

RWANDA ENERGY GROUP

ENERGY UTILITY CORPORATION LIMITED (EUCL)

ELECTRICITY ACCESS ROLL-OUT PROGRAMME (EARP)

RWANDA ELECTRICITY SECTOR STRENGTHENING PROJECT (RESSP)

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY OF
CONSTRUCTION OF ELECTRICAL TRANSMISSION AND DISTRIBUTION
NETWORK AND SUBSTATIONS IN SOUTHERN PROVINCE OF RWANDA**

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EXECUTIVE SUMMARY

Background

The Government of Rwanda, in its effort to sustain economic growth, has increased and stabilized the power production and distribution, hence reducing power shortages. The Government of Rwanda (GoR) also exercises a strong leadership role in donor coordination and has begun to work with donors on a clearer division of labour by identifying areas of individual donor comparative advantage.

In connection with the mentioned strategy, the Government of Rwanda through Energy Utilities Corporation Limited (EUCL) has embarked on a country-wide electricity utilities and distribution to realize the secondary EDPRS II targets. The EDPRS target regarding energy sector is to connect around 45% of household by 2017. Once the network has been extended and covers large rural centers, connection cost will be significantly reduced per connection (ESMF-EUCL,2015).

The general objective of this intervention is supplying sufficient reliable and affordable energy for all Rwandan. The specific objective is to improve the access to reliable on-grid electricity services for households and priority public institutions in rural areas of Rwanda.

A number of development partners so far committed to support the program including: World Bank IDA, World Bank, African Development Bank, BADEA, OFID, Saudi Funds, Netherlands and others. World Bank as main donor funded the Government of Rwanda to undertake the construction of distribution and transmission network in 5 Districts of the Southern Province namely Kamonyi, Nyanza, Muhanga, Huye and Nyamagabe District. The project shall in total construct 212.3 kms of medium voltage, 186.9 kms of low voltage to make a total of about 10.741 households. However, the construction and distribution of electrical lines at the sites will have key potential impacts (positive and negative) on the surrounding and connected communities.

In Rwanda, legislative and policy framework for environmental assessment are clearly highlighted the most of the laws, policies and guidelines such: Constitution of the Republic of

Rwanda, Rwanda Vision 2020, National Environment Policy, National Environment Law, Environmental Impact Assessment Regulation, Ministerial order N° 003/2008 for 15/08/2008 relating to the requirements and procedure for Environmental Impact Assessment.

Before starting the project at the field, an Environmental Impact Assessment will be carried out in order to comply with laws and environmental safeguards. However, activities will have adverse impact and will be addressed by proposing key mitigation measures.

ACRONYMS

ADB	African Development Ban
BP	Bank Policies
CAS	Country Assistance Strategy
CFL	Compact Fluorescent Lamp
CSP	Country Strategy Paper
DDP	District Development Plan
EA	Environmental Assessment
EAC	East African Community
EARP	Electricity Access Roll out Programme
EDPRS	Economic Development and Poverty Reduction Strategy
EIA	Environmental Impact Assessment
EPC	Engineering Procurement Construction
ESA	Environmental Security Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
EWSA	Energy Water and Sanitation
FDG	Focus Discussion Group
GEF	Global Environment Facility
GDP	Growth Domestic Product
GoR	Government of Rwanda

HH	Households
IDA	International Development Agency
IMCE	Integrated Management of Critical Ecosystem
IWRM	Integrated Water Resources Management
MDG	Millennium Development Goal
MINAGRI	Ministry of Agriculture
MINALOC	Ministry of Local Government
MINEAC	Ministry for East African Community
MINECOFIN	Ministry of Finance and Economic Planning
MININFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
NAFA	National Agro Forestry Authority
NEPAD	New Partnership for Africa's Development
OFID	OPEC Funds for International Development
OP	Operational Facility
PPE	Personal Protective Equipment
PPP	Policy, Plan, or Program
PRSP	Poverty Reduction Strategy Plan
RAP	Resettlement Action Plan
REMA	Rwanda Environment Management Authority
RESSP	Rwanda Electricity Sector Strengthening Project

RPF	Resettlement Plan Framework
SEA	Strategic Environmental Assessment
SWAp	Sector Wide Approach
UNCBD	UN Convention on Biological Diversity
UNCCD	UN Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
WHO	World Health Organization

GLOSSARY OF TERMS

Environment: The physical factors of the surroundings of the human being including land, water, atmosphere, climate, and the biological factors of fauna and flora as well as the cultural, social, and economic aspects of human activity(Adapted from REMA 2006).

Environmental impact: Effects on the environment and natural resources that may be positive and/or negative and produce benefits and/or costs(Adapted from REMA 2006).

Environmental Impact Assessment (EIA): The systematic evaluation of a project to determine its impact on the environment and natural resources(Adapted from REMA 2006).

Environmental security: A condition in which a nation or region, through sound governance, capable management, and sustainable utilization of its natural resources and environment, takes effective steps toward creating social, economic, and political stability and ensuring the welfare of its population(FESS 2009).

Environmental sustainability: Management of natural resources and the environment that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

Policy: Strategy with defined objectives, set priorities, rules, and mechanisms to implement objectives. (Adapted from Partidário 2009)

Plan: Priority, option, or measure for resource allocation according to resource suitability and availability, following the orientation of and implementing relevant sectorial and global policies(Adapted from Partidário 2009).

Program: Organized agenda with defined objectives to be achieved during program implementation, with specification of activities and program investments, in the framework of relevant policies and plans (Adapted from Partidário 2009).

Project: A detailed proposal, scheme, or design of any development design or development activity, which represents an investment, involves construction works, and implements policy/planning objectives(Adapted from Partidário 2009).

Scoping: A process of establishing the principal issues to be addressed in the SEA, the decision criteria, and indicators of desirable outcomes.

Screening: A process of determining whether SEA is required for a specific PPP.

Social sustainability: Social sustainability refers to the continuous betterment of human well-being and welfare through access to health, nutrition, education, shelter, and gainful employment, as well as through maintenance of effective participation in decision-making within and across generations(Adapted from Maler and Munasinghe 1996).

Stakeholders: Individuals, communities, government agencies, private organizations, non-governmental organizations, or others having an interest or stake in the SEA process and outcomes of the policies, plans, and/or program (Adapted from REMA 2006).

Strategic Environmental Assessment (SEA): “A systematic, on-going process for evaluating at the earliest stage, the environmental quality and consequences of alternative visions and development intentions incorporated in Policy, Planning or Programme initiatives to ensure full integration of relevant biophysical, economic, social and political considerations(EAC 2005).

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CHAP I: INTRODUCTION

Energy is crucial to Rwanda economic growth. In Rwanda, electricity is the second most important source of commercial energy for the formal sector after petroleum fuels. Commercial and industrial establishment as well as institutions and households in the country use electricity.

Rwanda remains among the lower per capita electricity and petroleum products consumption countries in the world. Only about 65.000(6-8%) of households had access to grid supplied power, almost entirely in the main urban areas. Grid extension has been extremely limited, and economically justified only to meet rural industrial loads and emerging population clusters (Richard Ngendahayo, 2014).

To realize the primary EDPRS target for the electricity sector, the Government of Rwanda through REG has embarked on countrywide programme of tripling access by 2012 to about 16% of households and at least 50% of identified public institutions in health, education and local administration and reach consumers and services providers currently off the national grid with an overall schedule of the EARP activities extending up to end of 2017(SEA-EARP.2013).

Rwandalike any other world countries and a signatory to the Rio declaration and a number of other International Environmental treaties and protocols has embarked on actions to protect, preserve and improve the quality of the environment and ensure sustainable development. The protection and safeguarding of environment has become an important concern in Rwanda. Key environmental challenges concern high growth population depend on limited resources, deforestation, soil erosion, over grazing, misuse of wetlands and poor waste management associated with negative impacts on human health and biodiversity thus a hindrance to sustainable development of the country.

In accordance with the environmental law, polices, guidelines and World Bank policies, the implementation of each activities will be assessed and predicted the significance of the impacts, the impacts will be measures in compliance with the national regulations and international standards.

In same way ,the present study will highlight on the potentials environmental and social impacts of the subprojects in this area, and will facilitate to identify corresponding mitigations measures that will be put in place for avoiding, reducing, minimizing or compensating potentials adverse impacts likely to arise in the cause of project implementation.

I.1.OBJECTIVES OF THE ESIA STUDY

The main objective of the project being to increase access to electricity in Rwanda, particularly in Southern Province, below is the specific objectives:

- To construct medium voltage lines of 212.3km
- To construct low voltage lines of 186.9km
- To install 114 transformers
- To connect an number of facilities, water pumps stations, markets, commercial centers, mining ,telecom towers, cells, sectors offices, health centers,primary,VTC and secondary schools.

I.2.APPROACH AND METHODOLOGY OF THE STUDY

The methodology of the study involved a preliminary assessment of the project, known as the scoping study; where project literature, preliminary technical studies were reviewed and field visits were done in all Districts of Southern Province in order to understand the project, identify its boundaries and relevant key stakeholders.

Literature review of Institutional, legislative and policy framework was done with a number of laws, policies, protocols and conventions such as; Organic law determining the modalities of environmental management in Rwanda, Organic law on land management, Resettlement Policy Framework (RPF), Environmental and Social management Framework (ESMF) and natural resources and World Bank environmental and social guidelines.

Public consultation- From the scoping exercise, stakeholders were identified in three categories. (1) First category of Government officials, (2) Second category of local government officials and (3) Third category of locals and PAPs likely to benefit or be affected the project. Public consultation was carried with people from these stakeholder categories.

During the Public consultation, the study applied different participatory methods, namely; interviews, one-to-one discussions, focused group discussions (FGD) and official meetings with stakeholders. Discussions were guided key questionnaires, census survey form and stakeholders were asked to raise their concerns on the proposed project. Issue raised by one individual or a group of people was cross-checked by discussing it over with other individuals or groups. It is from these concerns that the likely impacts were determined and summarized in chapter 10.

Baseline data collection- Information was collected on the existing physical, biological, socio-economic environment of *Nyamiyaga sector* in **Kamonyi District**, *Kinazi* and *Ntongwe* Sectors in **Ruhango Districts**, *Nyagisozi, Cyanika, Mbazi, Mugano, Rwabicuma and Busasamana* Sectors in **Nyanza District**, *Kigoma, Kinazi, Rwaniro* Sectors in **Huye Districts**, *Musange, Mugano, Mushubi* and *Nkomane* in **Nyamagabe Districts** project area.

Physical socio-environment analysis- involved determining the areas topography, climate, flora and fauna for selected project sites to determine likely eco-sensitive areas and predict flora and fauna that could emerge with the introduction of this project., involved collecting socio-economic primary data from field and matching it with secondary data obtained from desk reviews. Methods of obtaining field data were mainly through public consultation and expert observation.

Impact assessment applied number of tools and techniques to determine the nature (positive or negative), extent (spatial), occurrence (one-off, intermitted or constant), magnitude, whether reversible or irreversible, direct or indirect, probability of occurrence and significance with and without mitigation. For each adverse impact identified, its level of significance was indicated, mitigation measures for the predicted impacts were proposed and an Environmental Management Plan (EMP) developed.

A comprehensive report including all collected data, analysis of the data, anticipated impacts, proposed mitigation measures, an Environmental Management Plan and Monitoring Plan has been prepared. This has been shared with REG for inputs and constructive remarks, before World Bank and finally RDB.

I.3.PROJECT ACTIVITIES

The project is expected to be implemented in Southern Province particularly in Kamonyi, Muhanga, Nyanza and Nyamagabe Districts. During the project implementation, the activities will be divided into 4 phases Design and Planning phase, Construction Phase, Post Construction Phase (Operation) and Decommissioning Phase.

During Design and Planning Phase, it will be a process of survey and mapping for new transmission and distribution routes, stations and substation, sites selection, site selection in order of avoiding sensitive ecosystems. There is no land acquisition for MV and LV lines; only, it will be a compensation process for the crops and trees damage.

During Construction phase, it will be a process of clearing of path where the transmission and distribution infrastructure will pass as the initial activity that will occur during the construction phase. This is done in order to create the vertical and the horizontal clearance required when constructing electricity transmission lines.

There is also provision of Sites Access on which consisting of the provision and maintenance of all access from the main ways to the transmission and distribution line routes during erection and construction of stations and substations as required. Access road shall be constructed in such way that they can be used for maintenance of the line by four wheel drive vehicles up to a total weight of 7.5 tons. The length of the access road is the distance between the edges of public roads to the tower, station or substations location.

The activity of clearing the right-of-way consist on fell any vegetation and dispose of waste material along the entire length of transmission lines. The transmission line right-of-way is 15 meters wide for the 30kv lines symmetrical about the centreline.

Excavation Work and erection of poles consisted on 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 must be approved.

MV/LV mini substations or cabins shall be installed in different sites along the transmission path. These mini substations will play the role of stepping down the electricity from MV to LV before distributing to consumers. These substations are basically small housing units made of concrete and fitted with transformers and electrical gadgets.

During operation phase, it will be operation and maintenance of the transformers, circuit breakers, circuits switches and capacitors that will have been installed during the construction phase. Stations and substations maintenance process will be required for the station and mini substations. EUCL/EARP will no longer use transformers containing PCBs (as commonly used in old equipment) which are toxic to the environment and humans.

During the Decommissioning phase, it will be a dismantling and removing all the structures from mini substations sites, dismantling the supporting infrastructures and all those structures that where associated with the project implementation. The program also will rehabilitate the site to its former status or near what it was before the project was commissioned.

This electrification project will involve the following technical works:

Construction of aerial MV electrical lines (212.3Km) in:

- Three phase that can be transformable for future industrial zones
- Three phase for remote and inextensible zones
- Three-phase for reinforcement of already electrified three-phase zones
- Simple mono-phase for the rest of settlements

Installation of aerial LV electrical line (186.9km) in:

- Three-phase of the range of 10,25 and 50 KVA;
- Mono-phase made of triplex (114 transformers mono-phase and three-phase)

Construction of aerial LV transmission lines in:

- Twist cable mono-phase
- Twist cable three-phase

Connection LV of 10.741 households with:

- Installation of 10.741 prepaid meters/compteurs

- Installation of lighting boards

I.4. LINE CONFIGURATION

The 30 KV single circuit lines shall be constructed as follows:

Line length : Approximately 1636.9 km

Line Configuration: Single Circuit, triangular configuration

Cable, Conductors and Accessories 88/G/2015-ICB/EARP

Transformers and Accessories 70KN and 40 KN 87/G/2015-ICB/EARP

Types of Poles: Wooden Poles+Concrete poles and

Types of conductors and cable (3 phases ACSR Conductor).

Switchgear CBS in 3 phases (6mm²)

Insulator Fuse cut-outs and MV surge arrestors

Accessories 88/G/2015-ICB/EARP

Foundations : Compact soil (wooden pole), soil+Cement (steel)

Prepaid meter Single phase

Table 1: Summary of connections under the project

	SUM MV Lines(km)	SUM LV Line(km)	SUM Transformers	SUM MV Switchgr	POTENTIAL CONN'S	Cost (USD)
Lot 8	66.25	57.8	37.00	4	3.515	2.955.742
Lot 11	45.45	44.69	28.00	5	2.389	2.056.046
Lot 12	55.29	29.44	25.00	2	1.127	1.759.276
Lot 14	52.28	55.00	34.00	3	3.710	2.686.146
SUM (Total)	212.3	186.9	114	14	10.741	6.771.064

Source: Project Brief

In Southern Province, EDCL/EARP planned to connect almost **10.741** households which have been identified at the sites (see the table above). Most of households are grouped at the Centers located in rural areas of Southern Province.

II.1. LEGISLATIVE AND POLICY FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL ASSESSMENT IN RWANDA

II.1.1. Constitution of the Republic of Rwanda

In consideration of the Constitution of the Republic of Rwanda of June 4, 2003 as amended to date, article 49 states that every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The state shall protect the environment. The law determines the modalities for protecting, safeguarding and promoting the environment.

II.1.2. Rwanda Vision 2020

The vision 2020 of Rwanda gives strategic actions and inter alia institutes the principle of precaution to mitigate the negative effects caused to the environment by the socio-economic activities, to institute the “polluter pays” principle as well as preventive and penal measures to ensure the safeguard of the environment and to require the environmental impact study of any development project.

II.1.3. National Environmental Policy

The overall objective of the Environmental Policy is the improvement of man’s wellbeing, the judicious utilization of natural resources and the protection and rational management of ecosystems for a sustainable and fair development.

The Policy seeks to achieve this through the following objectives:

- i. To improve the health and the quality of life for every citizen and promote sustainable socio-economic development through a rational management and utilization of resources and environment;
- ii. To integrate environmental aspects into all the development policies, planning and in all activities carried out at the national, provincial and local level, with the full participation of the population;

- iii. To conserve, preserve and restore ecosystems and maintain ecological and systems functioning, which are life supports, particularly the conservation of national biological diversity;
- iv. Optimum utilization of resources and attain a sustainable level of consumption of resources;
- v. To create awareness among the public to understand and appreciate the relationship between environment and development;
- vi. To ensure the participation of individuals and the community in the activities for the improvement of environment with special attention to women and the youth and
- vii. To ensure the meeting of the basic needs of today's population and those of future generations.

II.1.4.National Environmental Law

The Organic Law n° 04/2005 of 08/04/2005 determining modalities of protection, conservation and promotion of environment in Rwanda regulates the Environmental impact Assessments. In its article 67: Every project shall be subjected to environmental impact assessment, before obtaining authorization for its implementation. This applies to programmes and policies that may affect the environment. Article 68 specifies the main points that an Environmental Impact Assessment must include. Article 69 stipulates that the environmental impact assessment shall be examined and approved by the Rwanda Environmental Management Authority or any other person given a written authorization by the Authority.

The environment impact assessment shall be carried out at the expense of the promoter. Article 70 states that an order of the Minister having environment in his attributions establishes the list of projects for which the public administration shall not warrant any authorization without an Environmental Impact Assessment describing direct and indirect consequences of the project to the environment.

II.1.5.Law N° 18/2007 of 19/04/2007 relating to expropriation in the public interest

The law defines the activities or projects that can be classified as public interest and process and requirements for expropriation activities as well as the cost for goods and other infrastructure to be expropriated. The law provides a window for appeal for somebody who is not satisfied by the cost of compensation.

II.1.6.Environmental Impact Assessment Regulations, 2006

REMA has now developed the EIA regulations which provide a guide and requirements for EIA in Rwanda. According to these new 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 in accordance with 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.

II.1.7.Ministerial order N° 003/2008 of 15/08/2008 relating to the requirements and procedure for Environmental Impact Assessment

Article 1 stipulates that Environmental Impact study is a systematic way of identifying environmental, social and economic impacts of a project before a decision of its acceptance is made. In article 3, the developer submits an official application which includes a project brief of the proposed project to the authority. Article 4 specifies that within thirty (30) calendar days after receipt of the project brief and after its analysis, the Authority shall submit the Terms of reference to the developer for the Environmental impact study.

II.1.8.Relevant policies

II.1.8.1.National Policy on EIA

The Constitution of the Republic of Rwanda, adopted in June 2003, ensures the protection and sustainable management of environment and encourages rational use of natural resources. Organic Law (No. 04/2005 of 08/04/2005) and various socioeconomic development policies and strategies such as “Rwanda Investment and Exports Strategic Action Plan, 2005-2007” and “Vision 2020” call for a well regulated environment management system that takes into account principles of sustainable development while at the same time contributing to poverty reduction.

The Organic Law (Article 67) requires that projects, programmes and policies that may affect the environment shall be subjected to environmental impact assessment before obtaining authorisation for implementation. Article 69 gives REMA legal authority to oversee the conduct of EIA.

EIA is an invaluable tool for environmental management in a trans-boundary context, playing role in information dissemination between Rwanda and neighbouring countries and widening the scope of understanding of impacts beyond its borders. EIA process in Rwanda provides a pretext and basis for future international cooperation and conflict resolution concerning environmental impacts at a regional level.

II.1.8.2. Energy Policy

The national policy goal is to meet the energy challenges and needs of the Rwandan population for economic and social development in an environmentally sound and sustainable manner.

Since 1994, the energy sector as well as the overall economy has gone through structural modifications, where the role of the Government has changed, markets have been liberalised and private sector initiatives encouraged. Hence, the energy policy document has to take into account structural changes in the economy and political transformations at national and international levels.

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

The Energy Policy, therefore, focuses on market mechanisms and means to reach the objective, and achieve an efficient energy sector with a balance between national and commercial interests.

An interactive and participatory process between Government, other stakeholders and relevant groups has been necessary as part of the formulation process in order to incorporate views of market actors and energy consumers to address the complex nature of the sector. Specifically, the energy policy takes into consideration the need to:

- i. Have affordable and reliable energy supplies country wide;
- ii. Reform the market for energy services and establishes an adequate institutional framework, which facilitates investment, expansion of services, efficient pricing mechanisms and other financial incentives;
- iii. Enhance the development and utilisation of indigenous and renewable energy sources and technologies,
- iv. Adequately take into account environmental considerations for all energy activities,
- v. Increase energy efficiency and conservation in all sectors; and
- vi. Increase energy education and build gender-balanced capacity in energy planning, implementation and monitoring.

Domestic energy demand has grown rapidly due to population growth and the increase in economic activities especially during the last ten years. The vision of the energy sector is to effectively contribute to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner. The mission of the energy sector is to create conditions for the provision of safe, reliable, efficient, cost-effective and environmentally appropriate energy services to all sectors on a sustainable basis. By fulfilling its vision and mission, the energy sector will contribute to social economic development, and in the long-term framework, poverty reduction.

The national energy policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner.

II.1.8.3.Land Policy

Apart from a few scattered land regulations, most of which date back to the colonial period, Rwanda has never had a proper land policy nor has it ever had a land law, a situation that enhances the existing duality between the very restrictive written law and the widely practised customary law, giving rise to insecurity, instability and precariousness of land tenure.

The Rwandan Government, therefore, found it compelling and necessary to establish a national land policy that would guarantee a safe and stable form of land tenure, and bring about a rational

and planned use of land while ensuring sound land management and an efficient land administration.

Currently, the land tenure system in Rwanda operates in a dual legal system: On one hand, there is: the 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. And 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).

II.1.8.4.National Land Law

Land ownership in Rwanda is determined by the Organic law N°08/2005 of 14/07/2005 determining the use and management of Land in Rwanda. It also institutes the principles that are respected on land legal rights accepted on any land in the country as well as all other appendages whether natural or artificial. The Law provides the definitions of some key words:

- Construction area is an area purposely for human settlement, trade and industries, an area reserved for recreation and other basic activities of public utility.
- Area not for construction is an area reserved for agriculture, afforestation, grazing, reserved tourist places and recreational gardens.
- The ownership of Land is determined by article 4, which announces that, any person or association with legal personality has the right over the land and to freely exploit it as provided for by this organic law in article 5 and 6.

II.1.9.Rwanda building control regulations

The Rwanda Building Control Regulations serves as a standard reference for the regulation of planning and design of all buildings in Rwanda. The regulations will facilitate professional practice in the construction sector and reduce the emergence of informal developments so as to ensure well planned and safe building and housing facilities which are environmental friendly in the country. The document also provides regulations in the different areas including electrical installations; Safety: equipment, escape routes and fire alarm; Site activities: construction and site operations etc.

II.2.INTERNATIONAL LEGISLATIVE FRAMEWORK

II.2.1.Environmental International Conventions

Rwanda has signed and ratified the following environmental international conventions which are to some extent in line with this project and the national policies and laws:

- The international Convention on Biological diversity and its habitat 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 c h a n g e 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 Tran boundary 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), 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.

II.2.2.International agreements

The following table indicates different agreements, date of signature and date of ratification where Rwanda is a signatory:

Table 2:Environmental assessment related agreement

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 the 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 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 the nature conservation and natural resources	15/09/1968	20/05/1975

These treaties and international agreements are relevant for the protection and the conservation of the environment and in particular the biodiversity in Rwanda together with the mobilization of funds as well at the bilateral and multilateral level.

II.2.3. World Bank Environmental and Social Safeguards Policies

World Bank Operational Policies (OP) and Bank Procedures (BP) Environmental Assessment - BP4.01 and OP 4.01 (January 1999 all of which require environmental assessment of projects proposed for World Bank financing to help ensure that they are environmentally sound and sustainable. The World Bank provides guidance on EA requirements through the Environmental Assessment Sourcebook (World Bank 1994) which includes sectoral guidelines. The World Bank EA process is implemented through a set of Operational Policies/Directives whose primary objective is to ensure that Bank operations do not cause adverse impacts and those they “do no harm”. These safeguard policies are grouped into Environment, Rural Development, Social Development and International Law.

The following safeguard policies have been considered in this EIA.

II.2.4. OP/BP 4.01 Environmental Assessment (January 1999)

Environmental Assessment is one of the 10 safeguard policies of the World Bank. The World Bank Environment and Social Safeguard Policy aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01. The World Bank system assigns a project to one of three project categories, as defined below:

Category A: Environmental Assessments are normally required because the project may have diverse significant impacts (projects in this category are forestry, large industrial plants, irrigation and drainage, mineral development (including oil and gas), pipelines (oil, gas, and water), resettlement, rural roads, tourism, urban development, large transmission lines, etc.).

Category B: A limited environmental analysis is appropriate, as the project may have specific environmental impacts. Projects in this category include agro-industries (small scale),

aquaculture & marine culture, small industries, mini-hydropower station, public facilities (hospitals, schools, housing complexes, rural electrification, telecommunications, small-scale tourism, rural water supply, etc.

Category C: Environmental analysis is normally unnecessary, as the project is unlikely to have significant environmental impacts. Projects in this category include education, family planning, nutrition, institutional development, technical assistance, etc.

II.2.5.OP/BP 4.04 Natural Habitats (Jun 2001)

The Bank supports the conservation of natural habitats and the maintenance of ecological functions as a basis for sustainable development. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

II.2.6.OP/BP 4.11 Physical Cultural Resource (July 2006)

Cultural property is defined to include both remains left by previous human inhabitants (e.g. middens, shrines) and unique natural environmental features such as canyons and waterfalls. The Bank does not support projects that will significantly damage non-replicable cultural property and assists only those projects that are sited or designed so as to prevent such damage.

II.2.7.OP/BP 4.12 Involuntary Resettlement (December 2001)

Details involuntary resettlement, emphasizing the severe economic, social and environmental risks, if unmitigated. It ensures that the population displaced by a project receives benefits from it and also covers those with usufruct or customary rights to land or other resources taken for the project. The Operational Policy is specifically inclusive, ensuring that all those affected both directly and indirectly by project developments are compensated as part of the project. Affected population, include those with income derived from informal sector and non-farm activities, and from common property resources. The absence of legal title does not limit rights to compensation. The World Bank's Policy objectives urge that involuntary resettlement be avoided whenever possible. If unavoidable, displaced persons need to:

- Share in project benefits,
- Participate in planning and implementation of resettlement programs, and
- Be assisted in their efforts to improve their livelihoods or standard of livings or at least to restore them, in real terms, to pre-displacement levels or levels prevailing prior to the beginning of project implementation, whichever is higher.

II.2.8.OP 7.60: Disputed Areas

Operational Policy (OP)/Bank Procedure (BP) 7.60: Projects in Disputed Areas may affect the relations between the Bank and its borrowers, and between the claimants to the disputed area. Therefore, the Bank will only finance projects in disputed areas when either there is no objection from the other claimant to the disputed area, or when the special circumstances of the case support Bank financing, notwithstanding the objection. The policy details those special circumstances. In such cases, the project documents should include a statement emphasizing that by supporting the project, the Bank does not intend to make any judgment on the legal or other status of the territories concerned or to prejudice the final determination of the parties' claims.

II.3.INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT IN RWANDA

The institutional framework for environmental management is currently enshrined in the Organic Law determining the modalities of protection, conservation and promotion of the environment in Rwanda, published in the Official Gazette RWA N° 9 of the 1st May 2005, particularly in its chapter III relating to the establishment of the institutions.

In Rwanda, the implementation of natural resources management and environment policies and sectoral strategies involves several stakeholders, including government state institutions, NGOs, civil society, the private sector, decentralised entities and donors.

Likewise, at regional levels, many actors in the five member countries are involved in carrying out environmental management interventions at different levels, using different modalities and applying different standards. In order to co-ordinate and harmonise different management approaches besides policies, laws, regulations, agreements and standards.

II.3.1. Ministry of Natural Resources (MINIRENA)

MINIRENA is a multisectoral ministry covering five sectors: Lands, Water Resources, Forest, Mining and Environment. Environment is a cross cutting sector because it covers the four other sectors. MINIRENA is responsible for the development of policies, laws and regulations as well as coordination of all activities in the management of land, water resources, forest, mining activities and environment, as well as their follow up and evaluation.

Other key Ministries and institutions

- **MININFRA:** is responsible for setting policies related to energy including electricity; urbanization and settlements; road and communication infrastructure; Meteorology, Urban Water supply. MININFRA oversees the resettlement and housing of people. The Ministry is also charged with constructing infrastructures that protect the environment where different assessments are prioritized. Besides organizing human settlement MININFRA has the mandate for town planning, public infrastructure and transport; the management of water supply as well as actions to encourage water harvesting in the settlement and housing sector.

- **MINALOC:** Under the framework of decentralization, MINALOC oversees the implementation of the decentralization process as well as relevant community and social protection programmes. This Ministry is also responsible for environment governance and therefore for mobilizing the public to participate in the management and protection of natural resources.

Districts are responsible for production and protection of water, tourism, and the environment. Similarly, cities, towns, and municipalities are responsible for land and environmental management, urban planning, road maintenance, maintenance of protected and recreational areas, and providing drinking water, sanitation, and waste treatment and disposal. MINALOC is over-seeing various community environment management related programmes in the districts. These include: Vision 2020 Umurenge, HIMO, Ubudehe and CDF which involve poor communities to participate in various initiatives aimed at enhancing their income.

- **MINECOFIN:** is responsible for Macroeconomic policy instruments, resource mobilization, and coordination of development partners and allocation of budgets to different Ministries and sectors. MINECOFIN is also charged with overseeing and advising on the formation of various Funds (including the Environment and Forestry Funds). It is also concerned with mainstreaming natural resources and environment concerns in the budgetary, PRSP and DDP processes.

- **MIGEPROFE:** sets policies and guidelines for mainstreaming gender in formulation and implementation of central and local governments' programmes. The Ministry is mandated to guide MININERA and local governments to mainstream gender related issues in natural resource and environment management and mobilize communities (women, men and youth) in the activities of natural resource and environment protection and management.

- **MINEDUC:** is responsible for training human resources in the management and protection of natural resources; It oversees the implementation of environmental education programmes in schools (by supporting Environmental Clubs), as well as initiating the process of mainstreaming environmental assessment into schools.

- **Rwanda Environment Management Authority (REMA):** in 2002, Rwanda Environment Management Authority (REMA) was established to act as the implementation organ of environment-related policies and laws. REMA is also tasked to coordinate different environmental protection activities undertaken by environmental promotion agencies; to promote the integration of environmental issues in development policies, projects, plans and programmes (due the implication of EIA and SEA); to coordinate implementation of Government policies and decisions taken by the Board of Directors and ensure the integration of environmental issues in national planning among concerned departments and institutions within the Government; to advise the Government with regard to the legislation and other measures relating to environmental management or implementation of conventions, treaties and international agreements relevant to the field of environment as and when necessary; to make proposals to the Government in the field of environmental policies and strategies.

- **Rwanda natural resources Authority (RNRA):** RNRA is an authority under the Ministry of Natural Resources that heads the management of promotion of natural resources which is composed of land, water, forests, mines and geology. It is entrusted with supervision, monitoring and to ensure the implementation of all issues relating to promotion and protection of natural resources, Implementing national policies, laws, strategies, regulations and government resolutions in matters relating to the promotion and protection of natural resources; Making follow up and to implement international conventions Rwanda ratified on matters relating to natural resources management, Advising the Government on appropriate mechanisms for conservation of natural resources and investments opportunities; establishing cooperation and collaboration with other regional and international institutions with an aim of harmonizing the performance and relations on matters relating to management of natural resources. RNRA is coordinate and supervise activities of its 3 child agencies, which are: [National Land Centre \(NLC\)](#), [OGM](#), Integrated Water Resources Management (IWRM) and [National Forestry Authority \(NAFA\)](#).

- **Rwanda Energy Group (REG):** REG has as mission to create conditions for the provision of sufficient, safe, reliable, efficient, cost-effective and environmentally appropriate energy services to households and to all economic sectors on a sustainable basis. REG has a vision of contributing effectively to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner.

- **RDB (Rwanda Development Board):** The Rwanda Development Board is evidence that Rwanda is open for business. It is truly a “one stop shop (Centre) for all investors”. Rwanda Development Board was set up by bringing together all the government agencies responsible for the entire investor experience under one roof. **RDB is responsible for approval of EIA reports by issuing an EIA certificate.**

- **Rwanda Utilities Regulatory Agency (RURA)**
The RURA energy sector's mission is to control and regulate an efficient, sustainable and reliable energy sector in a transparent and fair manner for the benefit of all stakeholders.

- **Provincial, District and Lower level Environmental Committees**

The Rwandan National Environment Policy of 2003 also proposed the establishment of provincial, district and lower level environmental committees beside the establishment of REMA responsible for environmental protection.

III.1. DESCRIPTION OF THE PHYSICAL ENVIRONMENT

This chapter gives background information of the subprojects area as whole specific sites in terms of its location, physical and socio-economic environment, which will play a crucial role in the identification, predict and analysis of environment impacts and proposed the appropriate mitigations measures.

III.2. SOUTHERN PROVINCE

III.2.1. Subproject Location

The Southern province is located in the Center of the Country and have border with the Republic of Burundi and are composed by 5 Districts: **Kamonyi, Ruhango, Nyanza, Huye, and Nyamagabe Districts**. However, the subprojects are extended on the big area which are not electrify. The methodology was sampling the zone on which many households are concentrated into centers or villages. Some subprojects are located in **Kamonyi District** especially in one Sector of *Nyamiyaga*, **Ruhango District** especially in the Sectors of *Kinazi and Ntongwe*, we find also others in **Nyanza District** specifically in the Sectors of *Nyagisozi, Cyanika, Mbazi, Mugano, Rwabicuma and Busasamana*, **Huye District** particularly in Sectors of *Kigoma, Kinazi, Rwaniro* and finally in **Nyamagabe District** in the Sectors of *Musanze, Mugano, Mbazi and Nkomane*.

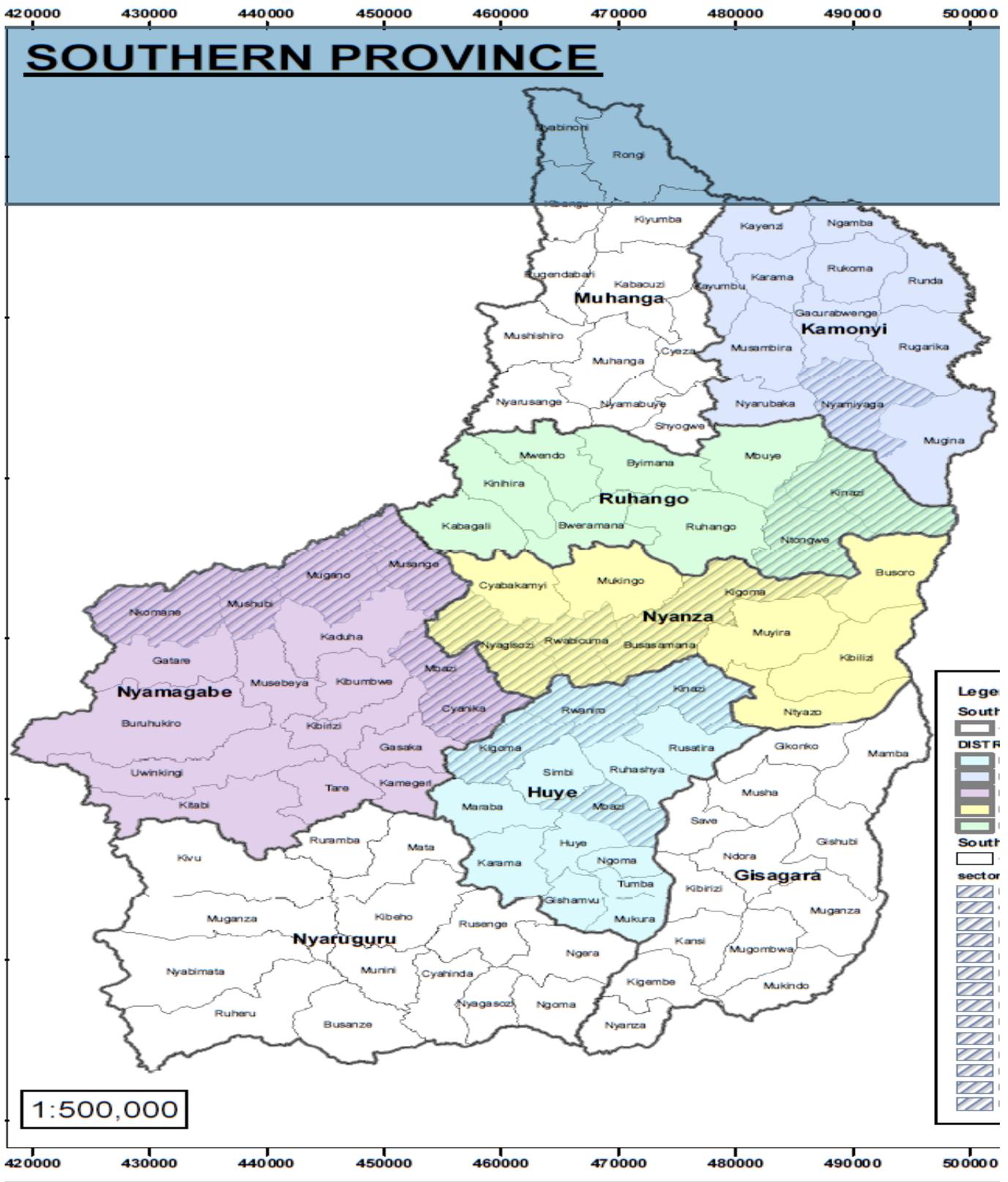


Figure 1 : Map of Southern province and its different district

III.2.2. Relief and Climate

The Relief of the Southern Province is characterized by elevated hills particularly in Nyamagabe District with some area flat tops, moderate depressions and low unevenness, with altitude ranges from 1750 to 1950 meters above the sea level. The slopes generally vary from 0% to 15% gradient. This kind of relief constitutes a seemingly favourable site for urban area extension with best places for residential purposes and other infrastructures such as roads with gentle slopes.

The characteristic of valleys changed based on physical-climatic of the soil. Most of the time, they are two big valleys: Kamiranzovu Marshland and Mwogo Marshland which are occupied by different cultures and others small marshlands which are occupied by rice culture.

Concerning the Climate, the area enjoy four climatic seasons that include two rainy seasons and two dry periods including a short rain season extending from October to December, a short dry season that runs from January to February, a longer rainy season from March to June, and another but longer dry season running from June to August or early September.

The area is climatically located in a high rainfall area ranging from isohyets 1100 mm to isohyets 1200 mm with the least amount of rainfall occurring in the month of July averaging 11mm rainfall, while the month of April has the highest amount of rainfall averaging 201mm. The temperature vary from 11°C and 28°C (REMA, 2005).



Figure 2:Relief and physical environment of Southern Province

III.2.3.Soils and Geology

The Geology of the Southern Province is composed by a variability of rocks but the major types of rocks are: granits, gneiss, quartzite, Schist and amphibolites. This kind of soils is observed in Muhanga and Ruhango District where the soil is eroded and degraded. However, the soils of Huye are generally humus-enriched Kaolin, turned slightly, reddish by the presence of iron oxide and like most of Rwanda where derived from schistose, sandstone and quartzite formations. Physically, the soil at the proposed site are murrum and pockets of cotton soils. It is difficult to have a positive production.

In general, rocks exposures are rare on the valley slopes which are covered with residuals soils having thickness of 0.5 to 1.5.As observed, in the test pits sunk along the canal route, below this residual soils layers hard moderately decomposed to highly decomposed rocks, could be found. However, in some areas residual soils is underlain by thick weak, completely to highly decomposed rock.

III.2.4.Flora and Fauna

The project area has no specific natural flora and is mainly characterized by grown flora. Noticeable flora include trees that are exotic to the project site mainly the eucalyptus trees that have been extensively planted in the hillsides and play a vital role in controlling soil run off that

is prevalent in the steep hillside. Other floral species that can be observed in the project area include: Grevillia, Jacaranda, Cypress and Pine.

Also present in the project area and hence can be termed as flora are crops planted by local communities and make an important component of the vegetation cover. These crops include beans, coffee, bananas, passion fruits, yams and cassava.

The project area has known significant species of wildlife and avifauna that could be adversely impacted by the project. However, domesticated animals like goats, chickens, pigs and cows are kept by the local communities at small scale level.

III.2.5.Housing and Settlement

Housing is constructed mainly in family compounds. Buildings are either<temporary>(built with traditional materials),semi-permanent (with traditional wall and corrugated iron roofs or permanent (with brick or concrete walls).The majority of housing is owner-occupied (EWSA,June 2011)



Figure 3: Rural settlement in Southern Province

III.2.6.Energy

The energy used for cooking and lighting in rural areas of Southern Province is biomass. According to MININFRA, in rural areas, biomass meets up to 86% of national need. However, there are some semi-urban areas like Muhanga, Nyanza, Huye and Nyamagabe District which use electricity, gas and kerosene for cooking.

III.2.7. Infrastructures

The infrastructures of the projects areas is relatively established normally in urban areas of Southern Province. Physically, there is a network of access roads which are linked with selected sectors. Most of the roads are compacted by laterites and some of them are damaged by erosion especially in the Districts of Ruhango, Muhanga and Nyamagabe. There is also electricity provided by REG generally in sub urban of Districts. Telephones services are available from telephone companies' towers on this areas.

III.3. DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT

III.3.1. Agriculture

The agriculture production system is based on small family exploitation whose production is consumed by the owners at more than 80%.The systems of crops are complex, based on the diversification of the production and the association of crops. Seven main crops, namely banana, bean, sweet potatoes, cassava, sorghum and potatoes of which the first five are present in 90% of the production units and constitutes the common basis for all the region of Rwanda (EUCL-ESMF, Septembre 2015).



Figure 4: Rice plantation in marshlands in Rwaniro Sector/ Huye District

CHAP IV.IDENTIFICATION, ANALYSE OF KEY POTENTIAL IMPACT AND PROPOSED OF MITIGATIONS MEASURES.

IV.1.Nature and extend of potential environment impact of proposed activities.

This subproject and its activities will have potential impacts (both positive and negative) on the surrounding and connected communities, both directly and indirectly as there will be direct and indirect interactions between project activities and the environment. This chapter identifies analyses and proposed mitigations measures of these impacts that could arise from the impact/activities either during the construction phase or the operational and maintenance phase.

The impacts also applied on socioeconomic environment (health, security, economic activities, employment, finances, population; present land use; planned development activities; community structure; distribution of income, goods and services; recreation; public health; cultural properties, etc.) and to the biophysical environment (fauna, flora, water, air, soil, landscape).

IV.2.IMPACTS IDENTIFICATION

IV.2.1. mpacts during Construction phase

IV.2.1.1. Positive Impacts

Throughout the construction period, local inhabitants of this area are positioned to benefit in the following aspects:

- i. Employment** opportunities will be offered to skilled and non-skilled workers during construction and operation phase and other employment opportunities benefiting from electricity connection. Income generating activities are expected to be created hence contributing to poverty reduction and increasing revenues and sustaining social and economic development with women at the center.
- ii. Economic development:** The availability of electricity will be an incentive of additional income-generation activities such as carpentry, mill, hair salon, repair and maintenance of vehicles, cleanings, restaurant and caterings amongst others which are hope to lead to improved livelihoods of operators in the community especially the

youth. On a middle and long term, the electricity will be an incentive for potential set up of industrial activities companies.

- iii. **Improved livelihood and environmental protection:** The electricity supply will bring about improved delivery of services in sectors such as health especially vaccination, child deliveries and surgical operators, educations and general facilitation of trade activities in the project areas. The electricity supply will contribute also to reduce firewood demand and avoid the use of stand-alone generators and hence it will participate to the environment preservation (forest, gas emission, fuel and lubrication ,oil leakage) and noise pollution reduction
- iv. **Security improvement:** The electricity supply will lead to improved security through better lighting in trading centers and public institutions along the project areas and their environs which will contribute to security of residents and investments.

IV.2.1.2.Negative Impacts

As the construction goes on, the adverse impact will occur later .For instance, it will be a number of excavations, soil disturbance and increased traffic around the site as a result of heavy trucks delivering various construction raw materials and taking away the generated waste including construction debris. All these are likely to pollute and degrade the local environment, through mud slides, noise, and dust and air pollution. Potential adverse impacts emanating from construction activities are described in detail here below:

IV.2.2.impacts at Pre-construction phase

IV.2.2.1.Line Route Survey and Asset losses.

During line route survey and assets losses, there will be a visual of environmental degradation especially destruction of natural vegetation, food and cash crops. In southern Province, they will no significant impact of loss of crops and trees of project beneficiaries. However, minimizing the impact, stakeholders and beneficiaries must be involve on survey and inventory of Assets and Crops.

IV.2.2.2.Site selection and planning design.

Poor site selection for transmission and distribution can be source of destruction of sensitive ecosystems or reviewing the proposed sites. Planner must be aware of environmental

conservation and avoiding negative impact of the future proposed subprojects especially in Nyanza District where we have historical and cultural museum. However, the size of the impact is very low because the right of way is very small

IV.2.2.3.Impacts at Construction phase

IV.2.2.3.1. Earth excavations

During site earth excavation, foundation excavation and site levelling, large masses of soil are likely to displace. The excavation and earth moving will expose the ground to potential erosion from both storm water run-off and wind. Increased movement of traffic on site especially from trucks disposing off the excess murrum. The excavation equipment will be a potential source of noise pollution and gases from exhaust. Analysing impact of excavation of this areas, we find that this action is very tough and need enough manpower. So, the impact is very significant. The strategies of mitigations actions will be involving local communities who knows the areas in order to avoid the destruction of infrastructures.

IV.2.2.3.2.Heavy truck and machinery movement

It obvious, that there are bound to be trucks delivering construction materials and disposing debris to dumping sites. This project might also acquire equipment such as; excavators, wheel loaders, dampers for purposes of clearing, leveling and moving earths. The consequence of those trucks movement will create noise and air pollution. The strategies proposed will be minimizing the number of deliveries through timely scheduling especially in the District of Muhanga and Ruhango.

IV.2.2.3.3.Rehabilitation of existing roads

The rehabilitation of existing tracks can impact the environment through vegetation clearance and compaction of land and a permanent loss of land. This activity will be done to minimize the number of new roads required; the impact is not expected to be highly significant. It will be significant in areas on which roads are damaged like Muhanga,Ruhango and Nyamagabe Districts.



Figure 5: Damaged of Existing road

IV.2.2.3.4. Construction of Transmission Line poles

Clearing of vegetation, site compaction and land acquisition has the potential to change land use patterns. However, the area required for each pole and the transmission line is not expected to have a major adverse impact on land use patterns because we don't need land acquisition.

IV.2.2.3.5. Disposal of construction debris

Most activities involved in the construction phase are waste generators, such as: excavated glasses, metal and debris, concrete, card board, organic waste on site (from fruits, foods...among others). However, debris from different activities during construction shall definitely affect environment. Poor solid waste management creates an eye sore giving the natural beautiful scenery a less pleasing perspective. Collect solid waste correctly and bury off sites with applicable government waste management regulations.

IV.2.2.3.6. Soil and water pollution

Any spillage of fuel from machinery works during operation and maintenance of the transmission line power may have impact on soil and water pollution. Store of all liquid material (e.g. fuel, engine oil...) must be avoiding rise out but the negative impact is very low. To minimize the impact, each worker must wearing his PPE and having his insurance (mutuelle de santé) in case of incident or injuries at the workplace.

IV.2.2.3.7. Surface and ground water

No significant impacts on the surface and ground waters of the project areas, base on the bio-physical environment. The area is not the place of high raining like in northern province of Rwanda..

IV.2.2.3.8.Sanitary facilities

During the planning phase of the project, temporary toilets (ECOSAN preferably) shall be planned for being used during site preparation, construction and operational project phases. Given the big number of workers expected during the construction phase, many impacts can be predicted, which are possible bad odours from the latrines that may be a dangerous and nuisance to the neighbouring residents. However, there is no significant impact of dumping sites which are vector of diseases. However, the sanitary facilities are needed at workplace (SEA,2013).

IV.2.2.4.Impacts during operation and maintenance phase.

IV.2.2.4.1.Negative impact

IV.2.2.4.1.1.Potential hazards/Accidents

There is a possibility on lines or poles falling on the ground, and during the operation phase, contact with the transmission lines can result in electrocution. Even, some injuries or accidents which will occur at the work place. The contractor must recorded every day hazards, injuries which occurring at the site. The medical Kit for First Aid must be at the site for emergency intervention.

IV.2.2.4.1.2. Fire risk

The risk of fire outbreaks during bad weather e.g. storms, winds etc. cannot be overruled especially when the electric poles crash or 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. That why each”mini” substation must be equipped by a extinguisher at the workplace in case of fire accident.

IV.2.2.4.1.3. Accidents at work place from operating of machineries and equipment by workers.

There are sometime potential adverse impacts for accidents and hazards occurring during the operation of the equipment that could lead to loss of life or injury to the workers. However, there is no significant impact at the site during operation and maintenance phase. The contractors must be ready every time to intervene if necessary aware the insurance services for compensation.

IV.2.2.4.1.4.Public Safety

Placement of low slung lines or lines near human activity (roads, buildings) increases the risk for electrocutions. Also, poles and transmission lines injuries from workers .A strong mobilization and sensitization of electromagnetic risk to the beneficiaries is important. And it is duty of EARP Staff to implement the Awareness Campaign Plan before starting activities.

IV.2.2.4.1.5.Aesthetics and visuals related impacts-visuals intrusion on the landscape

Construction works especially when bad construction of poles and cables are likely to cause visual intrusion related impacts mainly by having activities out of touch with the natural environment. The areas of Southern Province is not settled by many household. That why, there is no somewhere a significant impact of aesthetics and visual environment for some rural centers (ESMP.2013).

IV.3.PROJECT ALTERNATIVES

IV.3.1.Analysis of “No Project Option”

Access to electricity remains low in Rwanda and the country has one of the lowest percentage coverage by electricity among several nations in the region. The energy demand is higher than national power output and this lack of industrial energy constitutes a big obstacle s to development and a serious turnoff for foreign investors. Furthermore, several small private societies and individual initiatives for the development are facing lack of electricity power supply which constitutes a critical impediment to their competitiveness and/or expansion. Therefore, an electricity power transmission network has great potential to redress this matter especially in rural areas (EWSA,2015).

IV.3.2. Alternative Routes

An analysis of alternative routes is undertaken through mapping and involvement of all the stakeholders in this selection process. At the end of this process, alternative routes will be selected among the possible ones, based on the following general siting criteria (which are related to economic and environmental values):

- i. Avoidance of restricted zones (forests, parks);
- ii. Distance from zones of landscape value;
- iii. Distance from mountain edges, preference for valley routings;
- iv. Distance from urban areas;
- v. Route with constant slope;
- vi. Minimisation of infrastructure crossing (e.g. highways, other power lines, etc.).

IV.3.3 On-Grid Electrification

Provide on-grid electrification. This is the alternative that is proposed by this project. Through this all target sectors will be provided with electricity from the existing grid system and the new ones to be constructed. The project is expected to significantly reduce demand for firewood, as this is the primary source of heating and lighting in Rwandan communities.

This alternative will contribute positively to improving the lives of the target communities through reduced exposure to smoke, improvement in living conditions, increased communication via use of mobiles and opportunities for seeking alternative livelihood options. Local government institutions will also benefit through reduced time and money spent on sourcing firewood from local communities, as well as increase in accessibility to information through various media sources, internet and improved communication.

IV.3.4. No Project Alternative

A No Project (Do nothing option) alternative would primarily mean that the status quo will be maintained and in a sense the environmental impacts (adverse) will not occur. However the positive benefits will be forgone in terms of providing more access to electricity to the Rwandan population which would have in turn spurred and contributed to economic growth (SEA,2013).

Table 3:Environmental and Social Management Plan (ESMP).

Project components/ Activity	Potential Environmental issues	Mitigation Measures	Responsibility	
			Planning and Implementation	Cost Estimates(USD)
Pre-construction Stage				
Design and location of Distribution lines and Asset loss	Dispute and conflict arise when the inventory of Asset started	Ensure that the lands identified acquire the requirement of the government of Rwanda and the World Bank Policies and Guidelines regarding their environment polices. Involve and meaningfully engage the PAPs, general public including administration and local/traditional leaders in the resolution of land conflict.	EUCL EARP-PCU District authorities Contractors	Included in the contract probably 1% of the project cost implementation.
Site selection and Routing	The selection of electrical transmission line route may raise a lot of constraints and	Selection of the lineroute shall be in full compliance with national regulation (eg: specify the minimum distance between the line route and sensitive areas. -Follow REG-EDCL standards and	EUCL EARP-PCU District authorities	Included in the contract probably 1% of the project cost implementation.

	consideration which shall have implication on the feasibility and cost of the project implementation	procedures, practices in selection of the electrical lineroute in rural zones	Contractors	
Construction Stage				
Clearing of RoW along distribution line and construction of new access roads, rehabilitate bridges destruction	Loss of vegetation and biodiversity, potential erosion and siltation on rivers. Fugitive dust may be emitted from construction works and stock piles of materials including machinery as well as from trucks traffic.	Respect the national environment regulation and World Bank Policies and guidelines in terms of soil erosion, biodiversity conservation measures. Additional plantation and embracement using removed top soil is recommended near sensitive locations. Conversion of access roads to the new routes,roads and bridges. Environmental and compliance monitoring by environment officers, Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) registered at international level.	EUCL EARP-PCU Contractors	Included in the contract probably 1% of the project cost implementation.
Excavation, erection poles and	Dust may blow from cleared areas	Avoid using big machinery, manual excavated at pole sites and minimize disturbance at excavated sites,	Contractors	Include in the contract

construction of transmission line.	Effect on local drainage and soil erosion	Located poles at a minimum distance of 30 m from rivers and 50m from lakes, and construct these on stable ground	EUCL EARP-PCU Contractors	-
	Excavation for poles could damage water pipes in village	Consult local authorities, community and beneficiaries to identify and avoid existing infrastructures.	EUCL EARP-PCU Contractors	-
	Work in villages may create noise, dust & impede access	Before stating the work, try to inform local communities in advance, identify the areas with environment threats and local significance and consult custodians of facilities (schools, clinics, public buildings) and avoiding working at sensitive and religious times.	EUCL EARP-PCU Contractors	-
Disposal of construct debris	Dust and air Emission (pollution).	Reduction of speed and limited movement of vehicles. Use dust-suppressing water on unpaved roads, e.g.spraying of water with watering trucks in in advanced of transportation activities. Use equipment with dust suction devices in enclosed spaces during civil works, where necessary.	Contractor	Include in the contract
Delivery of Sanitary facilities	Hygiene and sanitation issues and air pollution.	Delivery mobile toilets (Aquasan) at the work place (raw material storages). Delivery clean and drinking water at	Contractor	Include in the contract

	Dissemination of communicable and transmission diseases (HIV,T.B...)	<p>the sites.</p> <p>Delivery soaps, toilets papers.....</p> <p>Hiring permanent sites keepers for cleaning and bringing every day clean water.</p> <p>Fencing sanitary facilities and the stores workplace.</p>		
Operation and maintenance phase				
Potential hazards/ Accidents.	<p>Electric and magnetic fields.</p> <p>Death and injuries</p>	<p>Follow EARP/EUCL O and M and H and S manuals and revise these manuals if necessary to increase safety of workers.</p> <p>Conduct system maintenance regularly and diligently.</p> <p>Regular training of EARP/EUCL workers to raise awareness of dangers and working procedures to be follows.</p> <p>Delivery appropriate material against fire risk (extinguisher).</p>	<p>EUCL</p> <p>EARP-PCU</p> <p>Contractors</p>	Include in the contract
Health and Safety	<p>Accidents at work place during construction from operating of machineries</p>	<p>Develop an HSE Policy for the construction phase, in advance of construction activities.</p> <p>Development of an HSE Management Plan for the construction phase (shall include</p>	<p>EUCL</p> <p>EARP-PCU</p> <p>Contractors</p>	Include in the contract

	and equipment by workers	<p>Waste Management Plan),in advance of construction activities.</p> <p>Public education and outreach efforts to provide information about hazards awareness, upcoming construction activities, safety measures, reporting unsafe conditions and environment impacts, in advance of construction period.</p> <p>Regular management reviews of safety record, with remedial action where it is necessary</p>		
Cultural and Social Impacts	<p>Bringing strange workers at the workplace.</p> <p>Social conflicts and Disputes</p>	<p>Ensure that workers have insurance (Mutuelle de Sante).</p> <p>Mobilisation and training on best practices talking to good health and safety.</p>	<p>EUCL</p> <p>EARP-PCU</p> <p>Contractors</p>	Public budget
Solid waste management	<p>Little if any solid waste will be generated which includes conductor and tree cuttings.</p>	<p>All left over conductor cutting to be disposed appropriately or be returned to the store for proper disposal.</p> <p>Proper budgeting of materials to reduce wastage.</p> <p>Practice 3 Rs of waste management: reuse, reduce and recycle of materials.</p> <p>Properly manage storage, transfer and disposal of transformer oils according</p>	<p>EUCL</p> <p>Contractors</p>	Include in the contract

		to industry standards.		
Decommissioning phase				
Transformers and cables	Waste Debris from equipment's and Machines when substation is dismantled	Ensure all the machines and equipment is disposed in the right places. Explore available recycling opportunities.	EUCL EARP-PCU	Public Budget
Poor disposal of used CFLs and exchanges IB.	Likely to lead to ground and surface water contamination.C FLs contain mercury a hazardous heavy metal (substance) that is harmful to aquatic resources, soil resources and human population. Soil contamination is a likely adverse impact if the CFLs are dumped in an open dumping site without mitigation	Ensure that all the IB s collected in exchange for the CFLs stored securely in appropriate warehouse until a disposal plan is prepared. Develop a waste disposal plan for the disposal of the CFL lamps. Identify a suitable store for keeping all the IBs.	EUCL EARP-PCU	Public Budget

	measures and controls.			
Health and safety and gender balance	<p>Accidents during decommissioning including oil spills.</p> <p>The electrical field is a charge of men and boys.</p>	<p>Minimize accident at the workplace/mitigation impacts specified in the construction phase of the project.</p> <p>Mainstreaming gender in all activities of the projects.</p>	<p>EUCL</p> <p>EARP-PCU</p> <p>Contractor</p>	Public budget

IV.4.ENVIRONMENTAL AND SOCIAL MONITORING PLAN OF THE PROJECT.

IV.4.1. MONITORING PLAN

A detailed environmental monitoring plan will be developed later to verify that predictions of environmental impacts are accurate and that unforeseen impacts are detected at an early stage and allow corrective measures to be implemented, if needed. During the construction phase the plan will provide for dust, noise, visual impacts, service disruption and safety monitoring.

During the operation period, monitoring will be planned in terms of routine inspection of the health and safety of the workers, disruption impacts during maintenance of ROW and probably fire hazards. The Monitoring Plan will be developed proposed by EARP-PCU at the end during environmental monitoring process.

Environmental monitoring is an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measure, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. Monitoring includes:

- Visual observations;
- Selection of environmental parameters at specific locations;
- Sampling and regular testing of these parameters.

Monitoring should be undertaken at a number of levels.

Firstly, it should be undertaken by the Contractor at work sites during construction, under the direction and guidance of the Supervision Consultant who will be responsible for reporting process. Actually, the Contractor's responsibility to monitoring inventory Assets and crops and compensation issues.

REG-EUCL will undertake independent monitoring of selected parameters to verify the results of the Contractor and to audit direct implementation of environmental mitigation measures contained in the EMP and construction contract clauses for the Project. REG-EUCL also will have the direct

responsibility to supervise inventory Assets and Crops and compensation issues as outlined in the on-going preparation RAP.

RDB has the overall responsibility for issuing approval for the Project and ensuring that their environmental guidelines are followed during Project implementation. Their role therefore is to review environmental monitoring and environmental compliance documentation submitted by the implementing authorities and they would not normally be directly involved in monitoring of the Project unless some specific major environmental issue arise.

Environmental monitoring of the following parameters is recommended as a minimum for EARP-EUCL subprojects:

IV.4.1.1.Noise Levels Monitoring

Although noise during construction is not expected to be a problem with the Project, periodic sampling of Contractor equipment and at work sites should be undertaken to confirm that it is not an issue. Noise level monitoring could be supplemented by consulting with Project Affected People (PAPs) in the first instance to identify the level of monitoring required.

IV.4.1.2.Soil Erosion Monitoring

The excavation of earth for erection of poles, temporary and permanent access roads, and storage facilities will exacerbate soil erosion. It will, therefore, be the responsibility of the Contractor's environmental inspectors to ensure the implementation and effectiveness of erosion control measures. Focus should be given to work sites where soil is disturbed and its immediate environ as well as along the ROW during and after vegetation clearing.

IV.4.1.3.Monitoring of Vegetation Clearing

Unique stands of indigenous trees should not be removed for the establishment of poles. The Contractor's environmental inspectors should make sure that the unique tree stands identified during the present study should not be removed.

IV.4.1.4.Monitoring Rehabilitation of Work Sites

The Contractor's environmental inspectors should ensure that areas used as temporary campsites for workers are progressively rehabilitated as they are no longer required. Once a site is rehabilitated it

should be “signed off” by either REG-EUCL environmental staff. He has the duty of implement the EHS plan and proposed EMP.

IV.4.1.5. Monitoring of Accidents/Health

The Contractor’s environmental inspectors must make sure that appropriate signs are posted at appropriate locations/positions to minimise/eliminate risk of electrocutions.

In addition the environmental inspectors should make sure that:

Table 4:Environmental and Social Monitoring Plan (ESMP)

Project components/ Activities	Negative impacts	Mitigation Measures	Benchmark period	Responsible	Cost
Pre-construction Stage					
Conducting topographic and line route survey in order to avoid any impact on human welfare and environment	The selection of electrical transmission line route may arise a lot of constraints and considerations while shall have implication on the feasibility and cost of the project	Selection of the line route shall be in compliance with national regulation. Follow standards, regulation and practices in selection of the electrical line route in rural zones	Monthly	EDCL EARP-PCU	N/A
Land/property acquisition impacts, loss of Assets, loss of land (access roads/) and other economic resources.	Disputes, complains and conflict arise when the inventory of Asset started	Respect the national environment regulation and World Bank Policies and guidelines in terms of soil erosion, biodiversity conservation measures. Additional plantation and embracement using removed top soil is recommended near sensitive locations	Annually	MININFRA MINICOFIN REG-EUCL EARP-PCU Contractor	N/A

Site selection and routing.	Poor selection and routing can cause environmental degradation.	Adequate survey and mapping will be carried out for new transmission and distribution route in order to avoid sensitive ecosystems. Ensure that during this process, each action taken must respect national environment regulation and World Bank Policies and Guidelines Ensure that all workers have their PPE	Weekly	REG-EUCL EARP-PCU Contractor	N/A
Construction Stage					
Excavation, erection poles and construction of transmission line	Dust may blow from cleared areas.	Avoid using big machinery, manual excavated at pole sites and minimize disturbance at excavated sites.	Monthly	EARP-PCU Contractor	Contractor

Solid waste and waste water management (sites, storage...).	Air and water pollution, problem of health and Sanitations (communicable and transmission diseases).	Delivery mobile toilets (AQUASAN) at the work place. Delivery clean and drinking water at the sites. Delivery soaps, toilets papers..... Hiring permanent sites keepers for cleaning and bringing every day clean water. Fencing sanitary facilities and the showers sites.	Monthly	Contractor	Contractor
Social Impact	Poor performance at the workplace. Social conflicts and Disputes	Ensure that workers have insurance (Mutuelle de Santé). Mobilisation and training on best practices talking to good health and safety.	Monthly	REG-EUCL EARP-PCU Contractor	N/A
Operation and maintenance phase					
Potential hazards/ Accidents.	Electric and magnetic fields. Death and injuries.	Regular training of EARP/EUCL workers to raise awareness of dangers and working procedures to be follows. Improved supervision of field workers.	Occasional	EARP-PCU Contractor	N/A

Health and Safety	Problems of Hygiene and Sanitation Development of communicable and transmission diseases at the sites	Develop Health and Safety Policy and Health, Safety and Environment Plan of EARP/EUCL Record regularly all hazards and injuries at the workplace.	Monthly	REG-EUCL EARP-PCU Contractor	N/A
Disposal of CLFs	Pollution of land (soil), river and other natural water sources.	Develop a waste disposal plan for CFLs debris.	Weekly	EARP-PCU Contractor	N/A

CONCLUSION

The proposed construction of a power transmission lines project is largely aligned with Government Policies for energy sector development and the World Bank Policies. The project enjoys a highly positive benefits profile as it will strongly support initiatives towards rural development, poverty alleviation and reversal of environmental-degradation in Rwanda.

The present ESIA report in Southern Province of Rwanda recommends that the project development and implementation should proceed, but factors in the implementation of mitigation measures proposed herein. The key mitigations strategies on this areas are to work together with all stakeholders in order to join their efforts in achieving sustainable development.

Implementation of those recommendations and others proposed in the present document will greatly improve the local environmental which are degraded. All stakeholders in energy sector (REG-EDCL, EARP, concerned Districts, Project beneficiaries.... shall take their responsibilities to closely monitor activities especially at construction and operational stages as well and at the same time mobilize funds for all planned activities.

Given the nature and location of the project sites, the conclusion is that the potential impacts (infrastructures damaged) associated with the proposed projects of the construction, transmission and distribution lines in Kamonyi, Ruhango, Nyanza, Huye and Nyamagabe Districts in Southern Province can be reduced, limited or eliminated by the application of appropriate mitigation measures.

REFERENCES

1. Abaza, Hussein, Ron Bisset, and Barry Sadler. (2004). Environmental impact assessment and strategic environmental assessment: Towards an integrated approach. UNEP (United Nations Environment Programme). Geneva.
2. Biwas A.K et Aquala SBC, 1992, Manual of Environment Assessment Policies, Procedures and Guidelines, Geneva.
3. Chemonics International Inc. (2003). Rwanda Environmental Threats and Opportunities Assessment. Task Order No. 818 under the Biodiversity & Sustainable Forestry (BIOFOR) IQC USAID Contract No. LAG-I-00-99-00014-00. Also available on: http://www.encapafrika.org/documents/biofor/Rwanda_2003.pdf
4. CIDA (2004). Strategic Environmental Assessment of Policy, Plan, and Programme Proposals: CIDA Handbook. Canada
5. EARP (2010): Environmental and Social Management Framework. Rwanda.
6. EARP (2010): Resettlement Policy Framework Kigali. Rwanda
7. Evans, A., L.H. Piron, Z. Curan, and R. Driscoll (2006). Independent evaluation of Rwanda's Poverty Reduction Strategy 2002-2005. U.K.
8. EWSA, Environmental and Social Management Plan for Rukarara-Kirinda 110Kv transmission line and Construction of Substations, Kigali, June 2011.
9. EWSA, Environmental Impact Assessment Draft report for Rukarara-Kirinda 110Kv, transmission lines EARP subcomponents, Kigali, June, 2011
10. Fichtner, Environmental and Social Impact Assessment (ESIA) of Access to electricity supply for the people of Rwanda and Burundi, Kigali, Mars 2012.
11. Fischer (2008). Personal Communication. On the occasion of the Conference on Gorilla Naming ceremony.
12. GoR (2003). Rwanda Vision 2020. Kigali, Rwanda

13. GoR (2003). Constitution of the Government of the Republic of Rwanda. Rwanda
14. GoR (2005). Organic Law No. 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of the environment in Rwanda. Rwanda
15. GoR (2006). Law No. 16/2006 of 03/03/2006 determining the organization, functioning and responsibilities of the Rwanda Environmental Management Authority (REMA). Rwanda.
16. GoR (2008). Economic Development & Poverty Reduction Strategy. Rwanda.
17. Minecofin (2007). Economic Development & Poverty Reduction Strategy 2008 – 2012. Rwanda
18. MININFRA (2008a) Biomass Strategic Workshop, 30th April 2008. Ministry of Infrastructure (MININFRA),Kigali.
19. MININFRA (2009a). Electricity. MININFRA website. Ministry of Infrastructure (MININFRA), Kigali. Also available on: <http://mininfra.gov.rw>
20. MININFRA (2004) Rwanda Energy Policy. Rwanda
21. MINIRENA (2009). Joint Sector Review. Ministry of Natural Resources (MINIRENA), Kigali.
22. MINITERE (2003a). National Strategy and Action Plan for the Conservation of Biodiversity in Rwanda.
23. MINITERE (2005). Deuxième Rapport National sur la Convention de la Diversité Biologique. Ministère des Terres, de l'Environnement, des Forêts, de l'Eau et des Mines (MINITERE), Kigali.
24. NBI (2005). National Nile Basin Water Quality Monitoring Report for Rwanda. Nile Transboundary Environmental Action Project, Nile Basin Initiative (NBI), Kigali.

25. NISR (2006). The Rwandan Industrial and Mining Survey (RIMS), 2005 Survey Report and Major Findings. Final Report. National Institute of Statistics of Rwanda (NISR), Kigali.
26. NISR (2008). Economic Performance As Measured By Gross Domestic Product 2007. National Institute of Statistics of Rwanda (NISR), Kigali.
27. REMA (2006). Economic Analysis of Natural Resource Management in Rwanda. Rwanda Environment Management Authority (REMA), Kigali.
28. REMA (2009). Economic analysis of natural resource management in Rwanda. Rwanda.
29. ROR (2007). Economic Development and Poverty Reduction Strategy, 2008-2012. Ministry of Finance Economic Planning, Republic of Rwanda (ROR), Kigali.
30. REMA (2009). Rwanda State of Environment and outlook. Rwanda
31. PGNRE (2005). Connaissance et Gestion des données sur l'eau au Rwanda. Etudes techniques Rapport général. Projet de Gestion Nationale des Ressources en Eau (PGNRE), Kigali, 2005
32. Twagiramungu, F. (2006). Environmental Profile of Rwanda. European Commission, Kigali.
33. UNEP (2004). Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach. Gene

APPENDIX

PUBLIC CONSULTATION LIST

No	AMAZINA	ICYO UKORA	Tel	SIGNATURE
1.	MITALI Jean Baptiste	Social Affairs/ P/Umbugu sector	0788533555	
2.	NZETINANA - Bertin	Branch MANAGER	0788570939	
3	Jean Pierre SEBASTIEN	Infrastructure	078887025	
4	NIYITEGEKA Daniel	Electricity Maintenance Engineer	0788630852	
5.	MWMEZERU Eugène	ES of GAKOROUMBA cell	0788515594	
6	TUMYAZESA Sylvester	Electricity Maintenance Officer	0788438936	
7	Mwatabwka Sematobaro	Dist. env. officer NABWA	0788837075	

PROJECT DESCRIPTION

Nature of the project:Construction of substation, transmission and distribution network in 4 provinces of Rwanda.

Project Objectives:To improve reliable on-grid electricity services for households and priority public institutions in the 4 provinces.

Specific objectives:Construction of substations, transmission and distribution network in 4 provinces of Rwanda.

Project Cost

Total Project Cost: About 7 million USD

Land

Total Land Area (sq. meters or ha):To be determined after survey

Existing land use: Mixed residential commercial and agricultural use.

Project Site

Description of the general location of the project site.

Developed Area (within a built-up-area with presence of utility systems or network, especially water supply, roads and power supply)

Under-development Area (relatively far from the urban center with

Predominant absence of utility system)

Other particulars, specify

Land Use Classification (base on approval land use plan of the City or District or Province),

[X] RESIDENTIAL [X] COMMERCIAL [X] AGRICULTURAL

[X] INDUSTRIAL [X] INSTITUTIONAL

[] Tourism [] Open Space

Project Components:

I. Eastern Province LOT (Kayonza,Gatsibo,Ngoma and Rwamagana District)

	SUM MV LINES (km)	SUM LV LINES(km)	SUM TRANSFOR MERS	SUM MV SWITCH GR	POTENTIAL CONN'S	COST(USD)
Lot 4	75.84	120.30	59	4	6,566	4,876,859
MV_LV1	13.95	23.65	8	0	1,489	1,014,178
MV_LV 3	25.00	37.15	22	1	1,312	1,344,350
MV_LV 4	46.31	64.84	35	2	2,694	2,415,677
MV_LV 12	14.14	22.47	12	0	576	782,727

Source: Project Brief

Project activities during all phases (Design, Implementation, Operation, and Decommissioning)

Design: Topographic surveys, site clearing,land documents acquisition, demarcation of right of way.

Implementation: Site installation,construction of foundations, installation of poles, installation of transmission and distribution lines, testing and adjustment.

Operation: Maintenance of Transmission and distribution lines, trimming of grown up trees.

Decommissioning: Demolition of structures and vegetation restoration

Utilities and Infrastructures

Water Supply

- *Demand*

What is the estimated daily water requirement for the entire project during Project implementation: **500m³**

Water demand during operation: **50 m³ / month**

- **Supply**

Is the project going to connect to an existing public water supply system?

Yes **No**

- **Water Treatment**

Is there provision for water treatment?

Yes **No** **N/A**

Sewage Disposal System

- Sewage System:

Modern waste water treatment plant

Ecosan toilets Biogas plant

Septic tank

- Sewage Design: Capacity in Population Equivalent (PE): **10 PE**

Power Supply

Source of power supply:

Local Electric REGgrid:

Own Generator Capacity (KVA) _____

Others, please specify _____

2.9 Solid waste management

Types of solid wastes to be generated during all project phases:

- Disposal system

Ecological solid waste management (e.g. composting)

Open dumpsite outside of the project site

municipal/city landfill area

others _____

Manpower and Employment

How many people will be employed by the project?

During the Design/implementation period: **400**

During the operation and maintenance period: **10**

Project implementation duration

How long will the implementation/construction period take? **18mont**

DESCRIPTION OF PROJECT SURROUNDINGS

Physical Environment

Components/Parameters	Answers		Remarks
	Yes	No	
What is the general elevation of the project area?			Average 1600msl
Are there areas in the site where indications of soil erosion are occurring? If yes, what activities are causing erosion?	X		Causes of erosion: [X] heavy rains [X] unstable slopes [] others, please specify
Are there existing water bodies found near or within the site, e.g. creeks or streams, Lake? If yes, please enumerate them in the opposite space and indicate their location (distance from project site).		X	NO water bodies within project area
Is there an access road going to the project site? If yes, what is its distance to the site: maximum 1 km	X		Type of access road: murrum roads and asphalt roads
Does the site conform to the approved land use plan of the city/Districts?	X		Land use approved by districts
Are there existing structures or developments around the project sites? If yes, please list them in the opposite space.	X		Modern markets Modern landfill Small factories Schools Health centers

Components/Parameters	Answers		Remarks
	Yes	No	
			Sector and cells offices

What is the present land use of the area?

Agriculture Land

Grassland

Marshland

Built-up

Others, pls. specify only factories, industries and warehouses.

Biological Environment

Components/Parameters	Answers		Remark
	Yes	No	
Are there existing trees and other types of vegetation in the site? If yes, please provide examples.	X		<ul style="list-style-type: none"> • Eucalyptus • Shrubs • Cyprus • Other species
Are there birds and other forms of wildlife found in the area?		X	
Are there fishery resources in the water bodies found near or within the site?		X	
Is the site near or within a watershed or forest reservation area? If near only, how near? _____ m or km If within, indicate name of the watershed or reservation		X	

area.			
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Socio-Economic Environment

Components/Parameters	Remarks
Are there existing settlements in the project area? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Average family size:	6
What are their source(s) of livelihood? <u>Livelihood Type</u> <input checked="" type="checkbox"/> farming <input type="checkbox"/> fishing <input checked="" type="checkbox"/> vending / buy and sell <input type="checkbox"/> Tourism <input checked="" type="checkbox"/> Livestock others, please specify administrative	

Are there other existing local organizations in the area? **Yes** No

Are there existing social infrastructures in the project area? **Yes** No

If yes, what are these social infrastructures?

schools communication (radio, TV, newspaper)

health centers/clinics **churches/chapel**

hospitals **roads**

transportation **Hotels**

others,

PREDICTED IMPACTS AND PROPOSED ENHANCEMENT/MITIGATION MEASURES

Project design & implementation Phase

Predicted Impacts	Answers		Proposed Enhancement/ Mitigating Measures	Remarks
	Yes	No		
1. Increase in dust generation due to clearing, civil works and earthmoving activities	X		<p><input checked="" type="checkbox"/> Regular watering of unpaved roads or exposed soils/ground</p> <p><input checked="" type="checkbox"/> Remove soil /mud from tires of trucks and equipment before Leaving the area.</p> <p><input checked="" type="checkbox"/> Hauling trucks should be covered with canvass or any equivalent materials</p>	
2. Top soil removal and loss due earthmoving activities, transport, access road construction	X		<p><input checked="" type="checkbox"/> Stockpile the top soil in a safe place and use as final grading material or final layer</p> <p><input checked="" type="checkbox"/> As soon as possible, rip-rap or re-vegetate the area</p>	
3. Erosion from exposed cuts and landslides due to earthmoving and excavation activities	X		<p><input type="checkbox"/> Conduct construction activities during dry season</p> <p><input checked="" type="checkbox"/> Avoid long exposure of opened cuts</p> <p><input type="checkbox"/> Installation of barrier nets</p>	

Predicted Impacts	Answers		Proposed Enhancement/ Mitigating Measures	Remarks
	Yes	No		
4. Sedimentation/ siltation of drainage or waterways from unconfined stockpiles of soil and other materials		X	<input type="checkbox"/> Set-up temporary silt trap/ponds to prevent siltation <input type="checkbox"/> Proper stockpiling of spoils (on flat areas and away from drainage routes) <input type="checkbox"/> Spoils generated from civil works be disposed as filling materials	N/A
5. Pollution of nearby water body due to improper disposal of construction wastes		X	<input type="checkbox"/> Set-up temporary disposal mechanism within the construction area and properly dispose the generated solid wastes. <input type="checkbox"/> Set up proper and adequate toilet facilities <input type="checkbox"/> Strictly require the contractor and its workers to observe proper waste disposal and proper sanitation	N/A

Predicted Impacts	Answers		Proposed Enhancement/ Mitigating Measures	Remarks
	Yes	No		
5. Loss of vegetation due to land clearing	X		<p><input checked="" type="checkbox"/> Limit land clearing as much as possible</p> <p><input type="checkbox"/> Provide temporary fencing to vegetation that will be retained</p> <p><input type="checkbox"/> Use of markers and fences to direct heavy equipment traffic in the construction site and avoid damage to plants</p> <p><input checked="" type="checkbox"/> Re-plant/ plant indigenous tree species and ornamental plants</p>	
6. Disturbance or loss of wildlife within the influence area due to noise and other construction activities		X	<p><input type="checkbox"/> Re-establish or simulate the habitat of affected wildlife in another suitable area</p> <p><input type="checkbox"/> Schedule noisy construction activities during day time</p> <p><input type="checkbox"/> Undertake proper maintenance of equipment and use mufflers</p>	N/A
7. Noise generation that can affect the nearby resident	X		<p><input checked="" type="checkbox"/> Schedule noisy construction activities during day time</p> <p><input checked="" type="checkbox"/> Undertake proper maintenance of equipment and use mufflers</p>	
8. Generation of employment	X		<input checked="" type="checkbox"/> Hiring priority shall be given to qualified local and unskilled residents	In addition, women shall be given priority

Predicted Impacts	Answers		Proposed Enhancement/ Mitigating Measures	Remarks
	Yes	No		
9. Conflicts in right of way	X		[X] Conduct consultation and settle agreements before finalizing detailed design	Local leaders to play a big role
10. Increased traffic and possible congestion	X		[X] Strict enforcement of traffic rules and regulations [X] Proponent should provide traffic aid during peak hours	
11. Increase in the incidence of crime and accidents	X		[X] Strictly require the contractor and its workers to follow safety rules and regulations in the construction and in the locality (in coordination with local authorities)	

Operation Phase

Predicted			Proposed Enhancement /Mitigating Measures	
1. Generation of domestic effluents		X	[] Provision of adequate wastewater treatment facilities	
2. Generation of solid wastes	X		[X] Segregation of recyclable materials [X] Proper collection and disposal of solid wastes [X] Proper housekeeping and waste Minimization	
3. Increased traffic and possible congestion as well as increase risk of vehicular and related accidents	X		[X] Strict enforcement of traffic rules and regulations [X] Placement of signage and warnings in appropriate places	Sign posts should be part of the project

Predicted			Proposed Enhancement /Mitigating Measures	
4. Risk of fire	X		<p>[X] Fire extinguishers in good working condition installed in each corner of substation</p> <p>[X] Exit stairs provided and shown on plans clearly posted at entrance</p>	