handling, and use of hazardous substances;
- ✓ Product containers are to be properly labeled.

3.10. Alcohol and Drug Control Plan

The consumption of alcohol and drugs in the workplace can cause changes in the behavior of workers (loss of concentration and reaction time) and lead to situations of risk with disastrous consequences for the workers and their companies.

As the construction activity is considered high risk, is of particular importance to preventing and controlling alcoholism, to increase the quality of life of employees and the contractor's performance.

The consumption of alcohol and drugs on the work site during working hours is strictly prohibited. Information sessions will be held to prevent hazards caused by the consumption of alcohol and drugs. It is also prohibited to perform any work whilst affected by alcohol or drugs.

Smoking is prohibited on-site or at any project office or project location.

4. TRAINING AND COMPETENCY

4.1. General Requirements

EPC contractor and subcontractor will undertake internal training and education activities to ensure that Project expectations regarding Environmental Social Health and safety are achieved. In addition, the Project will guide contractors regarding expectations for Environmental Social Health and Safety training, education, and competencies. Occupational health and safety competencies will be appropriate to the respective parties' scope of activity and level of responsibility. The project will undertake an initial evaluation of training needs associated with this ESHS and, on this basis, develop and maintain an ESHS training matrix.

The Project's Environmental Social Health and Safety training will include several levels of competency, depending on everyone's level of involvement and responsibility:

- **Induction Training and Awareness:** this training will be for visitors or individuals who do not have direct roles or responsibilities for implementing the ESHS and will cover basic Project environmental and social commitments.
- **Management Training and Awareness:** this training focuses attention on management; covering key aspects of the ESHS and providing an overview of the Project's environmental and social impact management expectations and the supporting processes and procedures prescribed in the ESHS plan to meet performance expectations.
- **Job-specific Training and Awareness:** job-specific training will be provided to all personnel who have direct roles and responsibilities for implementing or managing components of the ESHS. This training will also include all people whose specific work activities may have an environmental or social impact.

4.2. General training and induction

4.2.1. Induction Training

All newly recruited employees and visitors shall have to undergo induction training before the commencement of any work activity with the contractor. Workers shall receive this competency training depending on the nature of the activities they shall execute. In these training courses, the recruits shall be introduced to the company safety rules and regulations. Note also that sub-contractor and their employees shall be inducted. All trained personnel must sign against their names to confirm their attendance.

4.2.2. Safety meetings / Pre-job briefings

A preliminary meeting for initial safety induction will be held with the Project Manager, Site Manager, Site Supervisor, and Foremen. All of these have the responsibility to maintain the OHSP activities implemented on-site to achieve the Zero Accident goal. All site meetings will have OHSP as a first item on the agenda, covering both general aspects and those that need highlighting at the time of the meeting.

Additional meetings will be held by the Site manager or project manager, both with assigned OHSP functions when operations with increased risks or the follow-up of near-miss incidents make such meetings necessary. Minutes of the Meeting will be issued. Pre-job Briefings shall be held regularly, depending on the size and complexity of activities at the construction site. The responsible will ensure the Job Hazard Analysis and Toolbox meetings are regularly implemented for each daily work assignment.

4.2.3. Toolbox talks

Toolbox talks communicate the risks identified for project activities and daily work including potential hazards associated with performing such a job. The toolbox talks are complemented by the job hazard analysis which serves as guidance for daily activities.

Toolbox talks are conducted daily and led by site managers, site supervisors, foremen, or team leaders, upon availability. The end objective is to make the team members aware of potential hazards on that specific day to avoid accidents on site. In addition to the informative nature of the talks, they empower employees to identify and discuss specific hazards and protective measures associated with the assigned work. Project managers and site managers will ensure employee involvement in the toolbox talks. This process is mandated by EDCL's policy but is not required to be documented.

4.2.4. Safety operation and training

All personnel appointed to work on-site will have the necessary knowledge, experience, and training to carry out the duties assigned to them. This is ensured and reinforced through the Toolbox talks. All members of staff involved in tasks that require special knowledge are experienced and qualified.

4.3. Competency training

This training will be provided to all contractors, subcontractors, and employees. Those responsible for performing site inspections will receive training by drawing on external resources as necessary. Upon completion of training and once deemed competent by management, staff will be ready to train other people. The Project will require each contractor to institute training programs for their personnel. All contractors and their subcontractors will be responsible for implementing relevant and adequate training programs to maintain the required competency levels. Contractor training programs will be subject to approval by Project Management and will be assessed to confirm that:

- training programs are adequate;
- all relevant personnel have been trained; and

- Competency is achieved.

Contractors will be required to report on their training activities, and the Project will maintain records of all training delivered.

Table 81: C-ESHS training plan;

Training course	Unskilled labor	Skilled labor	Frontline supervisors	Middle management	Senior manager	Drivers	Safety men
Intro to the OHS	X	x	X	x	X	x	x
Emergency response	X	x	X	x	X	x	x
Hazards& controls			X	*	*		
Foreman responsibilities			*	x	x		
Managing safely			X	*	*		
Managing rule-breaking				*	*	x	
Fire prevention	*	*	X	x	X		X
First aid	*	*	*	*			
Confined space entry	X	x	X	x	X		
Back safety/ lifting safety	X	x	X	x	*		
PPE	X	x	X	x	X	x	X
Fall protection		*	*	*	*		
Small/ power tools		*	*	*	*		
Hand Safety	X	x	X	x	X	x	X
Scaffold construction			X	x	X		
Forklift operations	X	x	X	x	X		
Hazard recognition	X	x	X	x	X	x	X
Excavation safety			X	*	*		X
Health& hygiene	*	*	X	x	X		X
Environmental awareness	X	x	X	x	X		X
Ladder safety	X	x	X	x	*		*
Excavation safety	X	x	X	x	*		X
Risk assessment		x	X	x	X		*
Hazard registers				x	*		
Lifting operations		x	X	x	*		
Safe use of chemicals	X	x	X	x	*	x	X
Accident prevention	X	x	X	x	X	x	X

Key: x= compulsory

***=selected personnel**

Each training will be provided by a qualified expert hired by a contractor. The number of people to be trained for each topic will be known after the recruitment of workers and screening to define the training appropriate for each category depending on their expertise and knowledge.

5. ACTIVITY-BASED PREVENTION PLAN FOR TRANSMISSION AND DISTRIBUTION LINES

5.2. Foundation works, excavation, and trenching

5.2.1. Excavation safety plan

This excavation safety plan has been developed to protect employees from safety hazards that may be encountered during work in trenches and excavations. This program is intended to ensure that:

- ✓ Employees who perform work in excavations are aware of their responsibilities and know how to perform the work safely.
- ✓ All persons involved in excavation and trenching work will receive appropriate training in the safe work practices that must be followed when performing this type of work. The project manager shall ensure that:
- ✓ The procedures described in this plan are followed.
- ✓ Employees entering excavations or trenches are properly trained and equipped to perform their duties safely.
- ✓ All required inspections, tests, and recordkeeping functions have been performed.
- ✓ All employees who work in or around excavations, must comply with the requirements of this plan.

Employees are responsible for reporting hazardous practices or situations to the Supervisor/Foreman, as well as reporting incidents that cause injury to themselves or other employees.

The site manager will ensure that whenever an excavation operation is being undertaken, work practices and proper conditions are met before beginning, during, and after such excavation operations. Employees will cease operations if there is a question regarding a hazard or if such is suspected or discovered.

No employee is permitted underneath loads being handled by lifting or digging equipment. Employees are required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles provide adequate protection for the operator during loading and unloading operations.

5.2.2. PPE during foundation works

All employees working in excavations shall wear PPE. Employees exposed to flying fragments, dust, or other materials produced by drilling, sawing, sanding, grinding, and similar operations shall wear safety glasses with side shields and mouthcovers. Employees using or working near hammer drills, masonry saws, jackhammers, or similar high-noise-producing equipment shall wear suitable hearing protection. Materials and equipment used for protective systems will be free from damage or defects that might impair their proper function.

Manufactured materials and equipment used for protective systems will be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards. When material or equipment that is used for protective systems is damaged, the Contractor's competent person will examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment can support the intended loads or is otherwise suitable for safe use, then the material or equipment will be removed from service and will be evaluated and approved by a registered professional engineer before being returned to service.

5.2.3. Protection from water accumulation hazards

Employees are not permitted to work in excavations that contain or are accumulating water unless precautions have been taken to protect them from the hazards posed by water accumulation. If water is controlled or prevented from accumulating using water removal equipment, the water removal equipment and operation shall be monitored by a person trained in the use of that equipment.

If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation.

Precautions shall also be taken to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains shall be re-inspected after each rain incident to determine if additional precautions, such as special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water or use of safety harnesses and lifelines, should be used. The site supervisor shall inform affected workers of the precautions or procedures that are to be followed if water accumulates or is accumulating in an excavation.

5.2.4. Protection of the public

Barricades, walkways, lighting, and posting shall be provided as necessary for the protection of the public before the start of excavation operations.

5.3. Poles erection protection plan and working at height.

5.3.1. Poles Erection Plan

This Erection Protection Plan has been developed to protect employees from safety hazards that may be encountered during erection works and the use of heavy machinery like cranes. All employers involved in pole erection works have complete knowledge of pole erection. This plan is intended to ensure that:

- ✓ Control, before starting work, the efficiency of tools, equipment, lifting slings, equipment,
- ✓ PPE use and safety equipment;
- ✓ Call the attention of the operator on the ground before starting the movement;
- ✓ Proper locking of the support/implementation of the vehicle with ropes;
- ✓ Appropriate locking and stability of the hold of the supports on the ground;

- ✓ Controlling the visibility from the driving position of the crane over the entire work area (with coordination between crew and crane driver) with particular attention to the position of the vehicle concerning the land slopes and visibility;
- ✓ Ban on driving under suspended loads;
- ✓ Adequate stabilization of the crane;
- ✓ Immediate application of the sling above the center of gravity;
- ✓ Use of wooden beams to store backup elements or support sections preassembled;
- ✓ Use of signs and red flags protruding loads into the ends of the poles;

5.3.2. Safety while working at heights and permanent attachment.

The health and safety manager will train project employees in the hazards and control measures associated with working at heights, will make sure that personnel is permanently attached, and will make maximum use of primary fall protection systems, such as scaffolds, aerial lifts, etc. The contractor will use safe work procedures and enforce, among others, the following prevention/protection measures:

- ✓ Evaluate all overhead work for fall exposures and pre-plan and install required fall protection systems before assigning the work to employees;
- ✓ Adopt a 100% fall protection policy that makes provision for secondary fall protection for all employees who are working more than 2 m above ground or other solid objects.
- ✓ Review work to identify the methods to achieve 100% fall protection before the commencement of such work;
- ✓ Require the inspection of fall protection equipment before each use;
- ✓ Defective equipment will be removed from service and destroyed;
- ✓ Contractor shall ensure that each & every activity has fall protection rescue plan;
- ✓ All lifeline equipment (cable, connectors, supports, etc.) shall be part of the system and will only be used for fall protection;
- ✓ Approved safety harnesses are to be used for employees.
- ✓ Ensure that persons working at height will have their safety helmets secured by chinstraps to retain the helmet on the head;
- ✓ Ensure systems are in place to prevent tools, materials, and other objects from falling from height.

5.4. Stringing works

Employees shall not be permitted under overhead operations or on cross-arms while a conductor or pulling line is being pulled (in motion).

A transmission clipping team shall have a minimum of two structures clipped between the team and the conductor being sagged. When working on bare conductors, clipping teams shall always work between earthing equipment; the earthing equipment shall remain intact until the conductors are clipped in, except on dead-end structures. Reliable communications between the reel tender and pulling team shall be provided, e.g. VHF or similar radios. Each pull shall be dead-ended at both ends before subsequent pulls.

5.5. Stringing protection plan

This stringing (ending with sagging and regulation) protection plan has been developed to protect employees from safety hazards that may be encountered during work. All employers involved in stringing work know their role in the process and pay attention to the instruction they receive continuously. This plan is intended to ensure that:

- Control before the work of grounding and safety of power lines interfering with line of work and equipment;
- Use of PPE to climb and work on supports, special awareness of permanent attachment;
- Call the attention of the operator to the coil and wait for your consent before starting the stringing of conductors;
- Use of one radiotelephone for operators at the puller, and at any location deemed as acting as obstacles to the signal;
- Placement of scaffolding in the case of crossing facilities, roads, housing, etc;
- Use of lifting equipment and accessories (ropes, slings, hooks, etc.) loads adapted to their capacities;
- Use of adequate means for their characteristics;
- Use of service ropes to provide the operator with tools and materials required;
- Check the stability of supports before climbing and using any bracing;
- Use carrying bags to store tools when working in a high position;
- Before starting the stringing operation briefing on the work phase shall be performed;
- All personnel involved have to be continuously in radio contact.

5.6. Earthing

When earthed, new lines or equipment may be considered de-energized and worked upon as such. Earthing should be applied in all cases, even when the hazard of induced voltages is not present and adequate clearances or other means are implemented to prevent contact with energized lines or equipment. Earthing equipment shall be placed upstream and downstream of the working location of the transmission line.

Earthing equipment may be temporarily removed only when necessary for test purposes and caution shall be exercised during the test procedures. The lines or equipment from which earthing equipment has been removed shall be considered energized due to induction current.

An earthing device shall be installed between the tensioning reel setup and the first structure, e.g. tubular pole. The earthing device shall be installed at each conductor, groundwire, or OPGW during stringing operations. During stringing operations counting from the first structure, each bare conductor and overhead ground wire shall be earthed starting from the first pole adjacent to both the tensioning and pulling setup.

5.7. Barricades and traffic control plans

The contractor will properly erect and maintain barricades and barriers in such a manner that they provide adequate protection. Barricades and barriers erected will have appropriate signs and tags indicating the nature of the hazard and the responsible supervisor. Barricades left after dark on or near roadways will be properly equipped with flashing amber lights.

The contractor will provide and use appropriate barrier devices to identify the nature of the job hazard involved (i.e., yellow and black for "CAUTION" or red and black for "DANGER"). Barrier devices, including barrier tape, will not be used as a substitute for a barricade as they do not offer adequate protection from falls. Barrier devices will be used only in those applications where temporary identification of a hazard is needed; but not as a primary means of protecting employees from exposure. It will be ensured that employees understand and comply with barricade and barrier procedures (i.e. prohibited entry into red barrier taped areas). Where hazards are expected to exist for more than 24 hours (e.g., excavations), it will be ensured that a physical barricade is erected using wooden, mounted plastic or metal guardrails.

The contractor will ensure that barricades are complete (i.e., the work area is entirely isolated and identified). The barricaded area will be of sufficient size to afford appropriate protection. It will be ensured that required safety signs will be posted (e.g., prohibition signs, warning signs, mandatory action signs, fire safety signs, etc.).

6. EMERGENCY PREPAREDNESS REQUIREMENTS

6.1. Initial actions

First Aid is defined as:

- ✓ Treatment to preserve life and minimize the effect of the injury/illness, until the arrival of paramedic assistance via the Emergency Services;
- ✓ Treatment of minor injuries that would otherwise receive no treatment or are not sufficiently serious to require the services of a medical practitioner;
- ✓ First aid aims to reduce the effects of injury or illness suffered at work. It does not include giving medication.

6.2. Emergency procedures

The general procedures applicable in emergencies must be followed to implement the appropriate response against unexpected events that may injure people and/or goods. The measures to be followed are described in the table below:

INCIDENT WITH NO PERSONAL	INCIDENT WITH LIGHT PERSONAL	INCIDENT WITH SERIOUS PERSONAL INJURY
Report to supervisor; Restore all working and safety conditions.	Report to supervisor; Provide first aid and send the injured to the Hospital; Restore all working and safety conditions.	Report to supervisor; Provide first aid; In case of emergency communicate with external means of relief for intervention; Indicate the correct location and number of victims

The contractor will implement procedures and will provide all emergency equipment and supplies needed to support the work and each work location. The enclosure above illustrates the procedures and guidelines in case of an accident. This documentation must be complete for each line.

6.3. Notifications procedure

Serious incidents will be reported to the Engineer promptly and accurately. The incidents involving employees, subcontractors, and/or property will be properly investigated to determine the causes and the corrective measures necessary to prevent their recurrence. For serious incidents, a complete incident report will be filled out.

Near misses that had the potential to have resulted in an injury, fire, spill, motor vehicle accident, or other incident will be investigated, and corrective measures will be taken.

6.4. Emergency equipment and tools

6.4.1. First aid kit

All construction sites shall have first aid kit stations. Also, each vehicle, including Contractors' vehicles, shall have a first aid kit. The first aid kits should contain the following material:

- Material Containment;
- Betadine Solution Dermal;
- Sterile compresses;
- Bandages;
- Adhesive Anti-Allergic;
- Quick dressings;
- Saline solution;
- Scissors with curved tips;
- Sterile Gloves.
-

6.4.2. Fire extinguisher.

Fire extinguishers will be provided and suitably located, distinctly marked, readily accessible, and maintained in a fully charged and operative condition.

Inspections should be recorded on the inspection tag attached to each extinguisher or on a log documenting the extinguisher's location and/or number.

Work areas shall be kept free from combustibles and flammable liquids. Fire extinguishers shall be provided by the contractor for hot work and any use of flammable or combustible liquids. All flammable liquids shall be stored in approved Flammable Liquid Storage Cans. Only the quantity necessary for the job should be present in the work area. The site manager shall ensure that the proper number and location of fire extinguishers are present for any occupancy or type of work.

6.5. Medical Emergency Response Procedures

Stage 1: In the event of Serious injury or illness

- ✓ **Stay calm** – Assess the situation and make the area safe before attempting any rescue. Do not endanger yourself.
- ✓ **Take control of the situation** – Immediately call for assistance, and safeguard against further danger to others if possible. If there are victims, and if the scene is immediately life-threatening to them, it may be necessary to remove them from danger before attempting first aid. If no life threat is present, do not move the victim until the condition is known to be safe to move or instructed by the paramedic.
- ✓ **Preserve life** – If you can give First Aid without risk of injury to yourself or the patient – begin treatment. If not, contact the nearest source of medical attention, either a trained first aider nearby or the project paramedic. In either case, control bleeding and reassure the victim that everything is under control until help arrives.
- ✓ **Get assistance** – The first person present at the scene must inform the Site Manager, who has the overall OHSP responsibility, giving the following:
 - 1) Location of injured personnel;
 - 2) Name and number of injured persons;
 - 3) Nature of injuries;
 - 4) Brief description of what has happened.
 - 5) Details of any resources already near the scene, such as first aid personnel, ambulance, etc.
- ✓ After receiving the emergency call from the scene, The Site Manager will inform the following personnel:
 - 1) Paramedic;

2) Ambulance driver.

The Paramedic/ Site Manager will advise personnel at the emergency scene about what action is to be taken and determine if a medical evacuation will be necessary.

If no further treatment or action is necessary, this procedure will end. If a medical evacuation is required, Stage 2 will be implemented immediately.

When a working site is too far from nearby medical facilities site personnel with medical experience or training will be located at the site and equipped with a vehicle to transport the injured to a medical facility.

Stage 2: When a medical evacuation is required.

The Paramedic/The Site Manager monitoring the situation will determine the type and method of evacuation to be conducted, and to which destination the injured/ill person should be evacuated. The degree, severity, and nature of the injury or illness will be the sole basis for his decision. Casualties with suspected fractures of the Skull, Spine, or Upper Leg(s) are in severe danger. They are NOT to be moved until the paramedic arrives at the scene UNLESS a further life-threatening condition exists, such as loss of limb, heart attack, head injury, internal bleeding, etc.

Authority Limitations the Paramedic and Site Manager are authorized to take any actions involving expenditures for REG/ EDCL in connection with the emergency or incident that are judged essential to save life or to relieve suffering.

Stage 3: - Evacuation

- ✓ Ambulances are to proceed on instructions to the nearest safe and accessible point waiting for the patient's arrival.
- ✓ Field first aiders will proceed on foot if necessary to the accident site with all necessary equipment for patient stabilization.
- ✓ Other work groups near the site of the incident are to stop work if necessary and assist medical personnel in case stretcher carriers etc are required.
- ✓ If the patient can walk or be moved safely by his companions they are to make their way towards the ambulance. The situation will continue to be monitored by the paramedic / Site Manager.

The ambulance will proceed with the patient straight to the closest clinic if deemed necessary. Care will be taken to avoid causing further injury or discomfort to injured personnel when driving over rough terrain.

In all cases where evacuation is needed, the injured/ ill person will be transferred to the closest clinic.

6.6. Fire Response Procedures

Early detection

- By personal vigilance
- Prompt reaction.
- By shouting "Fire, Fire, Fire!"

Immediate response

- Call 911 or the local emergency number;
- By using the nearest suitable firefighting equipment;
- By accounting for all personnel (Head Count).

6.7. Site Waste Disposal & Management

Bins will be provided at convenient intervals for disposal of waste within the construction site. Bins should have liner bags to allow for efficient control and storage of waste and prevent leak of material from waste containers.

Provision of separate waste receptacles for each waste will be required. Where possible recycling should be encouraged. Mixing of hazardous and non-hazardous waste will not be permitted.

Proper storage facilities shall be provided before the start of construction activities and will be distributed at the construction site areas. Liquid and hazardous waste must be stored in a fenced area on a hard surface and under cover. Storage facilities will consist of designated areas with sufficient provisions and/or containers with lids will be used for litter collection and storage on site.

Littering on site is strictly forbidden and the site shall be cleared of litter at the end of each day.

6.7.1. Non-hazardous waste

All waste will be removed from the site and transported to an approved disposal area. A certificate of safe disposal will only be required for hazardous waste; however, it must be demonstrated that the waste has been taken to an approved landfill. Construction rubble shall be disposed of at an approved disposal site and may not be buried on site. Care to be taken to avoid contamination of soil and water and nuisance to adjoining areas.

6.7.2. Hazardous waste

Hazardous waste disposal such as defective transformers shall be carried out by an approved waste contractor. A certificate of safe disposal is to be provided to the Site Manager. The disposal site must be classified for the class of waste being taken there.

All collected hazardous waste will be placed into the containers to prevent the likelihood of exposure during handling. All vehicles, reusable containers, and covers that have been in contact with hazardous waste must be cleaned and decontaminated after use in such a way that the vehicle, container, or covers do not cause a hazard. e. All employees involved in the collection, transport, and disposal of Hazardous substances are to be provided with suitable personal protective equipment.

6. REPORTING AND DOCUMENTATION

6.1. Reporting and monitoring

This section outlines the reporting and notification associated with the implementation of the OHS plan. The Project and contractors will work closely together to identify and agree to all such Project notification and reporting requirements. It is envisaged that reporting will cover at least the following areas:

6.1.1. Contractor Monthly Reporting

Contractors will work closely with the Project before the commencement of work to define the structure, content, and format for their environmental and social monthly report. This report will contain key information about the contractors' implementation of the environmental and social requirements and mitigation measures and will cover, among others:

- environmental and social assessment and improvement findings;
- incident notifications;
- non-conformity/non-compliance and corrective actions;
- key performance indicators;
- details of any environmental or social surveys or studies; and
- Environmental and social training conducted.

6.1.2. Quarterly Reporting

The Project will prepare and submit to the relevant government departments a Project Environmental and Social Quarterly Report. The structure, content, and format will be agreed upon with the government before the commencement of work. This quarterly report will document key information on the Project's performance against the OHS requirements.

6.2. Managing Changes

Changes in the Project may occur due to unanticipated Project developments. This OHS plan, for example, is being undertaken before the completion of the design stage of the Project. Wherever possible, the environmental, social, Health, and safety mitigation measures should be updated depending on final designs. As the project planning progressed, certainty regarding the nature and magnitude of impact sources became clearer to the Project and the relevant changes should be made in the ESMP, and OHS plans. Adaptive changes may also occur during Project commissioning and operations. The Project will implement a formal procedure to manage changes that will apply to all Project activities. The process for dealing with Project changes and uncertainty recognizes three levels of change/uncertainty:

- **Level One: Minor Significance**, where the change or uncertainty is largely deemed to be immaterial to the OHS findings and does not affect the Project's ability to meet environmental and social performance requirements outlined in the OHS. This change may require additional but limited environmental or social study or survey activities.
- **Level Two: Moderate Significance**, where the change or uncertainty is deemed to be material to the OHS findings but is within the boundaries of the defined Project base case covered by the OHS. This may require minor changes to the OHS and additional surveys or environmental and social assessments.

- **Level Three: Higher Significance**, where a future significant change or uncertainty leads to a departure from the base or a key aspect of it. An addendum to the ESMP/OHS plan, or a new OHS and formal submission and approval process, is then required.

6.3. Documentation and document control

The abovementioned process will ensure that the Project can adapt to changes whilst meeting the relevant environmental and social performance requirements. In its OHS report, OIA will include the following documentation:

- environmental and social policy, objectives, and targets;
- description of the scope of the OHS plan;
- description of the main elements of the OHS plan and their interaction, and reference to related documents;
- documents including records consistent with the requirements of lenders; and
- Documents, including records, determined by the EPC contractor to be necessary to ensure the effective planning, operation, and control of processes that relate to its significant environmental and social aspects.

6.4. Control of Documents

Documents required by the OHS plan will be controlled by the EPC Contractor and will establish, implement, and maintain procedures to:

- approve documents for adequacy before issue;
- review and update as necessary and re-approve documents;
- ensure that changes and the current revision status of documents are identified;
- ensure that relevant versions of applicable documents are available at points of use;
- ensure that documents remain legible and readily identifiable;
- ensure that documents of external origin determined by the organization to be necessary for the planning and operation of the OHS Plan are identified, and their distribution controlled (e.g., government guidance, permits); and
- Prevent the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

7. STAKEHOLDERS ENGAGEMENT AND GRIEVANCE MECHANISM

This section of the OHS Plan provides an overview of implementing entity plans and commitments to provide ongoing opportunities for stakeholder and community engagement while implementing the electrification project. It also provides plans to advance sustainability initiatives during Project Construction and Operation and through Decommissioning. The objective of this engagement is to:

- identify parties with an interest in the Project, understand their interests and concerns, and ensure opportunities for their participation;
- build long-term and mutually-beneficial relationships;
- establish effective communication processes;
- allow for meaningful input into the Project planning, design, and development activities; and
- Ensure effective tracking and documentation of engagement activities and issues.

7.1. Engagement Dimensions

There will be several dimensions of the engagement program as described below.

❖ Site committee

A key component of the engagement program will be a field team that will collaborate with nearby communities, local authorities, affected Persons, and perhaps other stakeholder groups for the engagement committee. The purpose of the Committee is expected to be to:

- Disseminate and discuss information about Project activities;
- Provide community review of environmental monitoring and performance of the Project;
- Provide a forum for the exchange of information and discussion regarding issues they arise, and for developing effective means for addressing such issues.

❖ EPC contractor offices

Furthermore, During Construction, there will be significant interest in the on-site activities as well as business, contracting, and employment opportunities. OIA has established a temporary office in the project and another office in Kigali. These offices provide information on the Project, answer questions, and collect any comments or questions

from members of the public. This office will provide the public with information about employment, procurement, and contracting opportunities.

❖ **Site Tours**

During the Construction and Operation of the Project, the Contractor will provide guided tours (pre-arranged) and conduct open houses at key milestones to keep the public informed about the Project.

❖ **Presentations and Meetings**

As appropriate, the contractor will conduct meetings and presentations of the Project and updates to some individuals, stakeholder groups, individuals representing stakeholder groups, business groups, and federal, provincial, and District officials.

❖ **E-mail and Phone calls.**

The contractor will explore the possibility of creating a project Email and provide phone contact that can be used by stakeholders to express their views, and concerns, and request information.

7.2. Communication

The Contractor shall implement communication mechanisms to ensure that all internal and external stakeholders are made aware of OHS hazards that may affect their health and welfare.

Methods used to communicate OHS hazards on the project shall include:

- Toolbox talks;
- Pre-work briefing;
- Safety messages of the week;
- Safety alerts;
- OHS and other project meetings;
- OHS training including OHS induction;
- Site posters, noticeboards, and signage.

7.3. Participation and consultation

To ensure that all project stakeholders are invested in OHS management, the following key OHS procedures mandate the active participation of, and consultation with multiple internal and external stakeholders (as required):

- Environmental aspects& impacts;
- Internal audit;
- Emergency preparedness& response;
- Hazard identification& risk assessment;
- Incident report& investigation –HSE;
- Legal HSE and other requirements;
- Management review;
- Method statement development;
- Monitoring HSE performance;
- Organization objectives;
- Permit to work;
- Internal and external project communications;
- Pre-work briefing.

Additional participation and consultation methods employed on the project shall include:

- Establishment of a project OHS committee;
- Open door policy of all management;
- Continuous improvement and lessons learned submission;

7.4. Grievance Mechanism

EPC contractor together with stakeholders will establish and implement a Grievance Procedure based on existing structure in the project's areas. The GRM includes all stakeholders such as representatives of affected communities, local authorities, and contractor and Client staff. The establishment of GRM considers both Men and Women, youth and vulnerable people. The Grievance Procedure describes how community members can raise grievances regarding the Project's activities. The Grievance Procedure addresses verbal or written grievances, which must include sufficient

information about the complaint or claim so that a proper and informed evaluation of the grievance can be made. When a grievance is filed, it will be logged and evaluated. All grievances will be tracked for monitoring and reporting purposes and to ensure timely and proper resolution. The OHS Officer serves as the project liaison person for GRM and coordinates with the GRM committee and Local authorities.

The GRM will be made by:

- EDCL/RUEAP Environmental and Social team;
- District representatives (land officer/in charge of infrastructure and district environment officer);
- PAPs representatives (Women and Man);
- Contractor OHS PLAN specialist.

For complaints that are not solved by this committee then, the case will be referred to the existing administration structure up to the relevant court.

The first level of the Grievance redress mechanism is the GRM committee and if the complainant is not satisfied, they can appeal to their local leadership starting at the Cell level, then the Sector, and finally the district leadership. If the grievance is not resolved via the local leadership structure, the complainant's final resort shall be to file the case with the competent Court of Law. To ensure that the affected parties are fully aware and to reduce the possible backlog of complaints, it should be noted in advance that most members of the rural communities take time to decide to complain within the 30 days required to file their complaints. As per international standards, grievances logged outside this timeframe may still be valid and legitimate. Customarily, the government authorities ensure that all affected people are fully informed and will issue warnings about the consequences of failure to lodge their complaints in time. Within this customary procedure, affected people will be informed of the procedures during public consultation. EDCL will follow up with the aggrieved PAP at each level to ensure that the grievances are resolved.

8. CONCLUSION

The implementation of the planned projects in the western province has social and economic benefits for people living in the districts of intervention. However, the project might induce negative impacts, if protection and mitigation measures are not considered during its implementation. Fortunately, all negative impacts likely to occur can be prevented and/or mitigated as detailed in the ESIA of the project.

Therefore, it is crucial that all set OHS measures proposed in this Plan be properly implemented to assure sustainable safety conditions for both bio-physical and social environments in the project areas. Some of the key recommendations to consider are: (i) provide safety equipment to all workers and enforce their effective use during the construction phase; (ii) increase worker's awareness regarding EHS requirements; (iii) subcontract approved local companies for solid wastes disposal; (iv) Collaborate and involve of local administration (district & sectors) and other connected stakeholders in the project implementation.