

**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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**July, 2024**

## **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. This initiative is outlined in the National Strategy for Transformation (NST1) for 2017-2024.

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.

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

### **Project location**

The ASCENT will be implemented throughout the country 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. Even though the project is entirely described, this ESIA scope was only for the above Districts and focussing mainly on the distribution and access projects.

### **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 and social sound manner, consistent with established environmental regulations. This ESIA Report also proposes mitigation measures to potential impacts that have been identified, which are required to be implemented during implementation of the present project.

### **Sub-Project activities**

The project activities will consist mainly of 3 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 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**

The identification of project alternatives includes the consideration of the project developer's 'preferred option', as detailed 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
- Offsetting or Compensation of the losses generated by the sub-project

### **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. Mainly the WB Environmental and Social Standards (ESS) applied to the project were consulted. 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.

### **Positive Impacts**

Regrading 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:

- Improvement of the living conditions of households and public institutions to be connected due to easy access to electricity in homes and public lighting for the localities along main roads. To that should be added the opportunities provided to use TV sets, with the benefits they offer in terms of information, education, and entertainment for the population.
- There will also be improvement in study conditions for students and school children, following the electrification of schools within the villages concerned.
- There will be better functioning conditions in health centres and pharmacies, thus enhancing patient care.

- The creation of new trading opportunities for men and women in the artisanal sector (welding, hairdressing, catering);
- Development of commercial activities in project-targeted areas
- The possibilities of an electricity supply project are linked to poverty reduction and can be seen in an increased income, enhanced productivity, and improved quality of life.

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

- Job opportunities
- Income generation

### **Negative Impacts**

During the preparatory and construction phase of the project, negative impacts are foreseeable but can be mitigated using appropriate measures. These especially are:

- Resettlement and other associated negative impacts
- Loss of trees and crops resulting into loss of income and livelihood
- Construction works will have impacts on the soils, water and ambient air
- Risk of HIV/AIDS GBV, sexual exploitation and abuse and sexual harassment among workers and nearby communities, as a result of labour influx.
- The risk of accidents during clearing and excavation works and other installations of equipment and stringing of power lines.
- Risk of accidents by electrocution during the operation phase.
- Health risks for the population due to the electromagnetic field of power lines and transformers. However, this risk is minimal in the case of medium-voltage lines.
- Impacts from waste generated.
- Impact related to GBV
- Habitat destruction
- Potential bird kills from electrocution.
- Noise generation at the construction sites
- Traffic flow interference
- Soil and water pollution
- Labour issues for other specific projects
- Impacts on Physical Cultural Resources either tangible cultural heritage or intangible cultural resources, such as language, poetry, music, dance and intellectual knowledge.
- Resettlement impacts as this project will have to compensate for the crops and trees within the RoW.

### **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, land owners 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. To some extent, some houses and structures may be affected, and these will be relocated accordingly. 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 safeguard 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.

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## ACRONYMS

<b>BESST</b>	: Bureau for Engineering and Environmental Studies
<b>7YGP</b>	: 7-Year Government Program
<b>AfDB</b>	: African Development Bank
<b>CO2</b>	: Carbon Dioxide
<b>EDCL</b>	: Energy Development Corporation Limited
<b>EIA</b>	: Environmental Impact Assessment
<b>ESIA</b>	: Environmental and Social Impact Assessment
<b>ESMP</b>	: Environmental and Social Management Plan
<b>ESS</b>	: Environmental and Social Standards
<b>ESSP</b>	: Energy Sector Strategic Plan
<b>GOR</b>	: Government of Rwanda
<b>ICT</b>	: Information & Communication Technology
<b>LV</b>	: Low Voltage
<b>MININFRA</b>	: Ministry of Infrastructure
<b>MoE</b>	: Ministry of Environment
<b>MV</b>	: Medium Voltage
<b>MW</b>	: Mega Watts
<b>NGOs</b>	: Non-Governmental Organizations
<b>NSTI</b>	: National Transformation Strategy – Phase 1
<b>OS</b>	: Operational Standards
<b>RDB</b>	: Rwanda Development Board
<b>REG</b>	: Rwanda Energy Group
<b>REMA</b>	: Rwanda Environment Management Authority
<b>RoW</b>	: Right-of-Way
<b>RUEP</b>	: Rwanda Universal Energy Access Program
<b>RURA</b>	: Rwanda Utility Regulatory Agency
<b>SDGs</b>	: Sustainable Development Goals

## 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. This is recognized under the National Strategy for Transformation (NST1) for 2017–2024. The NST1 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 strategy lays out targets under the three pillars of economic transformation, social transformation, and transformational governance, and several cross-cutting areas. Under the social transformation pillar, NST1 aims to achieve universal electricity access by the end of the seven-year period. 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.

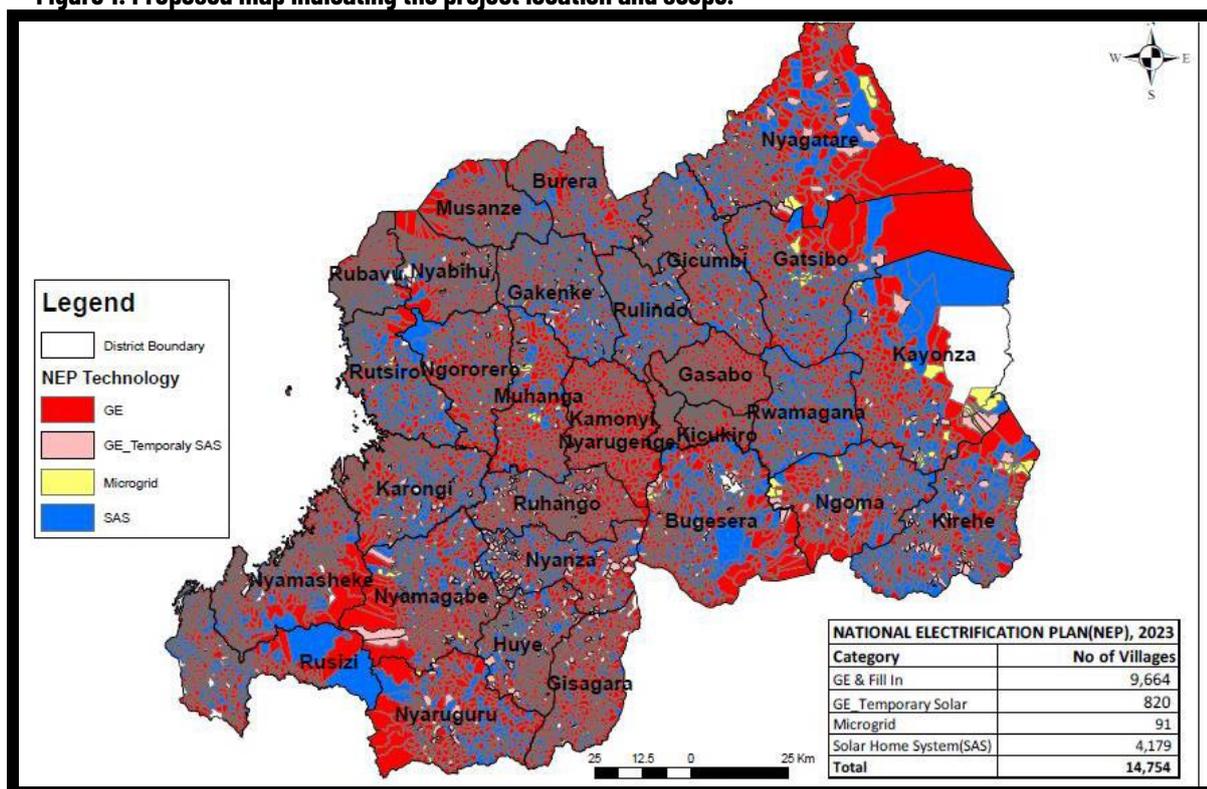
### 1.1. ASCENT Project description

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 investment 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, Kayonza, 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 be 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 district 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)	AIB US\$(m)	Total US\$(m)
1	Increasing Access to Grid Electricity	<b>Pillar 2:</b> 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	<b>Pillar 3:</b> 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	<b>Pillar 1:</b> Platform to accelerate energy access through development of institutional capacity and mobilization of funding, including scaling up climate funding	15	5	20
<b>Total financing</b>			<b>300</b>	<b>100</b>	<b>400</b>

Source: RUEAP, ESMF-ASCENT, 2024.

## 1.2. 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. These include the World Bank Environmental and Social Standards and the African Development Bank's Operational Safeguards that are applied to the project.

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.

### **1.3. 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.

### **1.4. 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. The current environmental and social Impact assessment report is based on electrification funded by ASCENT project based in districts of western Province of Rwanda namely Huye, Ruhango, Nyamagabe, Gisagara, Muhanga, Kamonyi, Nyanza, and Nyaruguru. 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.

#### **1.4.1 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
- World Bank ESF

#### **1.4.2 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 5<sup>th</sup> February 2024. Data collection used interviews, key informants and focus group discussions. The collected data were completed by data generated from the 5<sup>th</sup> 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.

#### **1.4.3 Environmental and Biological Baseline Survey**

The ecological data were collected 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.

#### **1.4.4 Stakeholders' consultation**

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**

##### **✓ 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).

##### **✓ The National Strategy for Transformation (NST1)**

The National Strategy for Transformation (NST1), which is the Seven Year Government Programme (7YGP), comes at a unique moment in the country's development trajectory which will see the crossover from Vision 2020 towards Vision 2050. This strategy is expected to lay the foundations for decades of sustained growth and transformation that will accelerate the move toward achieving high standards of living for all Rwandans.

The NST 1 will pick up from where the Economic Development and Poverty Reduction Strategy (EDPRS 2) left off and continue to accelerate the transformation and economic growth with the private sector at the helm. With this new strategy, Rwanda's public policy will focus on developing and transforming Rwandans into capable and skilled people ready to compete in a global environment.

**Under Priority Area 4:** Promote industrialization and attain a structural shift in the export base to High-value goods and services to grow exports by 17% annually. Key strategic interventions include reducing the cost of doing business and facilitating trade by implementing key projects, including scaling up electricity generation and improve quality, affordability, and reliability [Action 23].

✓ **The 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

✓ **The 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.

#### ✓ **The 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.

#### ✓ **The 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.

#### ✓ **The 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 governing land in Rwanda (2021)**

**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 regulating labour in Rwanda N° 66/2018 of 30/08/2018**

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.

✓ **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 I: - 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. Ministry of Environment (MoE)**

The Ministry of Environment (MOE) has the vision of protecting the environment for the safeguarding of green and climate-resilient Rwanda for the growth of the economy. It, therefore, also oversees the environmental aspects of the energy sector and is responsible for the coordination and implementation of legislation and policies relating to the environmental impacts of energy production and consumption.

The Ministry of Environment has the following main responsibilities:

- to develop and disseminate the environment and climate change policies, strategies, and programs through;
- to monitor and evaluate the implementation and mainstreaming of environment and climate change policies, strategies, and programs across all sectors, especially the productive sector;
- to oversee and evaluate institutions under its supervision by guiding the implementation of specific programs to be realized by the institutions under its supervision and local government;
- to mobilize the necessary resources for the development, protection, and conservation of the environment for climate change adaptation and mitigation.

### **2.2.2. 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.

### **2.2.3. Rwanda Environmental Management Authority (REMA)**

Under the supervision of the Ministry of Environment, and as per Law n°63/2013 of 27/08/2013 determining the mission, organization, and functioning of Rwanda Environment Management Authority (REMA), REMA reserves the legal mandate for national environmental protection, conservation, promotion, and overall management, including advisory to the government on all matters pertinent to the environment and climate change.

The mission of REMA is to promote and ensure the protection of the environment and sustainable management of natural resources through decentralized structures of governance and seek a national position to emerging global issues to enhance the well-being of the Rwandan people. The vision of REMA is to ensure that all sectors of the Rwandan Society value and undertake sound environmental management and rational use of natural resources to contribute to the national aspirations for sustainable development.

### **2.2.4. Rwanda Development Board (RDB)**

RDB was established in 2009 to coordinate, spur, and promote national economic development. RDB is evidence that Rwanda is open for business. It is truly a one-stop center for all investors. It was set up by bringing together all the government agencies responsible for the entire investor experience under one roof. This includes key agencies responsible for business registration, investment promotion, environmental clearances, privatization, and specialist agencies that support the priority sectors of ICT and tourism as well as SMEs and human capacity development in the private sector. RDB deals also with issuing EIA Certificates for investment projects in a bid to ease business in Rwanda.

### **2.2.5. 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).

### **2.2.6. 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.

### **2.2.7. Energy Development Corporation 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 neighbouring countries and power pools. EDCL works closely with MININFRA.

### **2.2.8. 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 audiovisual 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.

To fulfil this mission, the Authority is vested with the powers including among others: carrying 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.

### **2.2.9. Institutional framework related to social protection**

LODA's primary responsibility is the coordination and the implementation of the Graduation Strategy among key stakeholders (development partners, districts and NGOs/CSOs) to ensure that vulnerable households are supported to graduate from poverty. Under this sub-project, the EDCL shall work with the district to support vulnerable households within the intervening area, the special attention shall be made to the identified vulnerable people during all project activity. LODA focus on the implementation of social safety nets and livelihoods, as well as the funding of community and household projects.

LODA has the following key responsibilities under Social Protection:

1. Alignment of policies and institutional arrangements (governance framework, multi-sectoral approach, guidelines and training of staff);
2. Understanding clients and effectively support them (Sector & Cell staff, Para-social workers, Graduation contract);
3. Implementation of the Vision Umurenge Program (VUP), including Safety nets, Livelihoods and the various social protection programs;
4. Implementation of the UBUDEHE Program, including the community self-help projects and individual household projects;
5. Ensure vulnerable households have access to complementary services (para-social workers; NGOs, local service providers)
6. Provision of a wider enabling environment (Infrastructure – markets, transport, land, electricity, ...) for graduation from poverty

### 2.3. 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.

### 2.4. International agreements

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

**Table 2: Environmental assessment-related agreements**

No	Agreement	Date of signature	Date of ratification
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		6/12/2002
5	Agreement of Ramsar related to humid zones of international importance, particularly the wild housing	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.

## 2.5. World Bank's Environmental and Social requirements applicable to the project

The present project implementation is funded by the World Bank and therefore needs to comply with the WB's Environmental and Social Standards. The next table summarizes standards relevant to the project and borrows requirement:

**Table 3: World Bank's Environmental and Social Standards applied to the project**

SN	World Bank ESS	Objectives	Borrower Requirements
1	<b>ESS1: Assessment and Management of Environmental and Social Risks and Impacts</b>	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 environmental and social institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate.	Use and strengthening of the Borrower's environmental and social framework for the assessment, development, and implementation of World Bank-financed projects as appropriate.
2	<b>ESS2: Labor and Working Conditions</b>	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 disabilities, 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	<b>ESS3: Resource Efficiency and Pollution Prevention and Management</b>	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	Provide an estimate of gross greenhouse gas emissions resulting from the project (unless minor), where technically and financially feasible; Management of wastes, chemical and hazardous materials, and contains provisions to address historical pollution; Refer to national law and good international industry practice and World Bank Groups' EHSGs
4	<b>ESS4: Community Health and Safety</b>	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,

SN	World Bank ESS	Objectives	Borrower Requirements
			communicable, and no communicable diseases identify and manage risks related to labour influx on communities (SEA/SH, noise and air pollution ...).
5	<b>ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement</b>	<p>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 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.</p> <p>of tenure; Conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced 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.</p> <p>ment programs, providing sufficient investment resources to enable displaced 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.</p>	Ensure that the acquisition on land and assets 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.
6	<b>ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources</b>	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 for projects affecting areas that are legally protected designated for protection or regionally/ internationally recognized to be of high biodiversity value. Implement requirements relating to primary suppliers, where a project is purchasing natural resource commodities, including food, timber, and stones, water etc..
7	<b>ESS8: Cultural Heritage</b>	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	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 assets that would compromise or jeopardize their safety or integrity. Put in place a mechanism

SN	World Bank ESS	Objectives	Borrower Requirements
		from the use of cultural heritage.	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	<b>ESS10: Stakeholder Engagement and Information Disclosure</b>	<p>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.</p> <p>ocial 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.</p> <p>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.</p>	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.

### **3. 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 CO<sub>2</sub> 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. The land acquisition will be limited to poles and transformer locations. (Maps of the project location are provided in annexes of the report).

#### **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 2024. 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 2024).

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 of 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 CO<sub>2</sub> coming from the combustion of wood and charcoal for heating and cooking.

### **f. 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 activities to be completed by the project are detailed in the next sections.

## **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 center 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 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..

### **3.5.2 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 assets 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. Typical wooden poles for the project are illustrated in the figure below:

**Figure 2: Typical wooden poles to be used by the project**



Source: On field survey, April 2024

#### **c. Installation of 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.

### **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 or structures. 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.

## 4. 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 Physical and Biological Environment

#### 4.2.1. Rubavu district

##### 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 Km<sup>2</sup>. 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 help 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.

These hydrological features are vital for the livelihood of the residents, agricultural activities, and the overall environmental sustainability of Rubavu District.

#### **4.2.2. Rutsiro district**

##### **a. Location**

Rutsiro District is one of the seven Districts that make up the Western Province, others being; Nyamasheke, Rusizi, Karongi, Ngororero, 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 km<sup>2</sup>.

##### **b. 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.

##### **c. 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.

##### **d. 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.

##### **e. 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 Kiguhi. The water resource in Rutsiro is threatened by the high erosion risks due to high and teep slopes with arable lands, high mining activities also causes sedimentation into rivers.

#### **4.2.3. Karongi district**

##### **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 km<sup>2</sup>, 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° 5C 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.

## **4.2.4. Nyamasheke district**

### **a.Location**

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 km<sup>2</sup> including 225.85 km<sup>2</sup> as part of Nyungwe National Park and 346.53 km<sup>2</sup> 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, Nyabitekera, Mahembe, Rangiro and Shangji.), 68 Cells and 588 Villages (Imidugudu).

### **b.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.

### **c.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.

#### **d. 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:

1. **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.
2. **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.
3. **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.
4. **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.
5. **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.

#### **e. 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.

### **4.2.5. Rusizi district**

#### **a. Location**

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.

### **b. 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.

### **c. 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.

### **d. 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.

### **e. 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.

## **4.2.6. Ngororero district**

### **a. Location**

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 Km<sup>2</sup> and it is subdivided into 13 administrative Sectors (Imirenge), 73 administrative Cells (Utugari), and 419 Villages (Imidugugu).

### **b. 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).

### **c. 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.

### **d. 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.

#### **e. Hydrography**

The main rivers in the district are Nyabarongo, Rubagabaga, Mukungwa, Satinsi, 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.

### **4.2.7. Nyabihu district**

#### **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

#### 4.2 Fauna and Flora

Rwanda harbors very a diverse flora due to a considerable geo diversity and a climatic gradient from West to East. The number of vascular plants is estimates at around 3000 species originating from the different bio-geographical regions. Rwanda shelters 151 different types of mammal species, eleven of which are currently threatened and none of which are endemic. Among them are the primates (14 to 16), with half of the remaining world population of mountain gorillas (Gorilla gorilla berengei) that are found in the Volcanoes National Park

In Western Province, there are an important ecological heritage with a multitude of species, prominent among which are: the *Dombeya Gortzeneri* (umukore), *Entandrophragma excersum* (umuyove), *Prodocarpus* (umufu), *Catrapa grandiflora* (umushwati), *Sumphania globulifera* (umushishi), *Alanginus* (umurava), *lancolata* (umulanga), *Polycias fulia* (umwungo) and the Eucalyptus. On the other hand, the project area is very poor in wildlife. As a result of forest degradation, wildlife has gradually disappeared giving way to certain reptiles, amphibians and birds.

**Figure 3: Topographical and typical vegetation characteristics of the project areas in western province**



Source: Field survey, April 2024

It was not practical to identify all animal and vegetation species accounted in the project area and in each district however, typical fauna and flora mostly frequent in the project areas and their conservation status are presented in tables below:

**Table 4: 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 lasiopus</i>		Igiheriheri	-

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
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 robusta</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

**Table 5: Bird species recorded in the project areas**

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
1	Columbiformes	Columbidae	<i>Streptopelia semitorquata</i>	Red-eyed dove	Inuma (itungura)	LC
2	Galliformes	Phasianidae	<i>Pternistis hildebrandti</i>	Hildebrandt's Francolin	inkware	LC
3	Passeriformes	Nectariniidae	<i>Hedydipna collaris</i>	Collared sunbird	Umununi	LC
4	Pelecaniformes	Threskiornithidae	<i>Threskiornis aethiopicus</i>	Waterbird	nyirabarazana	LC
5	Gruiformes	Gruidae	<i>Balearica regulorum</i>	Grey Crowned Crane	Umusambi	EN
6	Passeriformes	Corvidae	<i>Corvus albus</i>	Pied Crow	Icyiyoni	LC
7	Passeriformes	Passeridae	<i>Passer griseus</i>	House sparrow	igishwi	LC
8	Accipitriformes	Accipitridae	<i>Buteo augur</i>	Common buzzard	icyanira	LC
9	Passeriformes	Leiothrichidae	<i>Turdoides jardineii</i>	Arrow-Marked Babbler	Ikijwangajwanga	LC
10	Apodiformes	Apodidae	<i>Apus caffer</i>	white-rumped swift	Intashya	LC
11	Pelecaniformes	Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	Inyange	LC
12	Hemiptera	Pseudococcidae	<i>Planococcus citri</i>	Mealybugs	utumatirizi	LC
13	Passeriformes	Muscicapidae	<i>Cossypha heuglini</i>	White-browed Robin-chat	Inyombya	LC
14	Passeriformes	Ploceidae	<i>Ploceus pelzelni</i>	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

**Table 6: 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	Ikiryambeba	LC
2	Squamata	Lamprophiidae	<i>Psammophis sibilans</i>	Striped sand snake	Imbarabara	LC

**Table 7: Amphibian species recorded in the project areas**

No	Order	Family	Scientific name	Common name	IUCN status
5	Anura	Bufoiadae	<i>Sclerophrys regularis</i>	African common toad	LC
6	Anura	Bufoiadae	<i>Amietophrynus kisoensis</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 guibe</i>	Guibe's Grassland Frog	-
2	Anura	Ptychadenidae	<i>Ptychadena nilotica</i>	Nile Ridged Frog	LC

**Table 8: Mammal species recorded in the project areas**

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
5	Artiodactyla	Hippopotamidae	<i>Hippopotamus amphibius</i>	River hippopotamus	Imvubu	VU
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

**Table 9: 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

No	Order	Family	Scientific name	Common name	Vernacular name	IUCN status
3	Siluriformes	Clariidae	<i>Clarias gariepinus</i>	African Catfish	Inkube/Inshonzi	LC

### 4.3 Socio-economic characteristics

According to the 5<sup>th</sup> Population and Housing Census (5<sup>th</sup> PHC, by NISR 2022), the Western Province in had 2,896,484 populations, where 47.8% are males and 52.2% females. the most populated district in western province is Rubavu with 546,683 inhabitants where 48.9% are males and 51.1% females. whereas the least populated district is Nyabihu with 319,047 inhabitants where 47% are males and 53% females. The table below provide the population of the western province.

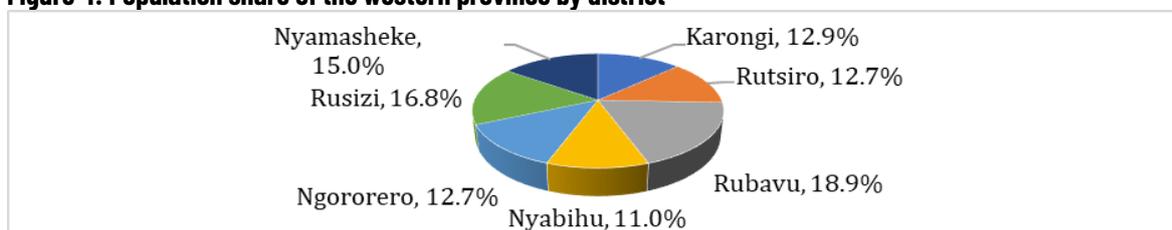
**Table 10: Population of western province by area of living**

District	Total			Urban			Rural		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
<b>Western Province</b>	<b>2,896,484</b>	<b>1,384,635</b>	<b>1,511,849</b>	<b>640,307</b>	<b>312,001</b>	<b>328,306</b>	<b>2,256,177</b>	<b>1,072,634</b>	<b>1,183,543</b>
Karongi	373,869	178,417	195,452	33,542	16,523	17,019	340,327	161,894	178,433
Rutsiro	369,180	176,498	192,682	20,606	9,724	10,882	348,574	166,774	181,800
Rubavu	546,683	267,299	279,384	294,448	142,348	152,100	252,235	124,951	127,284
Nyabihu	319,047	150,072	168,975	78,027	36,867	41,160	241,020	113,205	127,815
Ngororero	367,955	171,065	196,890	18,142	8,741	9,401	349,813	162,324	187,489
Rusizi	485,529	236,426	249,103	162,165	81,615	80,550	323,364	154,811	168,553
Nyamasheke	434,221	204,858	229,363	33,377	16,183	17,194	400,844	188,675	212,169

Source: 5<sup>th</sup> Population and Housing Census, NISR, 2022

The figure below illustrates the population share of the western province by district

**Figure 4: Population share of the western province by district**



Source: 5<sup>th</sup> Population and Housing Census, NISR, 2022

The detailed socio-economic data of each district of intervention were provided in the appendixes of the report. the following sections discussed some data related to population, housing characteristics, ownership of appliances that requires the use of electricity such as radio, television set, telephones, and discuss the status of access to energy in each district of the project area of intervention.

#### 4.2.1 Rubavu district

##### a. Population

The 5<sup>th</sup> 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 (32077 inhabitants). They represent 4.2% and 5.9% of the total resident population of Rubavu district, respectively.

**Table 11: Population of Rubavu District by Sector and sex in 2022**

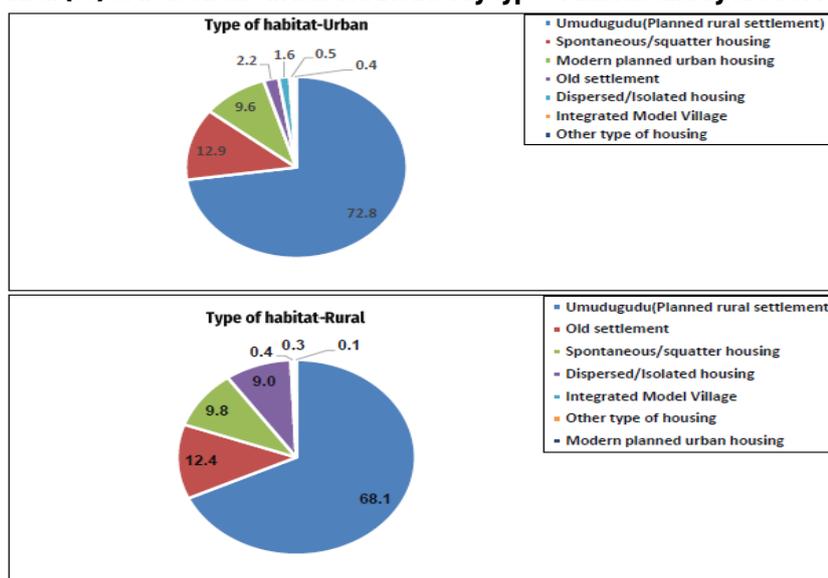
District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	-
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	-
Rubavu district	546,683	267,299	279,384	100	48.9	51.1	100
Bugeshi	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
Cyankarwe	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. Housing characteristics**

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%). 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 5: Distribution (%) of households in Rubavu District by type of habitat and by Area of residence.**



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

**c. 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 12: Percentage of private households and 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 <sup>1</sup>	Smart Mobile	Computer
<b>Rwanda</b>	<b>3,312,743</b>	<b>81.5</b>	<b>12.3</b>	<b>78.1</b>	<b>20.8</b>	<b>4.2</b>
<b>Western Province</b>	<b>671,506</b>	<b>79.5</b>	<b>8.0</b>	<b>77.1</b>	<b>15.8</b>	<b>1.9</b>
<b>Rubavu district</b>	<b>124,080</b>	<b>81.2</b>	<b>17.2</b>	<b>79.3</b>	<b>25.4</b>	<b>4.3</b>
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)

#### d. 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 13: Distribution (count and %) 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

<sup>1</sup> 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 Jamu	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Other source of energy for Lighting	Not stated
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
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%).

## 4.2.2 Rutsiro district

### a. Population

The 5<sup>th</sup> 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 14: Population of Rutsiro District by Sector and sex in 2022**

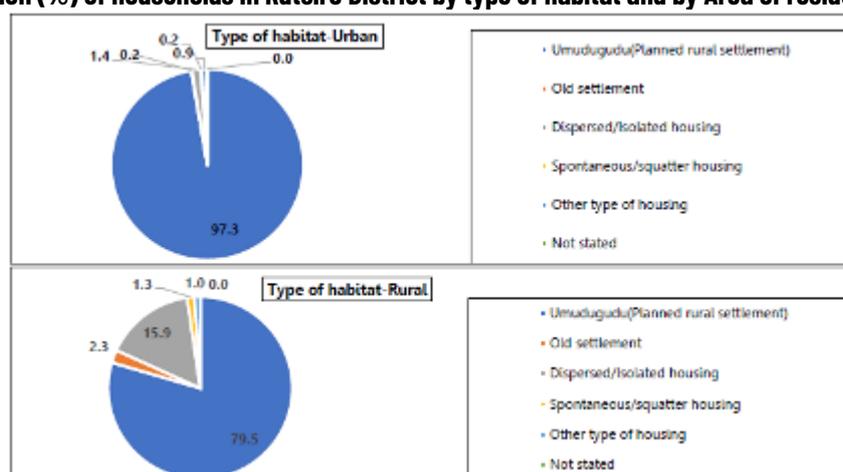
District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
Rwanda	13,246,394	6,429,326	6,817,068	100	48.5	51.5	
Western Province	2,896,484	1,384,635	1,511,849	100	47.8	52.2	
Rutsiro district	369,180	176,498	192,682	100	47.8	52.2	100.0
Boneza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

The results of 5<sup>th</sup> 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%).

**Figure 6: Distribution (%) of households in Rutsiro District by type of habitat and by Area of residence.**



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

### c. 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 15: 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)

#### d. 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 16: Distribution (count and %) 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 lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for	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	-
Manihira	4,703	100	37.0	0.3	-	0.5	13.4	4.2	43.0	0.8	0.1	0.6	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	Not stated
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%).

#### 4.2.3 Karongi district

##### 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 17: 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

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
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)

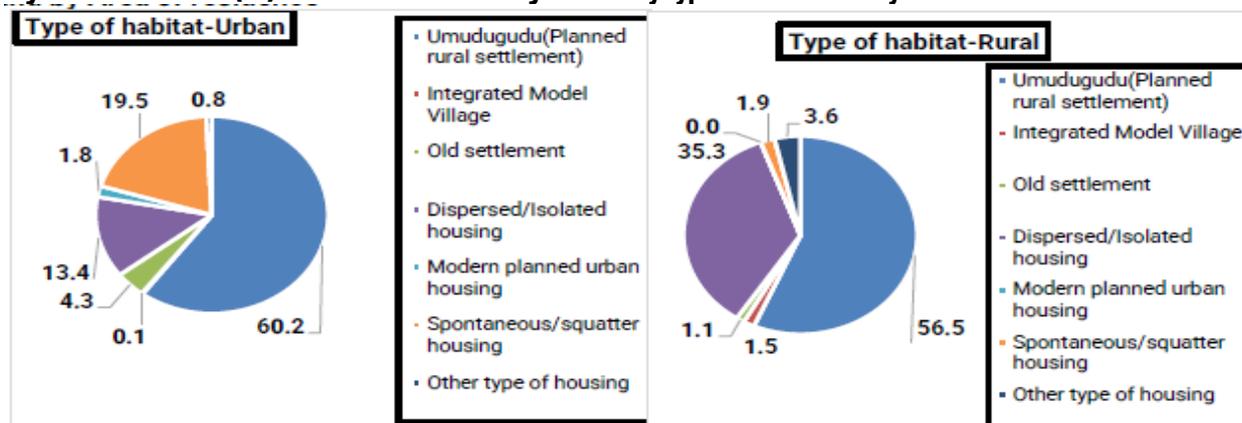
Karongi District population lives predominantly in rural area (91.0%) while resident population in urban represents 9%. Almost all sectors of Karongi District (11 out of 13 sectors) are entirely rural. Only Bwishyura and Rubengera sectors have some urban areas

### b. 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%).

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 7: Distribution (%) of households in Karongi District by type of habitat and by Area of residence.**



Source: Fifth Rwanda Population and Housing Census, 2022

### c. 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 18: Percentage of private households and of Karongi 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
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)

#### d. 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 19: Distribution (count and %) 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
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

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
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.

#### 4.2.4 Nyamasheke district

##### 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 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 20: Population of Nyamasheke District by Sector and sex in 2022**

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

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
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.

nyabitekeri and Rangiro.

nyabitekeri and Rangiro.

### b. Housing characteristics

The results of 5<sup>th</sup> 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 Shangji 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 Shangji 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 5<sup>th</sup> 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 Shangji 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 Shangji have the lowest at 0.2% and 0.4 respectively.

**Table 21: Distribution (count and %) of households in Nyamasheke District by type of habitat and Sector**

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

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
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%).

### c. 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 22: Percentage of private households and 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

Sectors and area of residence	Total Number of Private Households	% of HHs owning the specified communication asserts				
		Radio	Television	Mobile phone2	Smart Mobile	Computer
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)

#### d. 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 23: Distribution (count and %) 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/Parraffin 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%).

#### 4.2.5 Rusizi district

##### a. Population

The 5th Rwanda Population and Housing Census has enumerated 485529 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 24: Population of Rusizi District by Sector and sex in 2022**

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
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

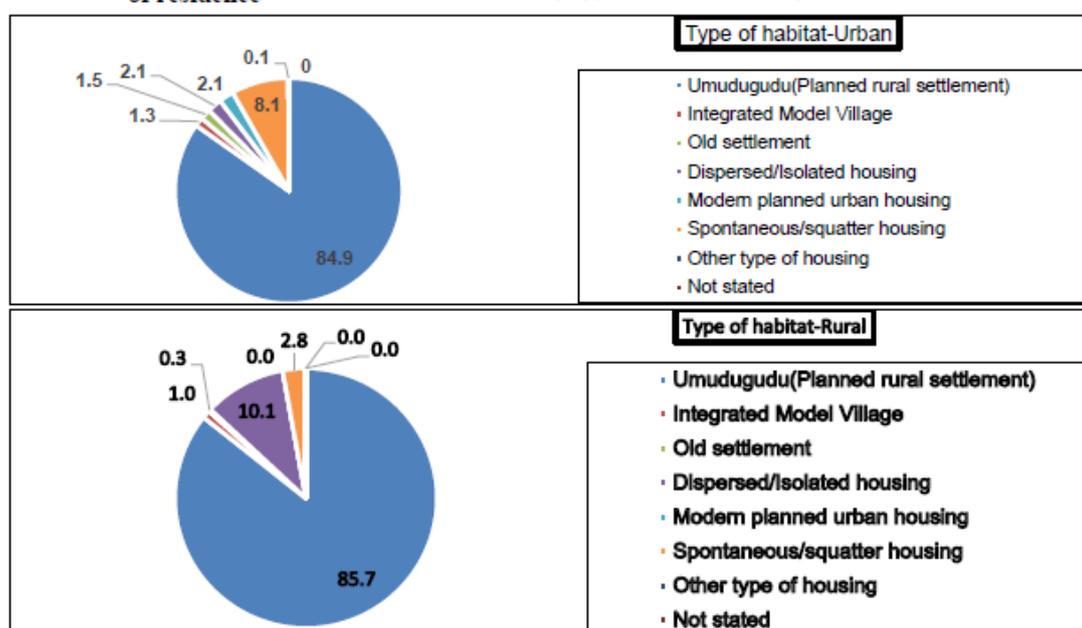
(77.9%) and urban area (22.1%). Rusizi district population is predominantly rural 66.6% while urban represents 33.4%. The sectors of Rusizi district which don't have urban areas are Butare, Bweyeye, Giheke, Gikundamvura, Nkombo and Nkungu. The sectors with Predominant urban areas are Bugarama (94%), Kamembe (81.2%), and Muganza (98.7%) and Rwimbogo (59.5%). The table below 1.3 illustrates the details

### b. Housing characteristics

The results of 5<sup>th</sup> 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 8: Distribution (%) of households in Rusizi District by type of habitat and by Area of residence.**



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

### c. 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 25: Percentage of private households and 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 <sup>2</sup>	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)

#### d. 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 26: Distribution (count and %) 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/Paraffin lamp	Biogas	Candles	Firewood	Batteries/Bulb	Flashlight/Phone Flashlight	Rechargeable Batteries	Lantern	Other source of energy for Lighting	
												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
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	0.0
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	0.0
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	-

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
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	0.0
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%).

#### 4.2.6 Ngororero district

##### a. Population

The 5<sup>th</sup> 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 27: Population of Ngororero District by Sector and sex in 2022**

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)

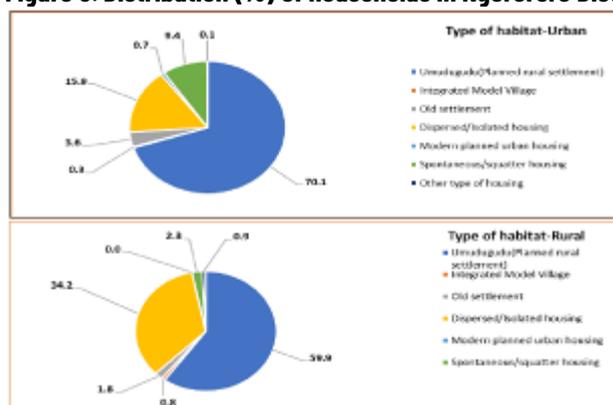
The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The Western Province is predominantly by the rural area (77.9%) and urban area (22.1%). Ngororero district 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. Housing characteristics

The results of 5<sup>th</sup> 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 9: Distribution (%) of households in Ngororero District by type of habitat and by Area of residence.**



Source: Fifth Rwanda Population and Housing Census, 2022

### c. 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 28: 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 <sup>2</sup>	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
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)

### d. 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 29: Distribution (count and %) 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

Sector and area of residence	Total number of private households	Total	Electricity	Kerosene/Paraffin Jamu	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
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%).

#### 4.2.7 Nyabihu district

##### a. Population

The 5<sup>th</sup> 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 30: Population of Nyabihu District by Sector and sex in 2022**

District and Sector	Frequency			Percent			Share of the population
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
<b>Rwanda</b>	<b>13,246,394</b>	<b>6,429,326</b>	<b>6,817,068</b>	<b>100</b>	<b>48.5</b>	<b>51.5</b>	
<b>Western Province</b>	<b>2,896,484</b>	<b>1,384,635</b>	<b>1,511,849</b>	<b>100</b>	<b>47.8</b>	<b>52.2</b>	
<b>Nyabihu district</b>	<b>319,047</b>	<b>150,072</b>	<b>168,975</b>	<b>100</b>	<b>47</b>	<b>53</b>	<b>100</b>
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)

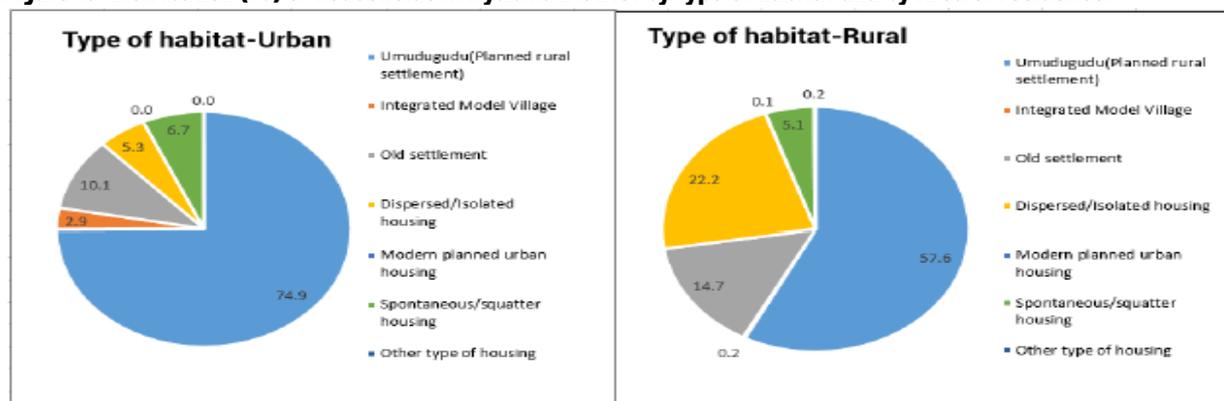
The results of Rwanda Population and housing census 2022 revealed that, the total population of Rwanda are spatially distributed in rural area that represent 72.1% and urban area represent 27.9%. The western Province is predominantly by the rural area (77.9%) and urban area (22.1%). Nyabihu district 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. Housing characteristics**

The results of 5<sup>th</sup> 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 10: Distribution (%) of households in Nyabihu District by type of habitat and by Area of residence.**



Source: Fifth Rwanda Population and Housing Census, 2022

### c. 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 31: Percentage of private households and 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 <sup>2</sup>	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)

### d. 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 32: Distribution (count and %) 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	
												Linhtinn	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

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	
												Other source of energy for Lighting	Not stated
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%).

**5. PUBLIC CONSULTATION AND PARTICIPATION**

**5.1 Overview**

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 . Public participation - methods and process**

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. 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.

**Figure 11: Consultations with local community.**



**Source: field Consultation**

**5.3. Outcome of consultation**

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

**Table 33: 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. Hover 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.
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 other affected assets will be done.
Other discussions on project impacts (both positive and negative)	Project impacts were discussed and are detailed in this report and mitigation measures for negative impacts were discussed. It was noted that positive impacts

Discussions/ information	Outcomes
and mitigation measures.	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 verry 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 incur 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 34: 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 35: Analysis of alternatives**

No	Alternative	Analysis
1	<b>Preferred Option: Overhead Power Lines</b>	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	<b>No-Go Option</b>	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

No	Alternative	Analysis
		network without interruption, temporary and permanent employment opportunity from project implementation etc.
3	<b>Underground Power Lines</b>	In some urban areas, distribution and service lines are typically placed underground, for safety and aesthetic reasons and for smaller voltages. Underground lines are not an option for present project. 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 more costly 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 thus considered unviable and eliminated from further consideration.
4	<b>Alternative land use</b>	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	<b>Construction Methods and Techniques</b>	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, extent and location and based on the social and environmental assessment of the project site, the consultant is concluding that the most preferred alternative would be implementing the project with the implementation 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**

Electrification project is crucial to the economy, health, and welfare of the local community and the country in general. This chapter describes the impacts identified for the implementation of project and the identified impacts apply to the socio-economic environment as well as the bio-physical environment. The impacts identified are both positive and negative, direct, or indirect, long term or short term and may be local or extensive.

### **7.1. Positive impacts**

The project will be implemented in majority in rural centres and even in some smaller villages near to the roads where small-scale handicraft units and workshops could profit from a permanent and stable electricity supply. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. Potential beneficiary enterprises affected by and contributing to regional socio-economic transformation will be small industries such as sawmills, grain mills and other agricultural processing and storage businesses. Data management with computers is enabled along with communication facilities like Internet and charging of mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

It is expected that the proposed project will create numerous direct jobs, many of which will be sourced from the project areas. A significant proportion of these jobs will go to people in the lower income brackets. Direct income effect will come from salaries and wages paid to workers and income from locally sourced contracts for services such as security guard, bush clearing, holes digging, cable stringing etc.

#### **a) Employment**

The present project will involve different works including soil excavation, poles election, cable stringing, ROW clearance etc. These works requires both skilled and unskilled workers. Based on the project size and similar project, more than 150 both unskilled skilled workers in each district will participate in works during construction and operational phase. The priority should be given to local people especially unskilled workers to provide them with more income, capacity building and increase ownership.

##### **Enhancement measures:**

Give preference to local people for casual labourers when allocating temporarily jobs. Officials from cells and villages of the electrification coverages may be involved in recruitment processes as they are aware of the behaviours and the conduct of those to be recruited.

#### **b) 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 by 2024.

##### **Enhancement measures:**

Registration of nearby people in the project area without electricity connection to be sure no one is left behind.

#### **c) 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.

##### **Enhancement measures:**

Give preference to local people for connectivity especially those owning businesses that generate income to the public revenues. These include commercial centres as well as those involved in trading activities.

#### **d) Improved business opportunities within the project areas**

The development of electrification project is meant to bring business opportunities in the project areas such as welding, workshops, hair salon etc. This may create and attract more businessmen to the project areas and hence increase business and infrastructure development in project areas.

##### **Enhancement measures:**

Increase the stakeholder engagement and community participation to ensure their needs are addressed during project implementation.

**e) Affordability of education and increased access to medical insurance and other benefits**

Increased incomes from employment opportunities at the project works will hand the locals of the area employed by the project the ability to pay school fees and increase their access to medical insurance "Mituelle de santé".

**Enhancement measures:**

Increase the stakeholder engagement and community participation to ensure their needs are addressed during project implementation.

**f) Overall long-term increased access to electricity**

The long-term direct positive impact is an access to reliable electricity supplies, which will lead to better provision and easier management of goods and services and enable new facilities for processing and storage. There will be better availability and use of computers and communication facilities like internet in rural areas, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

**Enhancement measures:**

During procurement of materials ensure they are procured the long-lasting construction materials which will serve the population in long term as per the project design.

**g) Improved quality of life**

Electricity project would support overall education in the project areas and strengthen the ongoing effort of capacity building to overcome critical constraints in the education sector. Essential to this effort would be power supply to health centres and consequently, the quality of life and extent of economic opportunity will be changed for the better.

**Enhancement measures:**

Increase the stakeholder engagement and community participation to ensure their needs are addressed during project implementation.

**h) Provision of alternative sources of energy in the project area**

As noted during the field surveys, in different areas not connected to national grid, local people are using woodfire and crop residue as main source of energy for lighting and cooking. Increased transmission and distribution of electricity to the project area will reduce the pressure on the use of fuel wood and in effect would help to conserve the fragile and diminishing forest cover of the country by providing an alternative source of energy in the area.

**Enhancement measures:**

Increase the stakeholder engagement and community participation to ensure their needs are addressed during project implementation.

**7.2. 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 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.

**7.2.1 Negative socio impacts and their mitigation measures**

**A) Labor influx**

Project activities may attract many people in the project areas in search for employment and settlements. The presence of these workers in the community may cause conflicts between workers and community residents. Such behaviour are

generally related to socially unacceptable behaviour according to local social standards and can be seen, for example, cases of drunkenness, robbery, insecurity, Sexual exploitation, and Gender based violence and pressure on existing social infrastructure.

#### **Mitigation measures**

- Maximum effort will 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;
- Project level Grievance redress mechanism and GRCs will be established and include local community and local leaders' representation, to settle any issues that may arise.
- Development and implementation of a Labor Management Plan
- Undertake training and awareness sessions for workers on SH, SEA, HIV/AIDS, STDs and communicable diseases.

#### **B) Loss of crops and other assets such as trees**

During line route survey and electrical lines construction, there will be environmental degradation especially destruction of natural vegetation, food, and cash crops. There are no identified sensitive or protected ecosystems that shall be affected by the project activities such as wetlands.

#### **Mitigation measures**

- Project activities will be implemented after harvest to avoid crops losses and damages;
- Survey activities will avoid at the maximum the zones of environmental risks such as marchland and protected areas;
- Local community and project beneficiaries will be involved in survey activities to identify and locate such protect areas such as graves and cemeteries where applicable;
- Priority in job allocation will 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.
- All workers to be sensitized against unnecessary destruction trampling and clearance of flora,
- Where losses of vegetation/crops are inevitable, compensation measures be instituted as per the BVR prepared. 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.
- All workers to be sensitized against unnecessary destruction trampling and clearance of flora,
- Tree species listed in the IUCN Red list and seen during the surveys will be marked and avoided, wherever possible, by re-aligning the route;
- Where losses of vegetation/crops are inevitable, compensation measures be instituted as per the RAP prepared.

#### **C) 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.

#### **Mitigation measures**

- The entire project will 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;
- First aid kit will be provided and avail permanent at the work site;
- All project workers will be provided with health insurance as means of health affordability;
- Working conditions will respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labor in Rwanda;
- Appropriate measures will be 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 will be prepared and enforced at the project site;

-Sign boards at the project site will be provided to prevent accidents and troubles involving site workers.

#### **D) 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

#### **Mitigation measures**

- All project workers will be regular sensitized on ways of HIV/AIDS contamination and prevention and other communicable diseases;
- Toolbox 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

#### **E) Occupational, health and safety issues**

During construction activities, workers will be subjected to situations that could be detrimental to their health and safety such as injuries caused by handling of construction equipment, election of poles, injuries from stepping on or using sharp objects, fires, accidents, communicable disease hazards due to interactions among the workers or with service providers such as food vendors, emissions of dust from clearing and excavation works and fumes from vehicles and other noise and vibrations from project equipment etc.

#### **Mitigation measures**

- Workers on the site will be provided with appropriate personal protective equipment (PPEs) such as; safety boots, helmets, reflective jackets, and overalls;
- All site workers will have medical insurance "mituelle de sante" a means of affordability of treatment;
- All site workers will sign a code of conduct as means of good conduct during project implementation;
- A qualified EHS officer will be available to monitor the overall compliance of the Environmental health and safety compliance;
- Toolbox talks on OHS, emergency response plans, labour management, traffic management, first aid training and response, etc. should be included in contractor obligations;
- First aid Kits and first aid helper shall be provided at working area and medical agreement will be established with the nearest health Center in case of emergence or serious injuries;
- The site shall be insured for any incident that may occur during project works.

#### **F)Child labour, 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.

#### **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.

#### **G) Vandalism of the project infrastructure**

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.

#### **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.

#### a) **Health issues**

Some of the significant health concerns associated with such kind of the projects include shortage of facilities like toilets and catering facilities for construction workers. For instance, the constructor remains the only responsible party to ensure that his or her workers are provided with the required facilities. These facilities could either be put in place before the construction of the line or arrangement could be done such that the personnel working along the line could get the facilities from the neighbouring communities.

#### b) **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 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 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;
- 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.

## **7.2.2 Negative physical impacts and their mitigation measures**

#### a) **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.

### **Mitigation measures**

- All project drivers will be provided with safety trainings;
- Local traffic police will be involved for traffic monitoring;
- Where possible speed limit and other traffic signs will be installed especially in project working areas.

### **Soil and water pollution**

Sources of potential soil and water pollution may include the following:

- Improper waste disposal of construction materials.
- Maintenance and servicing activities of the transformers

### **Mitigation measures**

- Waste management during construction is crucial to prevent negative aesthetic impacts on the surroundings environment of the project areas.
- The oils change of transformers will be done by competent and trained personnel.
- The defected transformers will be well disposed of and transported to the recycling area. Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses;
- 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;
- 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 fuelling tankers other than fuel storage on sites
- All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line
- All vehicles and equipment to be serviced in designated areas, preferably at garages in urban centres along the lines

#### **- 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.

### **Mitigation measures**

- During project works, contractor will 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.

### **H) Air and Noise Pollution**

Through site clearing and excavation at some areas dust generation is expected. Noise associated with construction can disturb households and neighbouring communities of the ROW as well as the local wildlife.

### **Mitigation measures**

- Works should be executed in short period of time to minimize the dust generation at the site;
- Excavated soil shall be re- used in backfilling the excavated holes;
- The excavated holes should be clearly marked;
- Workers will be provided with personal protective equipment;
- All kind of burning of any kind of waste shall be prohibited at project site and its vicinities.
- The movement of heavy vehicles during the night will be avoided;
- If particularly noisy works are scheduled, the nearest sensitive receptors (homestead owners, nearby schools, hospitals and shop owners) will be informed of the timing and duration of the nuisance.
- Siting of poles and transformers to avoid permanently and seasonally wet sections and water courses.
- 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.
- 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 fuelling tankers other than fuel storage on sites
- All vehicles to be checked for potential of oil leakages prior to works in wet sections of the line.
- All vehicles and equipment to be serviced in designated areas, preferably at garages in urban centres along the lines

#### **c) 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;

#### **d) Landscape and Visual impacts**

The visual impact of the power line is an effect on a socio-cultural level. From the perspective of rural populations, this is seen as a sign of development, of hope that things will change for the better. It is important to note that the proposed development will also have minimal effects on the landscape as the proposed routes for the powerlines were established based on the existing roads so as to meet housing requirement imposed by the natural landscape, objects, buildings, and facilities in the neighbourhood, while incorporating it into the existing landscape of the project areas.

#### **a) Impacts on water resources**

No water will be used for technological purposes. However, the overhead transmission lines will cross some water courses. The poles will be placed to leave a protection zone of 15m when crossing the streams with the span ranging of 10-15 m, and 5 m when crossing any drainage channels.

#### **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.

### **7.2.3 Negative Biological impacts and their mitigation measures**

#### **1) 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 transmission line.

#### **Mitigation measures**

- This impact is unavoidable and will be mitigated through compensation measures which include fair compensation of affected crops and trees;
- 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.
- 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 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.

#### **J) Disturbance of ecosystems habitats**

The clearing of existing vegetation will result in the complete loss of associated ecological habitats and their fauna, within the project sites. Noise, vibrations, and intrusive activities related to construction works will tend to scare away living biota remaining on the site after vegetation clearance.

#### **K) Impact related to regular vegetation clearing within the RoW**

In the ROW of the line, vegetation should always be cleared and removed to avoid affecting operation of equipment and that will be done regularly by clearing. Natural vegetation along the line, will be cleared. different trees species will be eliminated in the ROW, which has an impact on the population's lifestyle and biodiversity in those areas. Vegetation clearing could disturb fauna species on the areas of intervention.

#### **Mitigation measures**

- Clearing of RoW should be done by experienced personnel and appropriate monitoring be conducted;
- Only clear areas reserved for the RoW.

#### **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.

- Conductors along wetlands and in birds migration areas will run horizontal not vertical.
- Installation of visibility enhancement objects such as marker balls, bird deterrents or diverters

#### **7.2.4 Negative impacts of the decommissioning works**

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.

#### **7.3. Adverse impacts during operation**

The following adverse impacts are anticipated to occur during the operation and maintenance phase of the project. Two universal concerns about transmission line projects are (1) disposal of polychlorinated biphenyls (PCBs) once used in electrical equipment, and (2) possible health impacts of electromagnetic fields (EMF) associated with power distribution lines.

##### **7.3.1 Negative Socio impacts during the operation phase**

###### **• Public Safety issues**

Placement of low-slung lines or lines near human activity (e.g. highways, buildings) increases the risk for electrocutions. Also, poles and transmission lines can disrupt airplane flight paths and endanger low-flying aircraft.

### **Mitigation Measures**

- All workers entering the construction site must be equipped with PPE including goggles, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meet the international standards of PPE.
- Personal protection gear will be provided, and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.
- Training given to the employees should be backed by regular on- site training in safety measures.
- Machines and Equipment must be operated only by qualified staff and a site supervisor should be always on site to ensure adherence.
- The contractor must develop workers' Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.

#### **• 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.

#### **• Bird Strikes/Collusions**

Transmission and distribution networks are known to be a potential source of bird strikes that get entangled to the lines causing their injury or even instant death. This is especially significant when large flock of birds migrates from one point to another and usually gets struck by these transmission or distribution lines.

### **Mitigation Measure**

- Once established, the transmission line may cause increased risk of collision of birds in flight, however this risk is expected to be minimal since the route does not pass through any known migratory bird routes.

## **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.

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 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. The ESMP for each district is provided in annexes of this report.

### **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 environmental and social safeguard 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 around project work sites
- Works 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;

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 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 assets and it 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 environment 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.

### **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 diseases, primarily HIV AIDS, and other contaminating diseases are taken;
- Preventive measures to avoid work accidents are in place and followed appropriately
- All site workers are insured with mutuelle de sante as means of health affordability.

All districts of the project areas of intervention 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 to ensure that;

- All generated wastes are contained within construction sites and managed appropriately
- Solid waste: all site waste is to be collected and disposed of in an approved area or re-used. The segregation of waste (paper, glass, metal) shall be undertaken and recycling opportunities identified.
- Sewage at materials storage sites is disposed appropriately into sealed pit latrines or other approved sanitation systems.

**Table 36: Environmental and Social Monitoring Plan to be implemented in each district of the province**

Environmental items	Monitoring item	Parameter/Indicator	Location	Frequency	Responsible	Budget (USD)
<b>Pre-construction and project mobilization phase</b>						
Land acquisition and compensation	Fair compensation for affected crops, trees and other assets	Reports for affected crops, trees and other assets	Project area	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)
<b>Construction phase</b>						
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	Project area	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	At construction and excavation sites	during project works	Contractor/ supervisor	300 for noise measurement in each district
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center for all project machinery and vehicles	Project site	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	project areas	Daily	EDCL/ Districts	200 for each district
Soil Waste	Proper management of excavated soil and other soil waste generated from the project	Re- used excavated soil	at project sites	regular	EDCL/ Districts	No cost is required
Fauna and flora removal	Reforestation where possible to offset loss of flora and fauna	Restored area	At the ROW	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	Project site	Permanent	EDCL/ Districts	Cost covered during the preparation of OHS plan

Environmental items	Monitoring item	Parameter/Indicator	Location	Frequency	Responsible	Budget (USD)
HIV/ AIDS and other contaminating diseases Child and forced labor	Awareness on social, health and safety	Number of awareness conducted	Project sites	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	Project site	daily	Districts/ EDCL	Cost for sign post covered under construction budget
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	project area	daily	EDCL/ Districts district / workers	40 USD to cater for overall PPE for each staff in each district
	Health and sanitation plan for workers	Presence of sanitation facilities at project sites such as toilets and water	Project sites	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	Construction areas	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	At the project sites	Once	EDCL / Contractor/ Districts	to be covered under project construction budget
<b>Operation phase</b>						
Effects from electrocution	Presence of warning signs and anti-climbing barbed wire	Infrastructures damages Proper sagging Damaged poles and cables	Operation	Regular	EDCL/ Districts 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	Project sites	Once	Contractors/ EDCL	Under project construction budget

### **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. District of the areas of intervention 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 all monitoring provisions, etc. The project contractor will also have an Environmental Health and Safety officer to oversee the implementation of project during construction.

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. Role 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. Contractor's role**

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. Role 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 Management Specialists shall work closely with EDCL Environmental and Social Safeguards 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.

#### **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's**

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 assets inventory of affected assets and properties 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 and AfDB.

#### **8.3.11. 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.

#### **8.3.12. Grievance Redress Mechanism (GRM)**

A grievance mechanism will be developed for potential use by all interested stakeholders. The aim of the grievance mechanism is to achieve mutually agreed resolution of grievances raised by such stakeholders. This grievance mechanism ensures that complaints and grievances are addressed in good faith and through a transparent and impartial process, but one which is culturally acceptable.

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 the project and stakeholders, especially PAPs.

The types of grievances stakeholders may raise include, but are not limited to:

- i. Negative impacts on communities, which may include, but not be limited to financial loss, physical harm and nuisance from construction or operational activities;
- ii. Health and safety risks;
- iii. Negative impacts on the environment such as pollution of water ways, soil, and air;
- iv. Relocation of utilities, and
- v. Unacceptable behavior by staff or employees.

It is critical that stakeholders understand that all grievances lodged, regardless of the project phase or activity being implemented, will follow one single mechanism. The mechanism must not impede access to other judicial or administrative remedies.

**- Objectives of Grievance Redress Mechanism (GRM)**

The GRM works within existing legal and cultural frameworks, providing an additional opportunity to resolve grievances at the local, project level. The key objectives of the GRM are:

- i. Record, categorize and prioritize the grievances;
- ii. Settle the grievances via consultation with all stakeholders (and inform those stakeholders of the solutions);
- iii. Forward any unresolved cases to the relevant authority.

It is vital that appropriate signage is erected at the sites of all works providing the public with updated project information and summarising the GRM process, including contact details of the relevant Project Contact Person within the project implementation unit. Anyone shall be able to lodge a complaint and the methods (forms, in person, telephone, forms written in Kinyarwanda) should not inhibit the lodgement of any complaint. The grievance redress committee shall be composed of the PAPs representative, Village and Cell leader's representatives, women representative at cell level, client representative and consultant representative. The CRC members shall have the training on different topics related to the objectives of GRM prior to the commencement of the sub-project activities, especially the grievance redress mechanism, records and reporting system and others.

## **9. CONCLUSIONS AND RECOMMENDATIONS**

### **9.1. Conclusions**

Access to electricity is one of the primary constraints to the Rwanda economy; providing 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 EIA have 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.

It is critical to realize that the project must be implemented within the suggested ESMP guidelines, to avoid negative impacts related to gender inequality, gender-based violence, the abuse of children as well as planning around old trees and other significant environmental and social sites features. 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 document are fully implemented, it is no doubt that the project will benefit to both people and the environment. Projects benefits are outweighed than the negative impacts which mitigation plan has been prepared. Furthermore, project developer will carefully consider and apply all acceptable local and international standard/regulations at all stage through the implementation of the project.

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 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 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 the implementation of the project, EDCL shall secure in full the locations of poles and project facilities such as transformer locations, materials storages sites etc. and this to be accomplished via fair compensation and land easement via negotiations with land owners.
- ✓ EDCL is recommended to take into consideration issues and concerns raised during public consultation especially issues related to compensation and jobs opportunity for local community.
- ✓ 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 (REG- 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: Environmental Management Plan (EMP) for Rutsiro District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	13,000 (Estimated amount for meetings and transport allowance for members of committees-in 13 sectors of the project areas )
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	6,000 (estimated 4 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	6,000 (estimated 150 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	Cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	No cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>15,000 (estimated of 150 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 150 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>65,800</b>

**Annex 2: Environmental Management Plan (EMP) for Rusizi District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	18,000 (Estimated amount for meetings and transport allowance for members of committees-in 18 sectors of the project area)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	9,000 (estimated 6 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	10,000 (estimated 250 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	no cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>25,000 (estimated of 250 employees and 100\$/person</p> <p>900 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 250 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>87,900</b>

**Annex 3: Environmental Management Plan (EMP) for Rubavu District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	12,000 (Estimated amount for meetings and transport allowance for members of committees-in 12 sectors of the project area)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	6,000 (estimated 4 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	6,000 (estimated 150 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	no cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>15,000 (estimated of 150 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 150 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>64,800</b>

**Annex 4: Environmental Management Plan (EMP) for Nyamasheke District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	15,000 (Estimated amount for meetings and transport allowance for members of committees-in 15 sectors of the project area)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	7,500 (estimated 5 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	8,000 (estimated 200 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	no cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>20,000 (estimated 200 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 200 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>76,300</b>

**Annex 5: Environmental Management Plan (EMP) for Nyabihu District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	12,000 (Estimated amount for meetings and transport allowance for members of committees-in 12 sectors of the project area)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	6,000 (estimated 4 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	6,000 (estimated 150 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>-Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	no cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>15,000 (estimated of 150 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 150 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>64,800</b>

**Annex 6: Environmental Management Plan (EMP) for Ngororero District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	13,000 (Estimated amount for meetings and transport allowance for members of committees-in 13 sectors of the project area)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	6,000 (estimated 4 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	6,000 (estimated 150 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	Cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	No cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>15,000 (estimated of 150 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 150 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>65,800</b>

**Annex 7: Environmental Management Plan (EMP) for Karongi District**

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
<b>Pre-construction phase</b>					
Survey of lines routes	Loss of trees and vegetation	<ul style="list-style-type: none"> <li>- To follow standards and REG-EDCL procedures and practices in selection of the electrical line route in rural zones</li> <li>- Avoid areas with a lot of offs trees and crops</li> </ul>	-Report on REG-EDCL clearance process based on Environmental Officer's field report Final line routes designs	REG-EDCL/EPC contractor, REMA, District	To be included in EPC contract's Budget
	Loss crops trees and perennial crops	- Valuation and compensation of affected assets	Compensation report	EDCL-MINIECOFIN	Cost to be covered in A-RAP
	PAPs complaints about their assets affected by survey team	<ul style="list-style-type: none"> <li>- Establishment and operationalisation of GRM</li> <li>- Only clear areas earmarked only for the line route</li> </ul>	Survey report	EDCL-EPC Contractor	13,000 (Estimated amount for meetings and transport allowance for members of committees-in 13 sectors making the district)
Implementation of the project	No compliance in terms of environmental and social safeguards	- Recruitment of an Environmental safeguard and a Social Safeguard Officers	Employed environmental and Social Safeguard officers	REG-EDCL/ project funder	1,300*12months=15,000 (650 USD monthly salary for each Officer)
<b>Construction Phase</b>					
Clearing all vegetation, felling trees in 6m width of Right of Way	Loss of biodiversity (e.g. trees, crops) due to alteration of the natural habitats, visual and auditory disturbance and damages due to the presence of equipment and workers	<ul style="list-style-type: none"> <li>- To ensure that only those trees and other cover vegetation marked by the technical staff are cleared</li> <li>- Be informed about REG-EDCL procedures and practices in clearing sites and follow standards</li> </ul>	<ul style="list-style-type: none"> <li>-Number of trees felled and superficies of areas cleared for vegetation removal.</li> <li>-Report from EO observations on field</li> <li>-Report from DM&amp;E of REG-EDCL</li> </ul>	REG-EDCL/ /District REG-EDCL/ Contractor, REMA, Districts	To be included in EPC contract's Budget
	Impacting the ecological sensitive areas or wetlands through vegetation clearing	- Exploring the possibility of planting lower growing vegetation under below poles or reforestation nearby the power line corridor to restore	Availability of REG-EDCL procedure and practices document -Superficies of re-	REG-EDCL/EPC Contractor and District	PAPs contribution

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		natural habitats. - The choice of power lines route considered avoiding very sensitive and wetlands rich in biodiversity	vegetated areas -Report from site observations by EO -Power line route map		
	Risk of firing forests and natural habitats if cut trees and vegetation will be burnt	- Leave cut materials to rot down in situ and do not burn; - Leave a covering of grass and other lower vegetation on site - Sensitization on effected off bush fire	-Number of violations or illegal report	REG-EDCL/EPC Contractor and District	No budget is required
Clearing and excavation of Poles base and foundation;	Loose of natural vegetation and its biodiversity	- Protection of excavated soil materials from erosion and contamination by placing them away from stream of water on the slop or in direct line of local drainage.	-Reports on sites observations relatives to all practices recommended	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Alteration of soil structure as well as exposure of soil to erosion.	- Loose soil should be kept covered till the time of backfill and excess soil removed and transferred to a dumping site	Monitoring report "	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Loose soil and construction materials will lead to damages of crops and soil contamination	-Construction materials shall be storage within the footprint of the site to avoid any kind of damage and contamination of soil/crop adjoining	Monitoring report	EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	If excavation will occur in swampy areas, water pumped would further increase erosion from surface runoff	-Movement of materials and manpower shall be restricted to existing tracks to avoid creation of new ways	Monitoring report	EPC contractor	No budget required
Spotting plus erection of Poles & Conductors	Vegetation/crops in landing area could also be extensively damaged	-Minimum clearing of trees and wherever possible trimming of trees will be adopted instead of felling them	-Number of trees felled or trimmed	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Working at heights could present hazards to climbers and risks of	- Protective measures should be ensured to workers including	-Number of protective equipment provided to	EPC Contractor	6,000 (estimated 4 workers working at

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
	falling objects on ground workers	individual protective equipment	workers - Accident reports		heigh with appropriate PPE costing 1,500 USD each)
	Working with cranes and other lifting equipment also present potential injury from broken wires, lifting tackle and swinging objects.	- First aid box and emergency medical coverage will be provided to workers.	-Report on cases of medical care provided to workers	EPC Contractor	Cost covered under risks of accidents, injuries and fatalities
	Stringing of lines can cause major traffic blockage where roads are crossed and/or create impacts on occupational health and safety	- At road crossing during stringing, the conductors will be elevated with the help of poles on either side of the road, to avoid any blockage to traffic	Report on sites observations relative to such practices	EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
Construction of poles base foundation	Collection of storm water leading to the creation of stagnant pools at the pole's bases	- -The ground surface of the pole sites shall be so graded as to gently provide water drainage away from the pole legs;	-Site visit report to confirm pole foundation design and construction	REG-EDCL/EPC Contractor and District	To be included in EPC contract's Budget and catered under construction budget
Deliverance and mounting of appropriate strength electric equipment	Fall and trip hazards for workers and passersby during mounting of strength electric equipment Risk of poles failure resulting in societal hazards Stringing activity around low- or high-tension wires and other electrical units could be a potential hazard	- Reduce risks to workers and general public during erection of poles and mounting strength electrical equipment by putting warning signs (danger sign board) - -To ensure that safety margin is included in the design of poles to minimize the risk from any seismic activity or severe storm conditions	-Presence of warning signs or danger sign board visible -Report on verification of ordered poles or commands	REG-EDCL/ Contractor and District REG-EDCL/ Contractor and District	To be included in EPC contract's Budget and catered under construction budget "
Use of heavy lifting equipment to position the plant followed by wiring and connection	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	-Availability of traffic norms and report on its application -Number of protective equipment provided to workers -Report on cases of medical care provided to workers	REG-EDCL/Contractor and District	No cost required. The cost of first aid kit covered above

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		to workers.			
Works for laying foundation, erection of poles, stringing time etc..	Transport of construction materials across agricultural fields, pose of conductors from pole to the next, all will lead damages to standing crops	<ul style="list-style-type: none"> <li>- Adequate compensation will need to be paid whose land/productivity is affected</li> <li>- Consultation and communication with affected persons landowners</li> </ul>	<ul style="list-style-type: none"> <li>- Minutes on the consultation and negotiation meeting with project affected persons (PAPs)</li> <li>- Report on payment and proof documents</li> </ul>	REG-EDCL and District	Cost for compensation to be covered under A-RAP
Lines constructions	Clearing all vegetation, felling trees and crops plus removal of roots	<ul style="list-style-type: none"> <li>- Reforestation nearby the power line corridor in order to restore natural habitats</li> </ul>	<ul style="list-style-type: none"> <li>- Number of trees planted</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/OIA and District	To be covered under District ordinary Budget related to reforestation and environmental management
	Air pollution by gaseous like SO <sub>2</sub> , NO <sub>x</sub> , and CO to site peripheries exhausted from vehicles and machineries will lead to various chest and respiratory tract infections of human and animals	<ul style="list-style-type: none"> <li>- Heavy machinery and vehicles regular inspected to reduce at minimal exhaust</li> <li>- Workers shall be equipped with personal protective materials</li> </ul>	<ul style="list-style-type: none"> <li>- Report on monthly inspection of vehicles</li> <li>- Number of personal protective equipment delivered to workers</li> </ul>	REG-EDCL/EPC contractor and District	6,000 (estimated 150 workers with overall PPE costing 40 USD each)
	Incremental of stockpiled metal waste, concrete, earth and stones from demolished infrastructures	<ul style="list-style-type: none"> <li>- All un-reused solid waste will be transferred to the dumping site selected and indicated by local administrative authority</li> </ul>	<ul style="list-style-type: none"> <li>- Report on the existence of dumping place</li> <li>- Site visit, all utilized areas are cleaned</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Scraping off unwanted topsoil layers will lead to soil loss washed to lowland area or to streams and rivers having as consequences drastic change in water quality, turbidity, and siltation phenomenon	<ul style="list-style-type: none"> <li>- Erosion prevention mechanisms should be employed as much as possible, including avoid continuing works during heavy rain season</li> </ul>	<ul style="list-style-type: none"> <li>- Number of erosion control equipment installed</li> </ul>	REG-EDCL/EPC contractor and District	To be included in EPC contract's Budget and catered under construction budget
	Soil quality degradation will occur due to accumulation of earth excavated materials and their deposit on the adjacent farmlands	<ul style="list-style-type: none"> <li>- Hydrocarbon residuals deposited on land, and accidental spills should be dealt with as soon as they occur.</li> <li>- Prompt removal of all the affected</li> </ul>	<ul style="list-style-type: none"> <li>- All excavated areas cleaned;</li> <li>- All measurements showed that soil</li> </ul>	REG-EDCL/Contractor /District /MINAGRI and REMA	To be included in EPC contract's Budget and catered under construction budget

Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		<p>soil and dumping this in clearly labelled metallic drums with lids for disposal later</p> <ul style="list-style-type: none"> <li>- All excavated soils shall be reused and remaining selected and transferred to ground indicated by local authority</li> </ul>	<p>quality and structure remained unchanged;</p> <ul style="list-style-type: none"> <li>-Site visit report on dumping site done by Environmental Officer</li> </ul>		
	Installation of cable trenches drains, can pose health and safety hazards to both workers and visitors.	<ul style="list-style-type: none"> <li>- Workers will be provided with necessary protective equipment</li> <li>- Avoid works nighttime and keep time for works' schedule</li> </ul>	<ul style="list-style-type: none"> <li>-Number of personal protectives equipped delivered to workers</li> <li>-Installation of warning signs on site</li> </ul>	REG-EDCL/EPC Contractor / District	Cost for PPEs is covered above
	Damages to existing electricity distribution lines and infrastructures during lighting by piping and cabling, which may produce negative impact on local services and nearby families.	<ul style="list-style-type: none"> <li>- All nearby communities will be informed well in advance to works schedule and any changes which will arise accordingly.</li> <li>- Rapid electricity restoration should be envisaged.</li> </ul>	<ul style="list-style-type: none"> <li>-Program of works' schedule regularly advertised among public services and communities nearby</li> <li>-Number of letters sent or meetings organized with communities</li> </ul>	REG-EDCL/EPC contractor and District	No cost is required
	Accumulation of excess construction materials and solid waste (parts of tip or pipe,) during installation of sanitary facilities equipment;	<ul style="list-style-type: none"> <li>-Cleaning of all traces of work, removal of the rest of materials, rubble, garbage</li> <li>-Debris removal of water taps and pipes, cleaning of all sanitary equipment and their u-bend.</li> </ul>	<ul style="list-style-type: none"> <li>-Absence of remaining construction materials visible on the site</li> <li>-Landfill site available and has been monitored</li> </ul>	REG-EDCL/ District	To be included in EPC contract's Budget and catered under construction budget
	Risk of high voltage electrocution to residents' people and passengers	<ul style="list-style-type: none"> <li>- Placement of a metallic fence with iron mesh, properly grounded to protect people from high voltages</li> </ul>	<ul style="list-style-type: none"> <li>-Presence of metallic fence during site visit</li> </ul>	REG-EDCL/EPC contractor	To be included in EPC contract's Budget and catered under construction budget
	Risks of accidents, injuries and fatalities	<ul style="list-style-type: none"> <li>- Implementation of occupational health and safety management Plan including training and toolbox talks</li> <li>- Provision of personnel protective</li> </ul>	<p>Presence of safety personnel and training reports</p> <p>Number of PPE</p>	REG-EDCL/EPC contractor/supervisor	<p>15,000 (estimated of 150 employees and 100\$/person</p> <p>800 \$ (one first aid kits for a</p>

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		<ul style="list-style-type: none"> <li>equipment (safety shoes, helmets, gloves and visibility shirts)</li> <li>- Availability of first aid kit and first aid helper</li> <li>- Health and medical insurance for the site activities</li> </ul>	<p>provided</p> <ul style="list-style-type: none"> <li>Number of available first aid Kits</li> <li>Proof insurance</li> </ul>		<p>team of 25People)</p> <p>5000\$ (Lump-Sum for 150 workers)</p>
Operations of mounting appropriate equipment	Generation of abnormal vibration levels due to mounting equipment without solid support structure	- Pose of support structure that has sufficient mass and stiffness to permit the machine or equipment to operate in a state of equilibrium.	-Absence of abnormal noise or vibration from mounted equipment	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	Difficult of maintenance operations due to mounting equipment at a highly placed structure	<ul style="list-style-type: none"> <li>- Utilization of a heavy lifting equipment to an appropriate position for facilitate maintenance</li> <li>- Avoid direct mounting of equipment on concrete or deck plate floors which introduces a resonance problem</li> </ul>	<ul style="list-style-type: none"> <li>-Number of heavy lifting equipment to be utilized</li> <li>-Number of equipment mounted on a solid support structure</li> </ul>	REG-EDCL/EPC Contractor	To be included in EPC contract's Budget and catered under construction budget
	During equipment installation there shall be risk of electrical shocks and fire outbreaks	<ul style="list-style-type: none"> <li>- Automatic fire extinguishing system and heavy-duty ABC powder type fire extinguishers shall be available at particularly important electrical equipment areas.</li> <li>- Smoke detectors shall be in all critical areas</li> </ul>	-Number of equipment such as smoke detector, extinguishers installed within a substation	REG-EDCL/EPC Contractor/REMA/EO	To be included in EPC contract's Budget and catered under construction budget
Worker's recruitment	Risk of child labour, sexual abuse and increase of HIV	<ul style="list-style-type: none"> <li>- Recruitment should follow labour law,</li> <li>- Sensitization on HIV and sexual abuse should be conducted</li> </ul>	Monitoring report	EPC contractor, EDCL/ nearby health centre	5,000 (to cater for MoU to be signed with the district hospital to provide sensitizations)
<b>Operational &amp; Maintenance Phase</b>					
Maintenance of electrical principal equipment such as transformers	Unforeseen accidents such as fire outbreak leading to major oil spills of any hazardous materials during routine operations (e.g. transformer	- Recuperation of oily liquid in a disposed basin and its transfer to a nearby prepared septic pit;	<ul style="list-style-type: none"> <li>-Availability of a disposed basin</li> <li>-Constructed septic pit available</li> </ul>	REMA and District/Sector offices	To be covered Under REG-EDCL operational and line maintenance Budget

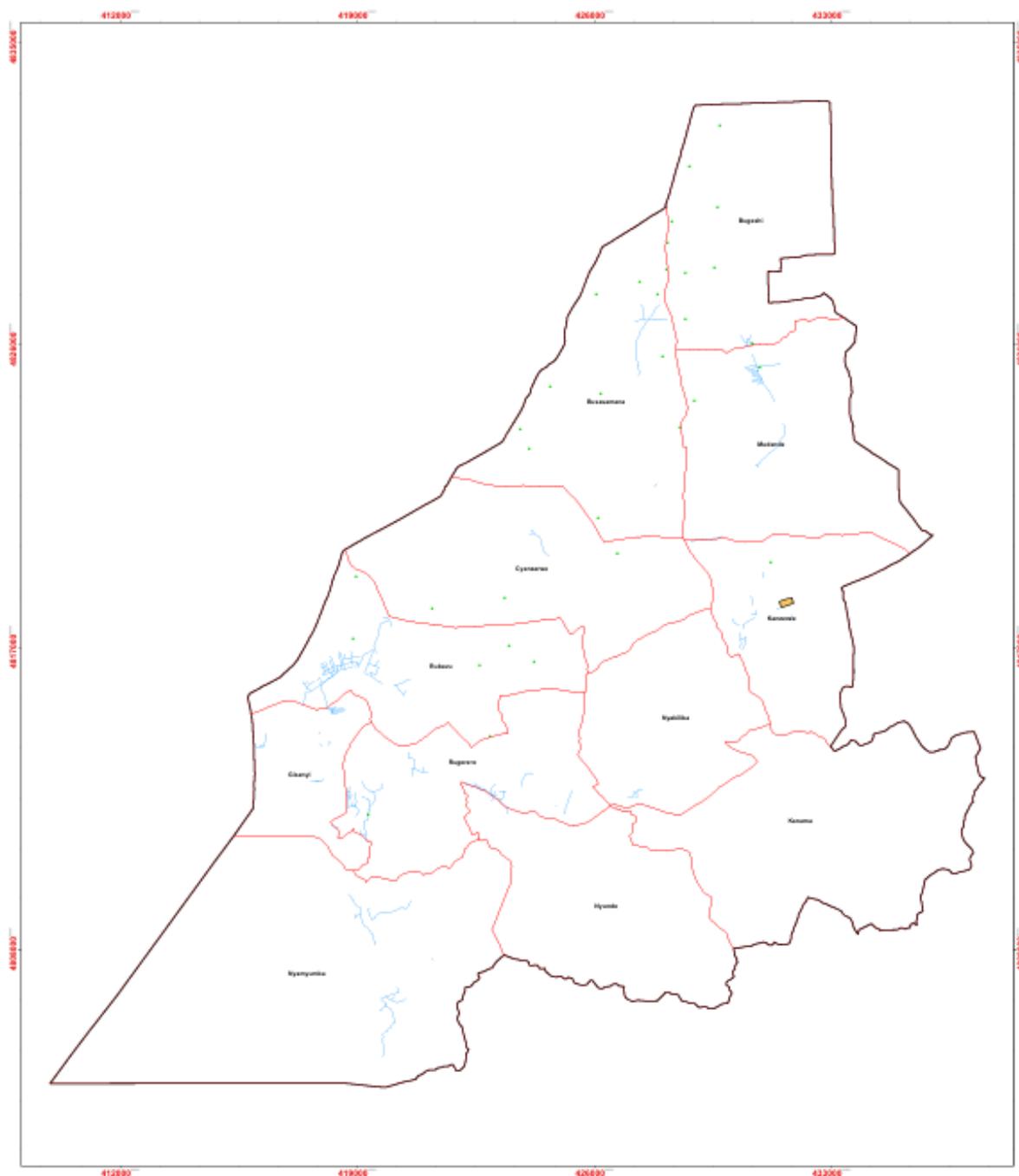
Activities	Description of Potential Impacts	Mitigations measures	Monitoring indicators	Responsible parties for monitoring	Budget (USD)
		- Regular maintenance and keep a check on principal equipment	- Strict calendar of equipment maintenance		
Control of land uses undertaken within the RoW	Risk of localized erosion during rainy season and creation of water pools around pole's feet	<ul style="list-style-type: none"> <li>- The ground surface at each poles site will be graded to provide drainage away from the poles and where necessary (e.g. on hillside) terracing, cribbing or riprap may be used to provide protection for poles foundations</li> <li>- Planting grass cover will protect soil against erosion</li> </ul>	<ul style="list-style-type: none"> <li>- Site visit report to confirm pole foundation design and construction</li> <li>- Number of erosion equipment installed</li> <li>- Superficies of re-vegetated areas</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
The routine clearance of vegetation for maintaining adequate clearance along the route length	Regular clearance of vegetation and loose of its biodiversity Avian collision with power line may occur in big number if localized within migration corridor	<ul style="list-style-type: none"> <li>- Restrict clearance for the trees growing under the transmission line or branches overhanging the lines</li> <li>- Visibility enhancement objects such as marker balls, bird deterrents or diverters shall be installed to avoid avian collision</li> </ul>	<ul style="list-style-type: none"> <li>- Hectares of vegetation cleared or trees' branches cut</li> <li>- Number of marker balls, bird deterrents or diverters installed</li> </ul>	REG-EDCL/Contractor and District	To be covered Under REG-EDCL operational and line maintenance Budget
Maintaining operation and maintenance system	Ensure a better provision efficient operation and maintenance of electrical system in rural zones	<ul style="list-style-type: none"> <li>- Technical field personnel should report power outages to the REG-EDCL and repair faults quickly</li> <li>- Public education to raise awareness of electricity danger and how to utilize the system safely</li> <li>- Improve supervision of field workers and conduct system maintenance regularly and diligently</li> </ul>	<ul style="list-style-type: none"> <li>- Monthly reports on power outages and faults repaired</li> <li>- Number of workshops organized or awareness meetings hold</li> <li>- Number of supervision missions to workers</li> </ul>	REG-EDCL District and Sectors	To be covered Under REG-EDCL operational and line maintenance Budget
<b>Total budget</b>					<b>65,800</b>







# EDCL PROJECTS RUBAVU DISTRICT

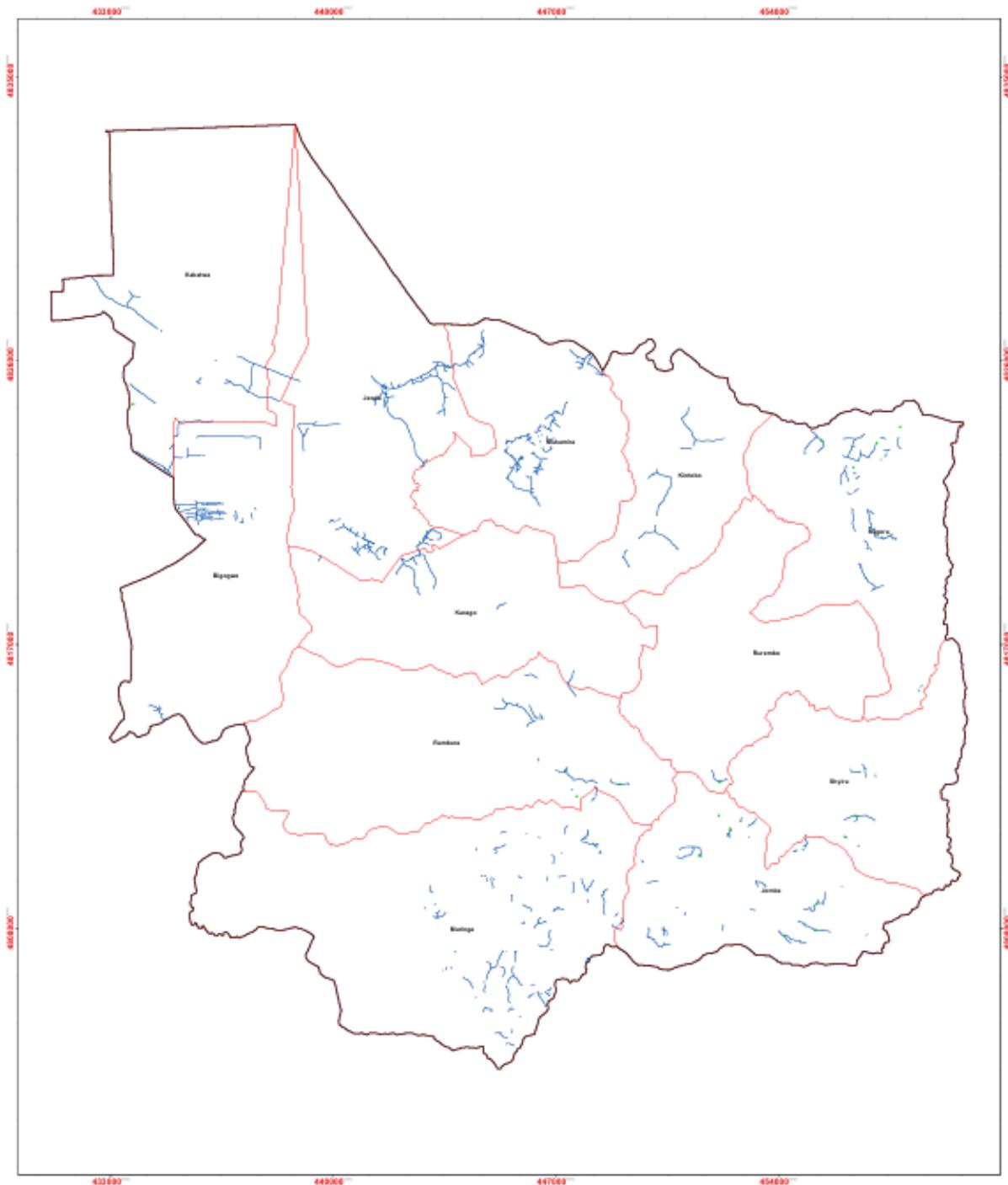


Legend	
	RUBAVU_DISTRICT SECTORS
	RUBAVU_DISTRICT_CMBINE
	SINGLE PHASE TRANSFORMER RUBAVU DISTRICT
	SINGLE PHASE LV LINES RUBAVU DISTRICT
	RUBAVU_DISTRICT





# EDCL PROJECTS NYABIHU DISTRICT



Legend	
	NYABIHU_DISTRICT sector
	SINGLE PHASE TRANSFORMER NYABIHU DISTRICT
	SINGLE PHASE LV LINES NYABIHU DISTRICT
	NYABIHU_DISTRICT









consulted Stakeholders during Onsite investigation of EPCs (Western province)

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## **Annex 11: Grievance Management Mechanism**

The experience has shown that many grievances derive from misunderstandings of the Project Policy, or result from neighbour conflicts, which can usually be solved through adequate mediation using customary rules. Most grievances can be settled with additional explanation efforts and some mediation using customary disputes settlement mechanisms:

- ✓ Through explanations (for instance explain in detail how the Project calculated the complainant's compensation and that the same rules apply to all); or
- ✓ Through arbitration, resorting to elders or individuals well regarded by the community and external to it.

In contrast, resorting to the judicial system often results in long delays before a case is processed, may result in significant expenses to the complainant, and requires a complex mechanism, involving experts and lawyers, which can fall well beyond the complainant's control, and be counterproductive to him/her. Also, courts may declare themselves not competent for matters related to informally owned property. Therefore, the Project will put in place an extra-judicial mechanism for managing grievances and disputes arising from the resettlement process based on explanation and mediation by third parties. Each of the affected persons will be able to trigger this mechanism, while still being able to resort to the judicial system. Procedures relevant to this amicable mechanism are detailed below.

It will include three different levels:

- i. Registration of the complaint, grievance, or dispute case by REG-EDCL in collaboration with local authorities;
- ii. Processing of the grievance or dispute until closure is established (within 15 days) based on evidence that acceptable action was taken by EDCL; and
- iii. In the event where the complainant is not satisfied with action taken by REG-EDCL because of the complaint, an amicable mediation can be triggered involving a mediation committee independent from the Project.

### **Amicable Resolution Mechanism**

Complaints that cannot be closed to the complainant's satisfaction will be handed over to a mediation committee that will include the following individuals:

One representative of the local Administration; One REG-EDCL representative acting as an observer; Three representatives of the affected people, including at least one woman, chosen from the Resettlement and Compensation Committees (RCC) and/or amongst community-based organizations, elders, customary authorities, one representative of an NGO or of a religious organization present in the project area.

The main function of the committee would be arbitration and negotiation based on transparent and fair hearing of the cases of the parties in dispute between PAPs and the implementing agencies for local government. The committee gives solution to grievances related to compensation amounts, delays in payment of compensation or provision of different type of resettlement assistance.

### **Processing**

After a complaint or dispute has been registered, EDCL will prepare the technical background to the complaint (for instance, the proposed compensation amount, the list of meetings and interviews with the complainant, a description of the exact reason of the dispute, etc.) for consideration by the mediation committee. The complainant(s) will be invited before the mediation committee, which will mediate and attempt to propose a solution acceptable to both parties (REG-EDCL and complainant). If need be, other meetings will be held and the committee may resort to one of its members to arbitrate in a less formal framework than meetings, if appropriate.

If reached, the agreement will be sanctioned by a settlement agreement signed by the parties, and the chair of the mediation committee will be responsible for monitoring the implementation of this agreement, which will include all references to the applicable local law provisions. Grievance resolution is encouraged to be resolved at Cell level, as they are aware of and involved in the whole process. If the grievance is not resolved in this way, local courts (ABUNZI) should be used. If not resolved then the high court or court of appeal of Rwanda remains an avenue for voicing and resolving these complaints.

### **Grievance Redress Committee (GRC) and composition**

First, all interested stakeholders have developed a Grievance Redress Mechanism (GRM) for potential use. The aim of the grievance redress mechanism is to achieve mutually agreed resolution of grievances raised by such stakeholders. This grievance redress mechanism ensures that complaints and grievances are addressed in good faith and through a transparent and impartial process, but one which is culturally acceptable. As the GRM works within existing legal and cultural

frameworks, it will be effectively implemented by a **Grievance Redress Committee (GRC)**, which is organized in such a way that it will comprise of local community representative, PAPs representative, local authority representative at village and cell levels, Contractor and Supervising firm representatives.

As mandated by the law on gender equality, women representation will make up at least 30% of the GRC. All PAPs representatives will be directly elected by their peers and the number of members may vary depending on the context and particularities of each sub-project site characteristics.

**Table 37: Proposed Members of GRC and their respective roles under the project**

No	Member of GRC	Roles and Responsibilities
1	President (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 she/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	Village Leader	Represents local government at village level; Resolves and lead community level grievance redress; Sends out notices for meetings; Records all grievance received and report them to next local level
3	Cell Executive Secretary	Proposes responses to grievances and lead in resolving community grievance unsolved from village level; 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
4	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 intervention areas.
5	Contractor representative	<ul style="list-style-type: none"> <li>✓ Receive and log complaints/grievances, note date and time, contact details, nature of complaint and inform complainant of when to expect response;</li> <li>✓ Handle complaints revolved around nuisance resulted from construction and endeavor to handle them satisfactory;</li> <li>✓ Inform engineer (supervisor) and GRC of received complaints/grievances and outcomes and forward unresolved complaints/grievance to GRC;</li> <li>✓ Attend community meetings, respond, and react to PAPs complaints raised concerning the contractor.</li> </ul>
6	Supervising firm representative	<ul style="list-style-type: none"> <li>✓ Represent client;</li> <li>✓ Ensure that all grievances raised have been responded to, and that the contractor responds to the complaints raised concerning them,</li> <li>✓ Attend community meetings and respond to all concerns related to the project from community;</li> <li>✓ Report on monthly basis the progress of GRM process.</li> </ul>

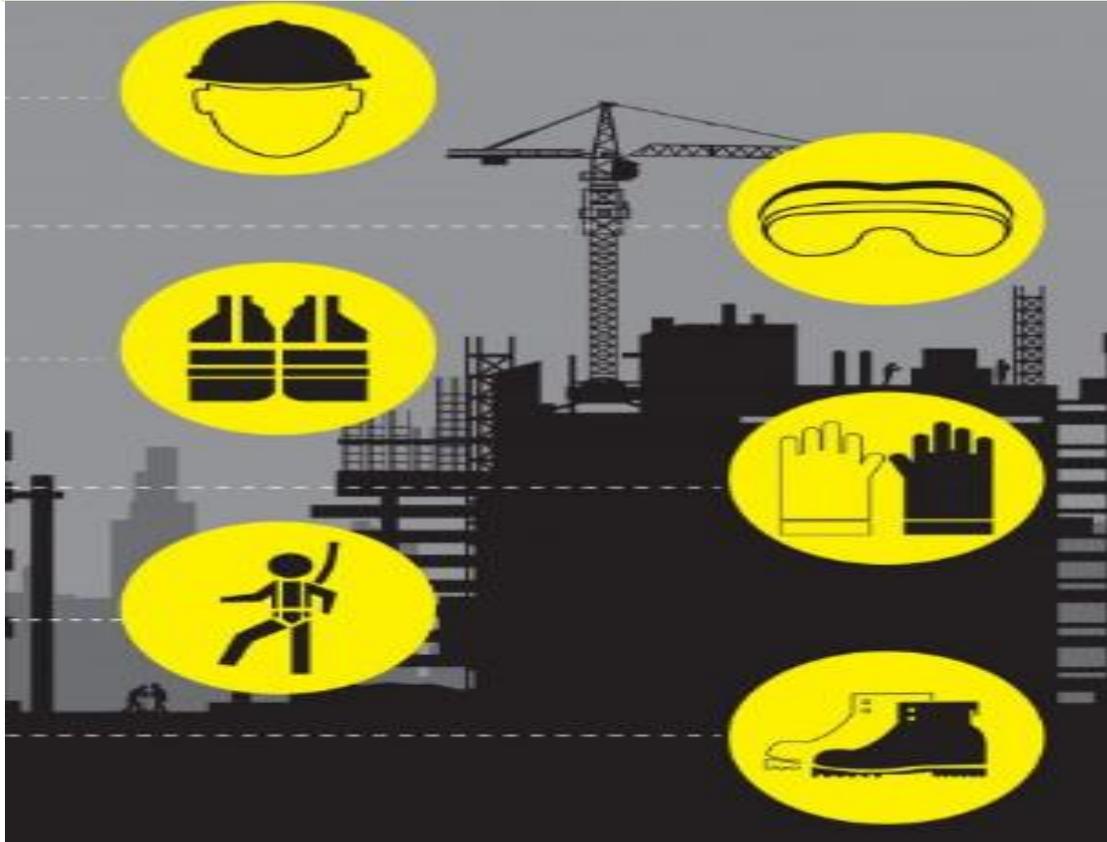
## **Annex 12: Physical Cultural Resource (PCR) and Chance Finds Procedure**

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.

**Appendix 1: Occupational 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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**April, 2024**

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## **ACRONYMS AND ABBREVIATIONS**

<b>BESST</b>	: Bureau for Engineering and Environmental Studies
<b>AfDB</b>	: African Development Bank
<b>EA</b>	: Environmental Assessment
<b>EDCL</b>	: Energy Development Corporation Limited
<b>EPC</b>	: Engineering Design, Procurement and Construction
<b>HSP</b>	: Health and Safety Plan
<b>ESHS</b>	: Environmental, Social Health and Safety Plan
<b>ESIA</b>	: Environmental and Social Impact Assessment
<b>ESS</b>	: Environment and Social Standards
<b>GoR</b>	: Government of Rwanda
<b>IFC</b>	: International Finance Corporation
<b>MININFRA</b>	: Ministry of Infrastructure
<b>OHS</b>	: Occupational Health and Safety
<b>OS</b>	: Operational Safeguards
<b>PPE</b>	: Personal Protective Equipment
<b>RDB</b>	: Rwanda Development Board
<b>REG</b>	: Rwanda Energy Group
<b>REMA</b>	: Rwanda Environment Management Authority
<b>MoE</b>	: Ministry of Environment
<b>WBG</b>	: World Bank Group
<b>WMP</b>	: Waste Management Plan
<b>PS</b>	: Performance Standard

## **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 WestWesternProvince 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, and African Development Bank Operational Safeguards Policies.

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 Kamonyi, Muhanga, Ruhango, Nyanza, Huye, Gisagara, Nyaruguru and Nyamagabe 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.

### **1.3.2. 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.

### **1.3.3. 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 EDCLProject 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 you squirt dangerous for the health. Lesions concerning any part of the body consequent to the projection of splinters or fragments during workmanships 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 workmanships 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.

#### • 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.

### 3.3.2. 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.

### 3.3.3. 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.

### 3.3.4. 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.

Danger      Noise      Electrical      Suspended      Flammable      Forklift





Loads



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



Respiratory



Eye



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

<b>WORK-RELATED INCIDENT</b>	<b>The incident happens at EDCL-controlled worksites or at time</b>	<b>EXAMPLES:</b> All work-related travel and transportation by EDCL rented vehicle / All activities at company worksite and office.
<b>NOT WORK-RELATED INCIDENT</b>	<b>Incident which does not happen at EDCL controlled situation</b>	<b>EXAMPLES:</b> 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).
	<b>Actions</b>	<b>Notes</b>
<b>FATAL or LIFE-THREATENING ACCIDENT</b>	<b>immediately 24/7</b> 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.	<b>Ensure that the message goes through.</b> You must send additional detailed information by email within 12 hours of the accident.
<b>ENVIRONMENT, MAJOR ROAD or OTHER ACCIDENT</b>	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.
<b>LOST TIME INCIDENT (WITH BODILY INJURIES)</b>	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.	<b>The incident resulted in more than one day's absence from work.</b> 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.
<b>RESTRICTED WORK</b>	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
<b>MINOR INCIDENT (WITH BODILY INJURIES)</b>	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
<b>NEAR MISS (NO BODILY INJURIES)</b>	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.	<b>An incident that occurred already but it did not cause any personnel injury.</b> E.g. a tool fell from a pole but did not hit anybody or hit the helmet without injury.
<b>POTENTIAL INCIDENT (NO</b>	daytime within 24 hours by phone, SMS, or email. Site Manager/Local Project Manager informs Project	<b>An event that could happen in the future if it is not prevented by preventing action.</b>

<b>BODILY INJURIES)</b>	Manager The Project Manager informs the Project Director, who in return informs the Managing Director.	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.
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### 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 Ugandan 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 cleardemarcation 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, labelled, 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 manufacturers 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 labelled 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 labelled.

## **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 Occupational Health and safety are achieved. In addition, the Project will guide contractors regarding expectations for Occupational 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 OHS and, on this basis, develop and maintain an OHS training matrix.

The Project's Occupational 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 OHS and will cover basic Project environmental and social commitments.
- **Management Training and Awareness:** this training focuses attention on management; covering key aspects of the OHS and providing an overview of the Project's environmental and social impact management expectations and the supporting processes and procedures prescribed in the OHS 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 OHS. 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 teamleaders, 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 38: OHS 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 mouth covers. 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 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. 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 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, ground wire, 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**

### **6.2. 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.

### 6.3. 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:

<b>Incident with no personal</b>	<b>Incident with light personal</b>	<b>Incident with serious personal injury</b>
<b>Report</b> to supervisor; <b>Restore</b> all working and safety conditions.	<b>Report</b> to supervisor; <b>Provide</b> first aid and send the injured to the Hospital; <b>Restore</b> all working and safety conditions.	<b>Report</b> to supervisor; <b>Provide</b> 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.

### 6.4. 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.

### 6.5. Emergency equipment and tools

#### 6.5.1. 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.

#### 6.5.2. 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.

## 6.6. 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 firstaid. 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.

## **6.7. 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).

## **6.8. 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.

### **6.8.1. 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.

### **6.8.2. 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 inside and outside the campsite. 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.

## **7.2.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.

## **7.3. 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.

## **7.4. 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;

### **7.5. 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 safeguards 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.