Republic of Rwanda
Ministry of Infrastructure

Environmental Impact Assessment Report for Construction and Rehabilitation of Electricity Distribution Networks in Gasabo District, Kigali City.
Medium and Low Voltage
2010.

Urgent Electricity Rehabilitation Project (UERP)
June, 2010
Prepared by Tito Kodiaga UERP Safeguards Advisor.
EXECUTIVE SUMMARY

Background

This EIA/EMP has been prepared by Tito Kodiaga the UERP Environmental Safeguards Advisor in order to fulfill the requirements of the World Bank in relation to its policies and procedures governing projects funded by them while at the same time it satisfies the host government (Rwanda) regulations regarding Environmental Assessment and Management (EA&M) as stipulated in the Organic Law that established the Rwanda Environment Management Authority (REMA).

The Urgent Electricity Rehabilitation Project (UERP) being implemented by its partners including ELECTROGAZ Ministry of Infrastructure (MININFRA) and RURA through the UERP Project Coordinating Unit (PCU) plans to construct improve the existing distribution and transmission network in Kigali as part of its effort to ensure effective distribution of energy in Rwanda which remains one of the fundamental objectives of the UERP. The project is going to involve creation of a new transmission route, rehabilitating dilapidated networks, erection of towers and constructing of small sub stations at different points in Gasabo District. This project intended to mitigate the power crisis in Rwanda and to help to restore good utility practice for its installations is financed through the International Development Association (IDA) and the Nordic Development Fund (NDF).1

The entire UERP project include the following components: (a) Power System Reinforcement, consisting of priority investments in new generation capacity as well as network rehabilitation and strengthening; (b) Technical Assistance and Capacity Building, aimed at strengthening planning, regulatory and implementation capabilities of the main sector institutions and provide project implementation support; and (c) Domestic Resources Development, to finance investments in high priority micro-hydro based independent grids as well as preparatory activities for the future increments in generation investments, primarily for ELECTROGAZ.

The project will be coordinated by a Project Coordination Unit (PCU) housed in Electrogaz2 and which will work under the overall responsibility of a Steering Committee headed by the Ministry of Infrastructure and comprising key stakeholders in the Project.

Project Description

The UERP intends to rehabilitate and establish new transmission and distribution networks for electricity in Kigali and precisely in Gasabo district with the sole purpose of increasing access to electricity to the residents of Kigali thereby enhancing growth and trade through energy access. The proposed transmission and distribution lines are 3 in total and target the District of Gasabo which is one of the 3 districts in Kigali province.

These proposed lines are;
1. 15kV double system line Birembo-Rubungo
2. 15kV double system Birembo-Kibagabaga, 15kv single circuit kibagabaga-Remera
3. 15kV single circuit line Birembo-Deutsche-Welle

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1 The NDF financing is about US$ 6 million
2 The National Power and Water Utility
There project also intends to construct 4 ring mains or mini substations at KBC, Remera, Rubungo and Deutsche-Welle. These are mini substations whose work is to step down the electricity current from Medium Voltage (MV) to Low Voltage (LV) before it is distributed to consumers.

**Proposed Activities**

Proposed activities related to the rehabilitation and installation of new transmission lines include the installation of Low Voltage and Medium Voltage (LV&MV) new transmission towers and distribution networks along routes already identified and the construction of 4 “minor” substations. These activities will include mapping of transmission and distribution network route, clearing of vegetation along the identified routes, demolition of structures and other aspects on the identified the routes in order to create Right Of Way (ROW), earth and engineering works and service utility buildings and installation of the towers.

**Positive Impacts**

The positive impacts are numerous and wide-ranging. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. In the construction phase there will be temporary employment opportunities for local contractors and those who will be employed or supply services and provisions for workers and to contractors. Within the respective project areas there will be opportunities for petty trading and small business service provision along the power line routes.

Significant social benefit will come through employment generation and safer more efficient operation of key services, through provision of electricity access to the villages along the transmission and distribution lines served by the project. Potential beneficiary enterprises affected by and contributing to regional socio-economic transformation will be small industries and other agricultural processing businesses which need electricity.

The long-term direct positive impact is therefore in access to reliable electricity supplies, which will lead to better provision and easier management of goods and services, and enable new facilities for processing and storage. There will be better availability and supply of safe and clean water (which needs pumping); data management with computers is made possible and communication facilities like Internet can be made available, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

Electricity is essential to the development of agro-processing industries, commercial enterprises and irrigation facilities in the rural areas. By providing local electricity to PAPs - either directly through the financing of local distribution lines, or indirectly, by reinvesting a proportion of the economic benefits of the Project into rural electrification - the Project will be enhancing overall poverty reduction and rural development efforts in the two affected countries.

Electricity supplied to rural towns would replace/reduce the consumption of woody biomass and petroleum products used for cooking, lighting, and motive power. It would support development in the agricultural sector (irrigation pumps, poultry, animal husbandry, preservation of products); in the commercial sector (shops, bars, and restaurants); to small and medium industries (flour mills, rural water supply installations, tanneries, and coffee processing plants); to the residential sector (lighting, heating, and cooking), to education (kindergarten, elementary schools, junior secondary schools, secondary schools and technical colleges), and to the health sector (pharmacies, clinics, health centers and hospitals).

In brief, the project would assist in the facilitation of economic growth in Project affected areas and create long-term employment opportunities for the poor, including women, thereby increasing income levels and reducing poverty.
As a consequence the quality of life and extent of economic opportunity will be changed for the better. Social and environmental costs, not least in noise and air pollution, associated with existing generator usage will be reduced and there may be a more limited requirement for firewood cutting and collection.

**Study Objectives**

For this reason in compliance and in accordance with the operational policy and procedures of the World Bank and the requirements of Rwanda Environment Management Authority (REMA) an Environmental Impact Assessment (EIA) study report must be prepared to identify the potential adverse impacts of the project.

The objectives of the study were to:

- Identifying both positive and negative impact of the project and the most appropriate interventions during construction, operation and decommissioning of the project.

- Develop an Environmental Management Plan (EMP) during construction and operation and present plans to minimize, mitigate, or eliminate negative effects and impacts based on the new site.

This project is classified under category B according to the World Bank Operational Procedure and hence requires the preparation of an EMP while REMA requires that an EIA report is prepared. This report is produced and meant to satisfy both requirements. Work on the EIA started in January 2009. The assessment considered baseline conditions and construction, operation and closure phases for the project.

As required by the ToR, the EIA process included the following steps: (i) Identify the environmental and socio-economic resources potentially affected by the project; (ii) Predict positive and negative effects and the extent to which positive effects can be enhanced and negative effects mitigated; (iii) Quantify and assess the significance of effects where possible; (iv) Consider the need to compensate for any significant residual negative effects; and (v) Identify methods to mitigate and monitor resources that may be affected by the project.

The EIA evaluates residual impacts, or those that remain after various mitigation measures are implemented. In the context of this assessment, mitigation includes the following hierarchy: (i) avoidance; (ii) minimization; (iii) rehabilitation or repair; and (iv) Compensation. In many instances results of initial impact analyses were provided to the engineering design team so that negative impacts could be minimized through improved design. The EIA also provides the basis for the development of an environmental management system for construction, operation and closure.

**Public Consultation**

Public consultation has been and continues to be an important part of the EIA process. Stakeholder engagement and discussion has been held targeting various and diverse concerned publics both at the project site and also with relevant institutions.

**Analysis of Project Alternatives**

The study assessed potential project alternatives in terms of project site, alternative routes, and alternative project with capacity to achieve the same goal, and no project alternative.

**Alternative Route**

The route that has been finally selected for constructing and installing the transmission and distribution lines is depicted in the section on alternatives. This route was arrived at after consideration of several other...
routes that were assessed during the survey component of this study. Using specialized technicians, ELECTROGAZ engineering department undertook routing survey and eventually arrived at the routes which provided the best option in terms of low risk and insignificant threat to the environment in comparison to the other routes.

**Potential Adverse Impacts**

**Destruction of Vegetation and Crops**
Some of the proposed sites that have been identified as the path or routes for the transmission and distribution network and construction of the 4 mini “substations” are located in areas that are currently being utilized by different Project Affected Persons (PAPs) to cultivate different crops including grevillea, eucalyptus trees, euphorbia trees, flowers, bananas, guava trees, euphorbia live fence, cactus, nappier grass among others at a small scale level.

These crops and trees will have to be destroyed to create the required Right of Way (ROW) and mini substations all necessary in the creating of electricity transmission and distribution networks. This impact is inevitable and an ARAP is being prepared that will guide the compensation for crop loss. This ARAP will be submitted to the bank and REMA for approval.

**Temporary and Permanent Land Loss**
The total land area cumulatively (i.e. all acquired land consolidated) is 12.35ha and this is a composition of government (public) and private land. In general the land acquired for the construction of towers is tiny and normally measure 15m by 15m. In total 106 towers will be required and this sums up to a total of 2.35ha. The consolidated size of land for the ROW is 10ha. Only 2 structures will be destroyed to pave way for the construction activities. These are the only instance of resettlement in the entire project.

**Localized Soil Erosion**
There is a likelihood of localized soil erosion and interference with the local drainage during the civil works which will entail minimal earth excavations when constructing the foundations for the towers, foundations for the cabins and access roads if necessary. However, these impacts will be largely localized to the project specific areas and will only occur during the construction phase. Construction equipment used for excavating the ground on where to install the towers and create ROW will be manual hand held tools like pick axe, forks, spades as well as mechanical equipment etc.

**Localized Oil Spills**
The project does not anticipate extensive use of motorised equipment and machinery that use fuel oil and lubricants that could impact on soil and water from accidental spills or unsound disposal or handling. The construction of the towers will be done manually using mechanical/hand held implements. The construction of access roads and foundation of cabins will however use motorised vehicles that can cause oil spills.

**Localized Dust Related and Noise Impacts during construction**
Construction works involving clearing of the access roads for the ROW and earth excavations for foundation preparation is likely to cause localized dust impacts in the areas of concern. Vehicular movement on gravel roads could lead to dust pollution in some areas during dry conditions. This impact would be of a short duration during the construction phase. Dust pollution could also take place during maintenance and inspection of the lines. This impact will be localized and of a short duration, and is anticipated to be of low significance.
Borrow Pit Impacts

Borrow pits created during the construction works if not rehabilitated could cause impacts including becoming breeding grounds for disease vector, hazards that could drown animals and people, and ecological destruction if borrow pits are located in sensitive environments. The project does not expect to use materials from borrow pits but if this occurs, these materials will emanate from government approved borrow pit areas in Rwanda.

Workers Health and Safety

Adverse impacts on the workers health and safety is likely to occur especially through workers interaction with the equipments and machines during construction and operation of the project. Workers are also at risk when erecting the towers which could cause accidental falls.

Bird Strikes/Collusions

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

Aesthetics and visual related impacts - visual intrusion on the landscape

Construction works especially when establishing the 4 cabins are likely to cause visual related impacts mainly by introducing activities out of touch with the natural environment. The tower structures are regarded as being the most visually intrusive component of transmission lines. It is anticipated that the construction of the proposed transmission lines will impose a visual impact on the immediate surrounding area. However, it is proposed that the new lines be constructed using CRS towers for the majority of the route. These towers are smaller, less steel-intensive, and less visually intrusive.

Fire Hazards and Safety

During the operation stage of the project, the 4 cabins become a potential source of fire hazards especially due to the existing electrical systems. In times of bad weather, e.g. storms, strong winds, etc, the towers could also fall down leading to fire caused by electrical faults in the process.

Disruption of Daily Living and Movement Patterns

It is anticipated that the construction activities will result in some intrusions and disruptions in the daily living and movement patterns of the property owners. Such disruptions are anticipated to be of high significance, but of a short-term nature, and could be caused by the movement of construction vehicles and frequent entries to the properties as a result of the construction activities. This would especially occur in the following cases: Where private dwellings and farm worker accommodation are situated near to the proposed transmission lines.

The negative social impacts on the living and movement patterns of the property owners during the operation phase of the project are anticipated to be of low significance and of a short duration, as maintenance of the transmission lines would not be undertaken on a daily basis.

Disruption of Infrastructure and Services

Without the implementation of appropriate management measures, general services (such as underground pipes, existing distribution lines and irrigation systems) could be damaged during the construction period.

Any disruption in the services (especially in the local electricity supply should distribution lines be damaged) could potentially have a negative impact on local enterprises (e.g. businesses activities). The nature and extent of the impact will depend on the length of the interruption in general services. The contractor is
expected to undertake the rehabilitation works and construction works sometimes in the vicinity of energized lines. This could lead to frequent power interruptions and blackouts or even de-energisation of lines.

The table below presents a summary of the potential key adverse impacts that are discussed in section 7 of this report.

**Table 1. Potential Project Impacts**

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Survey</th>
<th>Construction Phase</th>
<th>Operation phase</th>
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<tbody>
<tr>
<td>Permanent loss of land to establishment of towers (ha)</td>
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<tr>
<td>Temporary loss of land during establishment of ROW (ha)</td>
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<tr>
<td>Increased reliability of power supply</td>
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<tr>
<td>National economic</td>
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<td>Construction of temporary and permanent access roads leading to transmission alignment, tower sites and substations</td>
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<td>Temporary Increased traffic due to transportation of construction and operation personnel and machinery</td>
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<tr>
<td>Site leveling and development</td>
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<td>Clearing of vegetation in the Right of Way (ROW) and associated impacts on land use</td>
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<td>Relocation of existing households from the site</td>
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<td>Compensation for permanent loss of land or temporary loss of income</td>
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<td>Health effects of electromagnetic fields (EMF) of high voltage power transmission lines outside the 40m ROW</td>
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<tr>
<td>Safety issues arising from low-slung transmission lines or lines near human activity, e.g. buildings, roads</td>
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<tr>
<td>Hazards to low flying aircrafts</td>
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<td>Changes in storm water runoff due to clearing or grading, tower construction</td>
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<tr>
<td>Possibilities for local employment during construction or operation</td>
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<tr>
<td>Noise</td>
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<td>Gaseous Emissions</td>
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<td>Dust</td>
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<td>Generation of Wastes</td>
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</table>
Mitigation Measures

Permanent Minor Loss and Destruction of vegetation cover/crops
During the survey to map the routes, emphasis will be placed on ensuring that the routes avoid sensitive ecosystems like wetlands, densely populated settlements and farmlands in order to avoid or minimise the impacts associated with resettlement, compensation and relocation.

However, since this is a linear project land use related impacts in terms of crop destruction and acquisition is inevitable. The UERP/PCU will compensate for all the land, structures and crops that will be destroyed to pave way for the construction at the time of construction of the substation. This compensation will be calculated according to the guidelines presented in the Resettlement Policy Framework (RPF) document and will include compensation for labor. A separate Abbreviated Resettlement Action Plan (ARAP) is under preparation and will detail the actual cost of compensation.

Damage to trees should be limited as far as possible, and any removals should be undertaken in consultation with the landowner.

Determination of Final Alignment at Survey and design Stages

- Avoid siting lines through protected areas, other environmentally sensitive areas or through mature forest stands.
- Avoid cultural and heritage sites.
- Site towers on high points of land such that conductors can be strung over valleys thereby eliminating the need to remove trees.
- Locate transmission lines along the base of mountain slopes, rather than down the centre of valleys where large birds could come into contact with conductors.
- Locate transmission lines to avoid running through villages and instead run lines behind villages.
- Consult villagers regarding location of valued village resources and locate transmission lines to avoid these features.
- Situate transmission lines not far away from roads, but behind roadside forested areas so as to minimise visual intrusion.
- Minimise the need to construct new access tracks wherever possible.
- Use existing access roads and tracks wherever available.
- Ensure minimum clearance distances between conductors and ground, waterways, road crossings, buildings, communication systems etc. are incorporated into design.
- Limit ROW to 40m width, however, the undergrowth in the ROW should be allowed while only leaving a narrow strip to be completely cleared to allow stringing of the line conductors.
- Strictly define ROW clearing activities in the contract specifications and in the Environmental Management Plan (EMP).
- String conductors under tension to minimise potential damage to remaining ground vegetation.

Soil Erosion Mitigation Measures

- The final site grade for the 4 “mini: substations should include an adequate drainage channel which should facilitate drainage to avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
• Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
• Borrow pit areas (if any) should avoid other non site areas; borrow areas should be reworked to blend into the surroundings. Re-vegetation should be performed using local plants. All slopes and working surfaces should be returned to a stable condition.
• The use of bulldozers should be limited, especially in environmentally sensitive areas.
• Construction activities should be stopped during and for the period immediately after heavy rains.
• Design and construct transmission line towers with staggered legs so as to eliminate the need to excavate a level pad into slopes on which to construct towers.

Workers Health and Safety Mitigation Measure(s)
• All workers entering the construction site must be equipped with Personal Protective Equipment (PPE) including ear muffs, factory boots, overalls, gloves, dust masks, among others.
• The entire workforce of the plant should be trained in the use of protective gear, handling of electric safety equipment, fire protection and prevention, emergency response and care procedures. Training given to the employees should be backed by regular on- site training in safety measures.
• ‘Restricted ENTRY’ signs should be installed to keep away unauthorised workers from access to restricted areas.
• Machines and equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
• The contactor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
• The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the construction.
• A perimeter fence should be constructed all around the project site especially where the mini substations are being constructed to keep away unauthorised persons from the site.

Polychlorinated biphenyls (PCBs) Mitigation Measures
PCBs used to be widely used as insulators in electrical equipment, including transformers, capacitors, switches, voltage regulators etc. They are of concern because they are powerful toxins, even at low concentrations, and they persist and bio-accumulate in the environment creating adverse health impacts and adverse ecological changes. Intentional PCB production was ended in most countries by 1980 and most transformers and capacitors built after 1980 do not contain PCBs. The major exception to this is transformers and other PCB applications produced since 1980 in the former Soviet Union.

The Basel Convention on Persistent Organic Pollutants lists PCBs as one of 12 target persistent organic pollutants requiring particular attention. This is also reflected in the WB EA Sourcebook update dealing with “Privatisation and Environmental Assessment: Issues and Approaches” (March 1994). This states that the WB considers the use of PCB containing transformers a “red flag”.

Refurbishment of any substations for this Project will need to check whether any such old transformers/equipment will be replaced and appropriate safeguards taken. This is not an issue with new transformers, as they will not contain PCBs.

Health Effects of Electromagnetic Fields (EMF) Mitigation Measures
Electric and Magnetic Fields (EMF) are invisible lines of force that surround any electrical device. Power transmission lines, electrical wiring, and electrical equipment all produce EMF. There are many other sources of EMF as well. Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per metre (V/m). Magnetic fields result
from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T). Most electrical equipment has to be turned on, i.e., current must be flowing, for a magnetic field to be produced. Electric fields are often present even when the equipment is switched off, as long as it remains connected to the source of electric power. In summary, voltage produces an electric field and current produces a magnetic field. The US National Institute of Environmental Health Services and the National Institutes of Health has prepared a comprehensive report on electric and magnetic fields associated with the use of electric power which is available on the World Wide Web at: http://www.niehs.nih.gov/emfrapid.

Electric fields are shielded or weakened by materials that conduct electricity—even materials that conduct poorly, including trees, buildings, and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. However, both electric fields and magnetic fields decrease rapidly as the distance from the source increases. As a precautionary measure, ELECTROGAZ has adopted internationally accepted standard ROW width of 40m along their high voltage transmission lines. All habitation and structures are excluded from the ROW to ensure safety of people and animals from EMFs as well as from direct electric shocks and “flashover”.

With respect to substations, in general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels (http://www.niehs.nih.gov/emfrapid).

Based on a recent in-depth review of extensive scientific literature (World Health Organisation’s International EMF Project), the WHO has concluded that “despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health” (http://www.who.intpeh-emf/WhatisEMF/en.html). The low levels referred to by the WHO are levels expected to be found outside the 40m ROW proposed for the Rwanda-Rwanda Power System Interconnection Project. It is concluded therefore that provided the proposed 40m ROW is enforced along the proposed transmission line route, there will not be any adverse health affects to people along the route.

**Fire Mitigation Measure(s)**
The construction site for the 4 mini substations must contain fire fighting equipments of recommended standards and in key strategic points all over the site. At minimum at least, carbon dioxide systems, and portable fire extinguishers should be installed in the cabin construction site.

A fire evacuation plan should be developed by the contractor and must be posted in various points of the construction site including procedures to follow when a fire is reported. All workers must be trained on fire management and fire drills undertaken regularly.

**Solid waste Management**
- The contractor should engage a refuse handling company to remove the wastes from the site to the recommended waste disposal site.
- Warning signs against littering and dumping within the construction site should be erected by the contractor.

**Bird Strikes Mitigation**
The routing of the distribution and transmission network should avoid areas known to be migratory routes for birdlife.
Ecological Impacts Mitigation Measures
The project routing has been designed to avoid any ecologically sensitive areas especially wetlands. In cases where the route will cut across a wetland, minimal disturbance should be observed.

Infrastructure and Service Disruption Mitigation Measures
The contractor must use methods in order to reduce to the minimum the need to de-energize these lines, furthermore when crossing high voltage lines the contractor will use methods which avoid de-energizing the high voltage lines.

The contractor shall make sure that the Time Schedule provides for adequate advance notice to the Employer as to when shut-downs and/or partial de-energizing of existing equipment are required. The Contractor shall make provisions to be able to shift teams and equipment in order to continue work at other sites if the shut-down cannot be granted for the requested period at the requested dates. He shall be able to resume the works scheduled during shut-downs when they are granted, with a reasonable advance notice. The required interruptions shall be kept to a minimum in terms of length of the shut-down.

Other Disruption Mitigation Measures
Possible mitigation measures include:
• Property owners and nearby communities should be informed well in advance of the construction schedule and any changes to this work schedule.
• Heavy vehicles should make use of the existing access roads on private properties as far as possible. In cases where private roads are to be used, this should be negotiated with the property owner before the construction period commences.
• Construction vehicles should keep to the speed limit and should avoid busy roads, as far as possible.
• Construction activities should not be undertaken after-hours or over weekends.
• Construction should preferably not take place during the harvesting season.
• Property owners should be informed when maintenance of the transmission lines will be undertaken on their properties.
• The contractor should establish whether there is any infrastructure located near or inside the Transmission line servitude in order to avoid any damage to these during the construction phase.
• Discussions should be held with the relevant parties whose infrastructure could be negatively affected.
• The Local Authorities should be informed of the construction schedules to ensure the minimum disruption of such infrastructure.

Dust Mitigation Measures
The following mitigation measures are recommended:
• The contractor should aim to keep to areas of lower elevation as far as possible, in order to minimize the visual impacts associated with the proposed Transmission line.
• Routing of the lines should preferably not be in close proximity to residential dwellings.
• The construction schedule should be communicated with potentially affected parties.
• Construction timeframes should be discussed with property owners.
• Dust-suppression techniques should be used along gravel roads, when required.

Access Roads Mitigation Measures
• Use existing access roads and tracks wherever available.
• Decommission and rehabilitate excess temporary access tracks as soon as they are no longer required.
• Where access is required across agricultural lands use temporary access paths during the dry season involving placement of geo-textile over aggregates where necessary.
• Minimise the need for access tracks whenever possible.
• Construction to proceed in the dry season if possible to minimise soil erosion and mass wasting and to limit loss of crops (which are not grown in the dry season); where construction is required in the rainy season, potentially unstable slopes to be avoided.

Environmental Monitoring and Management

The purpose of the environmental monitoring program is to ensure that the envisaged outcome of the Project is achieved and results in the desired benefits to Rwanda. To ensure the effective implementation of the EMP it is essential that an effective monitoring program be designed and carried out. The environmental monitoring program provides such information on which management decisions may be taken during construction and operational phases. It provides the basis for evaluating the efficiency of mitigation and enhancement measures and suggests further actions that need to be taken to achieve the desired Project outcomes.

An outline of the Environmental Management Plan (EMP) has been included in this EIA Report to indicate the range of environmental impacts/issues and associated mitigation measures envisaged for this Project. The EMP also identifies responsibilities for implementing the mitigation and monitoring measures.

Conclusion and Recommendations

Conclusion

The majority of the potential impacts associated with the proposed transmission lines are anticipated to be restricted to the construction phase, and are thus of a short-term nature. These construction impacts can largely be minimized through the compilation and implementation of a site-specific EMP, which should form part of the construction contractors contract. Therefore, no significant impacts are anticipated as a result of the construction of the proposed lines.

No significant impacts are anticipated as a result of the operation and maintenance of the proposed lines, provided that appropriate mitigation measures are implemented through a site-specific EMP.

Professionally installed transmission lines and cables have a neutral to benign effect on the environment. In general significant adverse impacts are not foreseen through out the project phase of the project. However there will be short term impacts during the construction phase, primarily increased turbidity from cable burial; and damage to flora and fauna (e.g. sea grass and coral) where there is no alternative route.

Chapter 9 summarises the key conclusions of the EIA study, using headings as per this Executive Summary. These supports the view that, with full and proper implementation of the measures identified in the ESMP, the construction and operation of the Project is not likely to cause unacceptable impacts on the environment or the communities of the surrounding area.

Recommendations

• An Environmental Audit (EA) should be conducted annually to review compliance to the proposed Environmental Management Plan. According the EIA regulations of REMA, an annual environmental audit must be conducted at the end of every year once the diesel plant begins operating. The audit will be conducted by registered REMA consultants or the environmental safeguards advisor as required by the Organic Law on environmental protection.
• The goal of this EA is to establish and ascertain the extent to which the project achieved compliance with the environmental mitigation measures and requirements that were specified in the approved EIA report and make recommendations for correcting any problematic or non-compliant activities.

• It is expected as required by the REMA EIA regulations that the cost of the environmental audit will be paid for by the client in this case ELECTROGAZ who will engage competent registered consultants.

**Rwanda Development Board Approval**
This EIA and ARAP report has been submitted to Rwanda Development Board for approval.
CONTENTS

Background ......................................................................................................................... 3
Project Description ............................................................................................................. 3
Study Objectives ............................................................................................................... 5
Analysis of Project Alternatives ..................................................................................... 5
Mitigation Measures ......................................................................................................... 9
Environmental Monitoring and Management ............................................................... 13
Conclusion and Recommendations .............................................................................. 13
Abbreviations .................................................................................................................. 17

1.0 INTRODUCTION ......................................................................................................... 18
1.1 Project Background and Need .................................................................................. 18
1.2 Project Objectives .................................................................................................... 19
1.3 Project Components ................................................................................................ 19
  1.3.1 Transmission and Distribution Lines ................................................................. 19
  1.3.2 Medium and Low Voltage Substations ............................................................... 19
1.4 Co-ordination .......................................................................................................... 19

2.0 STUDY SCOPE AND METHODOLOGY ................................................................. 20
2.1 Methodology and ESIA Resourcing ....................................................................... 20
  2.2.1 Overview ........................................................................................................... 20
2.2 Methodology ............................................................................................................ 20
  2.2.1 Baseline Assessment ......................................................................................... 20
  2.2.2 Project Alternatives ......................................................................................... 21
  2.2.3 Public Consultation ......................................................................................... 21
  2.2.4 Impact Prediction and Evaluation ...................................................................... 21

3.0 PROJECT AREA DESCRIPTION AND BASELINE DATA .................................... 22
3.1 Geographical Location .............................................................................................. 22
3.2 Relief ......................................................................................................................... 23
3.3 Flora and fauna ........................................................................................................ 23
3.4 Climatic zones ......................................................................................................... 24
3.5 Demographics ......................................................................................................... 24
3.6 Economic Activities ................................................................................................ 25
  3.6.1 Agriculture ...................................................................................................... 25
  3.6.2 Energy .............................................................................................................. 26
3.7 Housing and Settlement ......................................................................................... 26

4.0 PROJECT ALTERNATIVES ....................................................................................... 28
4.1 Preferred Transmission Routes ............................................................................... 28
4.2 Rejected Routes ....................................................................................................... 28
4.3 No Project Alternatives ......................................................................................... 28

5.0 LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK ................................ 29
5.1 Organic Law on Environment Protection and Management .................................... 29
5.2 Energy Policy ......................................................................................................... 31
5.3 Land Policy ............................................................................................................ 33
5.4. International Legislations ...................................................................................... 35
  5.4.1 World Bank Environment and Social Safeguards Policy ................................... 36
  5.4.2 Environment .................................................................................................... 36
  5.4.3 Rural Development ......................................................................................... 37
  5.4.4 Social Development ......................................................................................... 37
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAP</td>
<td>Abbreviated Resettlement Action Plan</td>
</tr>
<tr>
<td>EMF</td>
<td>Electromagnetic Fields</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Audit</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>IAPs</td>
<td>Interested and Affected Parties</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
<tr>
<td>LV</td>
<td>Low Voltage</td>
</tr>
<tr>
<td>MV</td>
<td>Medium Voltage</td>
</tr>
<tr>
<td>MININFRA</td>
<td>Ministry of Infrastructure</td>
</tr>
<tr>
<td>FORENWA</td>
<td>National Fund of the Environment in Rwanda</td>
</tr>
<tr>
<td>NDF</td>
<td>Nordic Development Fund</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>PCBs</td>
<td>Polychlorinated biphenyls</td>
</tr>
<tr>
<td>PAPs</td>
<td>Project Affected Persons</td>
</tr>
<tr>
<td>PCU</td>
<td>Project Coordination Unit</td>
</tr>
<tr>
<td>RPF</td>
<td>Resettlement Policy Framework</td>
</tr>
<tr>
<td>ROW</td>
<td>Right Of Way</td>
</tr>
<tr>
<td>REMA</td>
<td>Rwanda Environment Management Authority</td>
</tr>
<tr>
<td>UERP</td>
<td>Urgent Electricity Rehabilitation Project</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 Project Background and Need

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

Rwanda remains among the lowest per capita electricity and petroleum products consumption countries in the world. Only about 65,000 (6-8 percent) of households have access to grid supplied power, almost entirely in the main urban areas. Diesel remains the primary fuel for self-generation in rural areas, and also for back up in urban areas during the current crisis, and kerosene for lighting for the vast majority.

Grid extension has been extremely limited, and economically justified only to meet rural industrial loads and emerging population clusters.

Rwanda’s post conflict genocide economic recovery is under threat from severe power supply shortages. A combination of strong demand growth with unexpectedly low water levels in its hydro power sourced lakes further exacerbated by high technical losses and unreliability of ELECTROGAZ dilapidated network, have led to extensive and lengthy power cuts.

Despite re-commissioning of an old diesel power plant, load shedding has increased to about 25% of peak demand with serious adverse consequences. Supply shortages have raised the cost of doing business, in particular for short export enterprises, and weakened the prospect of attracting new investments. Power supply shortages have also worsened water supply problems in the main urban areas, leaving ELECTROGAZ to switch to diesel water pumping and adding to its financial woes.

Rwanda already imports 60% of its electricity needs, mostly from SNEL and Sinelac plants in the Democratic Republic of Congo, and there is a little scope to increase this further. In the near term before any new hydro or gas based power can be brought on line, Rwanda will have to increasingly rely on higher costs diesel power (about 150USc/kWh compared to 2003 average bulk supply cost of around 5USc/kwh).

Urbanization and industrial growth, combined with limited access to electricity and high cost of petroleum products have led to an even more rapid growth in urban charcoal demand. Severe deforestation during conflict, in part by internally displaced persons and returning refugees has been further compounded by the large scale demands for charcoal making, construction materials, and agro industrial, institutional and commercial customers.

ELECTROGAZ operates, in addition to the system in Kigali, 14 Distribution Centers (called Stations), located throughout the country of Rwanda, which provide services to customers.

In the distribution system, power is distributed at medium voltages of 30kV, 15kV and 6.6kV. Low voltages are 380V three phases and 220V single phase. The distribution networks of Kigali are characterized by the large percentage of the network that is underground. The distribution system is generally in a poor state, with overall losses amounting to about 34.5% in 2001.

Through intensive investigations in consumer installations and the review and update of the customer and meter database in Kigali, the overall loss figure was reduced to about 26% in 2003. Although it is currently
not possible to allocate this figure to technical and non-technical losses, in the light of the network condition, technical losses considerably exceeding figures achieved by comparable utilities can be expected.

By the end of 2004 Rwanda has faced year energy crisis that has never happened before. The Government of Rwanda (GoR) ELECTROGAZ through has managed to mitigate the crisis by putting in places Diesel Power Plantations with additional capacity of about 12.5 MWS. The effort to get rid of the deficit has continued. As part of the strategy of the Government of Rwanda to arrest the energy crisis in the country, the GoR has asked the World Bank for support of its Urgent Electricity Rehabilitation Project (UERP). The overall development objectives of the proposed project are to: (i) Alleviate the power shortages: and (ii) enhance the capabilities of energy sector institutions.

1.2 Project Objectives
The objectives of the project are to extend and rehabilitate the electricity distribution and transmission grids for supplying electricity to consumers (household, agricultural, commercial and small and medium enterprises) in Kigali. All the connected consumers in Kigali will then be supplied from the interconnected grid. This project involves the installation of Medium and Low Voltage (MV&LV) transmission lines within the district of Gasabo emanating from different points as described below. Similarly, 4 mini substations will be located along these lines with the aim of stepping down the MV current to LV before distribution to consumers. The mini substations will contain in housing units that will be constructed during the project construction phase.

1.3 Project Components

1.3.1 Transmission and Distribution Lines
The main components of the project comprise construction, upgrading and rehabilitation of the following Distribution Networks;

These lines are;
1. 15kV double system line Birembo-Rubungo
2. 15kV double system Birembo-Kibagabaga, 15kv single circuit Kibagabaga-Remera
3. 15kV single circuit line Birembo-Deutsche-welle

1.3.2 Medium and Low Voltage Substations
As indicated above, this project involves the construction of medium and low voltage lines in order to extend the electricity network and supply to residents in Gasabo district. The MV current will be stepped down through the planned construction of 4 “mini” substations which will primarily step the current to LV before it is distributed to the consumers. These 4 ring mains or mini substations will be located at KBC, Remera, Rubungo and Deutsche-Welle

1.4 Co-ordination
Great care will be used in the co-ordination between the lots for the commissioning of the MV and LV lines to be connected to the existing networks.

The detailed working plan shall take into account that the existing networks will remain operational during the works. The necessary cut-offs and disturbances shall be reduced to a minimum and planned in close co-operation with the ELECTROGAZ. Sufficient notice of the disturbances shall be given in advance in order to allow the ELECTROGAZ to inform the public.
2.0 STUDY SCOPE AND METHODOLOGY

The World Bank has indicated that it considers the Project to be a category “B” project and as such an Environmental and Social Impact Assessment (EIA) including an Environmental Management Plan (EMP) and a separate Resettlement Action Plan (RAP) are required. The World Bank has also requested that separate RAP Reports be prepared for Rwanda and Rwanda to assist with disclosure and to meet Bank funding requirements.

The objectives of the EIA are to:
1. Identify potential negative and positive environmental impacts of the different alternatives considered.
2. Provide technical information and recommendations to help select and design the best alternative, and;
3. Prepare an environmental management plan (EMP) which includes: a mitigation program, monitoring plan, program of technical assistance; and describes institutional arrangements for the preferred route.

The EIA has been prepared in accordance with the requirements of the governments of Rwanda and the World Bank policies and procedures (refer to Section 5 on Policy, Legal and Administrative Framework for details).

2.1 Methodology and ESIA Resourcing

2.2 Methodology
2.2.1 Overview
The following methodologies for collecting baseline information for the Project have been formulated on the basis of:

- Relevant documents, including World Bank directives, guidelines and other documents; relevant federal, regional and local legislation, policy papers and guidelines of the Rwandan and Rwandese land administration, resettlement, cultural and environment sectors;

- Available ELECTROGAZ survey plans (complete with exact transmission line bend points, tower benchmarks, and substations, etc.);

- The EIA report also makes use of the socio-economic information collected for the ARAP investigation. The locations of the alternative routes are shown in Figure 2.

Collection of baseline information relied on both primary and secondary sources, and included an environmental factors survey for discussion with selected samples of local residents and project affected persons (PAPs) who have knowledge of the local ecosystem and its exploitation by traditional methods.

2.2.1 Baseline Assessment
Baseline data was first collected from secondary data however before undertaking field work to collect primary data.
Data collected included information on; physical environment: geology; topography; soils; climate and meteorology; surface and ground water hydrology; biological environment: flora; fauna; rare or endangered species; sensitive habitats, including significant natural sites etc.; species of commercial importance; species with potential to become nuisances, vectors or dangerous and socio-cultural environment: population, land use; planned development activities; community structure; employment; distribution of income, goods and services; recreation; public health and safety.

2.2.2 Project Alternatives
The EIA analysed the various project alternatives available to achieve this project’s objectives but with the least adverse environmental impacts. The alternatives considered included alternative routes for the lines and the “No Project” alternative.

2.2.3 Public Consultation
During the scoping process, a stakeholder mapping exercises was undertaken to identify Interested and Affected Parties (I&AP) to the project. The mapping exercise was conducted simultaneously with the scoping exercise. The exercise identified all the stakeholders in the area.

A screening exercise was undertaken to focus on consultations with only those stakeholders that would be impacted by the project.

The stakeholders’ consultation also helped in highlighting the serious socio-economic and environmental concerns and impacts that could arise from the project and was instrumental in helping to come up with feasible mitigation measures.

2.2.4 Impact Prediction and Evaluation
Various methods and techniques were applied in impact identification, prediction and evaluation. The EA identified and analysed potential impacts linking these with specific project activities and phase. First the task was to consider both positive and negative impacts of the project. While considering the impacts, the study examined them in light of their characteristics i.e. 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.
3.0 PROJECT AREA DESCRIPTION AND BASELINE DATA

This chapter gives background information of the project area as a whole then narrows down to project specific site in terms of its location, administrative set-up, climate, settlement patterns, and the major environment attributes, which will play a crucial role in the identification and development of the project.

This section begins with the relevant information pertinent to this project in terms of Gasabo District which is where the transmission lines will be sited.

3.1 Geographical Location

Gasabo District is one of three districts of Kigali City and forms one of 30 such entities that are in Rwanda after the administrative reform of February 2006. With 15 sectors, 73 cells and 501 villages (imidugudu), it follows from the merger of the former districts of Gasabo, Kacyiru, Gisozi, Kabuga (3 six sectors namely Gasogi, and Ndera Rusororo) Kanombe (Masoro sector), Buliza (Cyunga sectors, Jabana, Kabuye and Ngirya) Gasabo (Bumbogo sectors, Gasabo, Gacaca I & II, Gikomero, Gishaka, Jurwe Karama, Kayanga, Nduba, Sha, Shango, and Rubungo Rutunga).

It is located northeast of the City of Kigali, the Rwandan capital. It is bounded on the south by the district Kicukiro; to the north by the district and Rulindo Gicumbi; to the east by the districts of Rwamagana and west by the district Nyarugenge. It has an area of 429.2066 km², and currently has 410 485 inhabitants.

Due to this configuration, the District is a duality between rural and urban areas. The rural area accounts for more than 90% of the District, with a population representing 66%, which involves more effort in the field of urbanization and land use.
3.2 Relief
The terrain of Gasabo district is dominated by mountains of altitude (1800 m), especially in rural areas. Gasabo District is also surrounded by watersheds and valleys. The District has small rivers in the valleys of areas with high hills. The only river worth mentioning in name is the Nyabugogo River which has its source in Lake Muhazi and drains into the river Nyabarongo after crossing wetland valley approximately 50 kilometres long and 1000 m wide.

Figure 2 Relief of some sections where the routes will traverse

3.3 Flora and fauna
Natural vegetation is almost non existent in Gasabo District. It was gradually replaced by artificial vegetation whose presence is the dominant eucalyptus tree species. However, some wild plants are found in the marshes and in small corners of uncultivated land. Depressions are occupied by natural vegetation composed of Typha fringe of papyrus and Cyperus latifolius.

In the hills, the natural vegetation there is especially herbs like hyparenia spp (imikenke) and eragnostis (inshinge). There are also various shrubs and savanna trees and the most dominant types are Albizia gummifera (imisebeya) mimosacées, including Acacia abyssinica (iminyinya).
Figure 3. Vegetation type in some of the sections earmarked for ROW

As for wildlife, Gasabo district is characterized by a diversity of species of birds and small wild animals familiar to the type of vegetation in the District as well as fish species compatible with the aquatic environment of Lake Muhazi (tilapia, barbus, Clarias galiepunus, common carp, haprochromis,).

3.4 Climatic zones

Gasabo District has four seasons: two rainy seasons and two dry seasons alternately distributed as follows:

- A short dry season: December, January, February
- A great rainy season: March, April, May
- A long dry season: June, July, August, September
- A small rainy season: October, November

The four seasons are the common features of climate in the country. The seasons are irregular and hence the boundary cannot be correctly predicted. The rainy season may extend into the dry season and vice versa. The average temperature is 22 ° C and a rainfall between 900 and 1150 mm of annually is experienced.

3.5 Demographics

Table 2: Population of Gasabo District by sector

<table>
<thead>
<tr>
<th>Number of sector</th>
<th>Population 2007</th>
<th>Area (Km²)</th>
<th>Density (Km²) 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bumbogo</td>
<td>21289</td>
<td>60,0727</td>
<td>354</td>
</tr>
<tr>
<td>Gatsata</td>
<td>33515</td>
<td>6,0156</td>
<td>5571</td>
</tr>
<tr>
<td>Gikomero</td>
<td>16872</td>
<td>34,8095</td>
<td>485</td>
</tr>
<tr>
<td>Gisozi</td>
<td>18452</td>
<td>8,4834</td>
<td>2175</td>
</tr>
<tr>
<td>Jabana</td>
<td>27734</td>
<td>36,4359</td>
<td>761</td>
</tr>
<tr>
<td>Jali</td>
<td>26509</td>
<td>37,4999</td>
<td>707</td>
</tr>
<tr>
<td>Kacyiru</td>
<td>23648</td>
<td>5,8119</td>
<td>4069</td>
</tr>
<tr>
<td>Kimihurura</td>
<td>35741</td>
<td>4,8758</td>
<td>7330</td>
</tr>
<tr>
<td>Kimironko</td>
<td>44918</td>
<td>11,4356</td>
<td>3928</td>
</tr>
<tr>
<td>Kinyinya</td>
<td>39649</td>
<td>24,5943</td>
<td>1612</td>
</tr>
<tr>
<td>Ndera</td>
<td>23387</td>
<td>50,1650</td>
<td>466</td>
</tr>
<tr>
<td>Nduba</td>
<td>17983</td>
<td>46,7201</td>
<td>385</td>
</tr>
<tr>
<td>Remera</td>
<td>26925</td>
<td>7,0307</td>
<td>3830</td>
</tr>
<tr>
<td>Rusororo</td>
<td>30412</td>
<td>52,4736</td>
<td>580</td>
</tr>
</tbody>
</table>
The Sectors of Gatsata, Kimirunko, Kimihurura and Kacyiru have a higher density compared to other sectors are those in both urban and predominantly spontaneous neighbourhood. Furthermore, data from the census and the Integrated Household Survey of the District show that the population is predominantly young Gasabo with a proportion of persons under 45 years is about 80% of this result that it is the younger who migrate to urban areas.

3.6 Economic Activities

3.6.1 Agriculture

Agricultural activity is developed in the 8 rural areas of Gasabo. However with the expansion of the City there will be more and more loss in agricultural space. The land is relatively fertile and crops such as tomatoes, soybeans, sunflower, corn, coffee and vegetables have a comparative advantage for various reasons, including improved techniques for the production of tomato popularized by SORWATOM; proximity to the City of Kigali, which offers opportunities for vegetables; the proximity to factories washing coffee in Ndera.

The priority crops are cassava, beans, sorghum and bananas. In small wetlands, there are vegetables such as cabbage, onions, tomatoes, eggplants and other legumes. The promotion of modern agriculture is not yet widespread in all sectors; only the introduction of radical terraces to prevent erosion is in progress. People's participation in this activity is estimated at 75%.

In the "Urban", there are small agricultural activities like growing vegetables carried by individuals in some portions of the wetlands. However, there are some marshes where you can organize and modernize agriculture with a few adjustments.

<table>
<thead>
<tr>
<th>Rutunga</th>
<th>23451</th>
<th>42,7826</th>
<th>548</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>410485</td>
<td>429,2066</td>
<td>957</td>
</tr>
</tbody>
</table>

**Source: District Development Plan Gasabo**
3.6.2 Energy
The main sources of energy used for cooking are: electricity gas, oil, firewood, charcoal and agricultural residues. Charcoal is the energy source most used in cooking in urban areas. This use is among the direct causes of environmental degradation in the country in general and the District of Gasabo in particular urging or forcing peasants to engage in disorderly exploitation of forests. For lighting, energy sources used are ELECTROGAZ electricity, solar panels, generators, lamp oil, lanterns, candles and wood.

![Figure 5. Electricity lines in Gasabo district](image)

3.7 Housing and Settlement
The housing in the District of Gasabo is characterized by four different types: the well-developed urban area, urban areas in settlements, villages (imidugudu) in rural areas and houses scattered in rural areas.

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>Areas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Imidugudu (New Villages)</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Old villages (insiisiro)</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Dispersed Households</td>
<td>28%</td>
<td>89%</td>
</tr>
<tr>
<td>Formal Settlements</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>Informal Settlement</td>
<td>56%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

*Source: EICV 2006*
Figure 6. Type of settlements in sections where the lines will pass.
4.0 PROJECT ALTERNATIVES

This chapter describe and examine the various alternatives available for the project. Alternatives examined during the study included site and route alternatives in project location particularly with regards to location based impacts and land use conflicts was assessed, and finally a No Project alternative was also assessed to determine the impact of this No Project Scenario.

4.1 Preferred Transmission Routes

An analysis of alternative routes was undertaken through mapping and involvement of all the stakeholders in this selection process. At the end of this process, 3 routes were selected among the possible ones, based on the following general siting criteria (which are related to economic and environmental values):

1. Avoidance of restricted zones;
2. Distance from zones of landscape value;
3. Distance from mountain edges, preference for valley routings;
4. Distance from urban areas;
5. Route with constant slope;
6. Minimisation of infrastructure crossing (e.g. highways, railways, other power lines, etc.).

The following 3 routes were agreed upon after considerations of the above points.

1. 15kV double system line from Birembo to Rubungo
2. 15kV double system from Birembo to Kibagabaga and a 15kv single circuit from Kibagabaga to Remera
3. 15kV single circuit line from Birembo to Deutsche-Welle.

The annex section 1 of this report contains the map of the distribution lines for this project.

4.2 Rejected Routes

The following routes were considered but rejected mainly because they would cut across highly densely populated areas and farmlands hence not only exacerbating the adverse impacts but increasing the number of resettlement and relocation cases. They are;

1. Single circuit distribution line from Birembo substation to Rubungo substation and must be mounted on steel lattice tower. Additional will be the Rubungo to Kimironko line and Rubungo to Gasogi line.
2. Single circuit distribution line from Birembo substation to Remera substation must be mounted on steel lattice tower. Additional will be the Remera to Kibagabaga line and Remera to Poste Stade 1 line.

4.3 No Project Alternatives

A No Project 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 populace of Kigali which would have in turn spurred and contributed to economic growth.
5.0 LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

The chapter of the study reviews the relevant legal and institutional arrangements that would hinder or guide the development of the project in line with the national and international laws. Rwanda being a signatory to various international conventions and laws, it’s important that national projects are in line with these laws and as such some of the relevant international conventions are reviewed in this chapter.

5.1 Organic Law on Environment Protection and Management

The law sets out the general legal framework for environment protection and management in Rwanda. It also constitutes environment as a one of the priority concerns of the Government of Rwanda. Under the fundamental principle on national environmental protection policy develops national strategies, plans and programs, aiming at ensuring the conservation and use of sustainable environmental resources.

The framework of the law on the protection and management of natural resources centres on avoiding and reducing the disastrous consequences on environment. It measures result from an environmental evaluation of policies, programs and projects, aimed at preventing the consequences of such activities.

The principle of sustainability of environment and equity among generation emphasizes human beings at the core of sustainable development. They therefore, have a right to a healthy and productive life in harmony with nature. They must so as to equitably meet the needs of the present and future generation.

The protection and management of environment is currently registered in the environmental organic law that has been published in the official Rwanda newspaper in May 1st 2005.

MINITERE which is the ministry responsible for the environment under the article 65 puts the in place Rwanda Environment Management Authority (REMA) which is the institution now charged with the responsibility of ensuring environmental protection by demanding for EIA studies to be undertaken before projects are executed.

The present organic law has the following objectives:

- To protect human and natural environment;
- To establish fundamental principles of management and protection of environment against all forms of degradation so as to develop natural resources and to fight all kinds of pollutions and nuisances;
- To improve the living conditions of the population while preserving ecosystems and available resources;
- To ensure sustainable environment and resources as well as rational and sustainable use of resources, taking into account the equality between the present and future generations;
- To guarantee to all Rwandans an economically viable, ecologically rational and socially acceptable development;
- To establish the precaution principle in order to reduce the negative effects on Environment and ensure the rehabilitation of degraded areas.
Chapter IV of the Organic Law Article 65 clearly calls for the need to subject projects to mandatory Environmental Impact Assessment.

Article 3: States that every person has the duty to protect safeguard and promote environment. The State shall protect, conserve and manage the environment.

Article 65: Further specifies that every project shall be subjected to environmental impact assessment prior to its commencement. It shall be the same for programs, plans and policies likely to affect the environment. Specific details of projects referred to in this Article shall be spelt out by the order of the Minister in charge of environment.

**Article 66:**

The Environmental Impact Assessment (EIA) shall include at least the following:

- A brief description of the project and its variants.
- Analysis of direct and indirect foreseeable consequences on the environment.
- Analysis of the initial state of the environment.
- Measures envisaged reducing, preventing or compensating for the consequences.
- Reasons for the choice.
- A summary of requisitions from clause1 to 5 of this article;
- A definition of the evaluation and monitoring methods used regularly and environmental indicators before (initial state), during and after implementation of the project or, as the case may be, at the final evaluation stage of the project;
- A financial evaluation of measures recommended preventing, reducing or compensating for the negative effects of the project on the environment and measures for regular monitoring and control of relevant environmental indicators.

**Article 67:**

States that the analysis and approval of environmental impact assessments is done by the Rwanda Environmental Protection Authority or any other person given a written authorisation. The project promoter shall pay a levy which shall be assessed from the amount invested or to be invested, excluding the amount of operating cost. The assessment of this levy shall be fixed by law establishing the National Fund for the Environment. The impact study shall be done at the expense and under the responsibility of the promoter.

The Organic Law also puts in place the National Fund of the Environment in Rwanda (FONERWA). The composition, the working and the assignments of these institutions will be determined by particular laws.

The article 66 of the Organic Law on the environment specifies that it has created, to the level of the Provinces, of the City of Kigali, of the Districts, the Cities, the Sectors and the Cells, Committees responsible for the conservation and the protection of the environment. The composition, the working and the assignments of these committees will be determined by Decree of the prime minister.

**Title IV of Article 67 of the Organic Law requires that the execution of Policies, Plans and Projects must be subject to mandatory EIA studies to identify the potential adverse impacts they could have on the environment.**

Further to this through the Ministerial Decree, a list of all the project that must be subjected to mandatory EIA has been put in place under article 68 of the Organic Law. Article 30 further stipulates that works of public or private construction as roads, dams etc must be subjected to EIA studies.
Article 69 of the Organic Law further specifies that the EIA studies undertaken must be submitted to REMA for approval and the studies must be undertaken at the proponent’s expense.

**The Environmental Impact Assessment Regulations, 2007**

REMA has now developed the EIA regulations which provide a guideline and requirements for EIA in Rwanda. According to these new regulations Sub Article 1 makes it mandatory for all the projects listed under schedule I to be subjected to a full scale EIA. The Sub Article further states that:

Sub Article 1) 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.

Sub Article 2) states Any project listed under Impact Level III of Schedule I to these Regulations shall require a full environmental impact assessment by the preparation of an environmental impact report, unless the Authority refuses permission. The construction of a substation is in this category and thus must be subjected to full scale EIA.

**Public Hearing Process**

Article 47: The Authority shall on receipt of the developer’s environmental impact report, arrange for a public hearing to take place within twenty (20) working days from the first day of public notification, at which relevant Lead Agencies, local governments, civil societies and concerned members of the public may comment on the environmental impact report and express views on impact of the proposed development. The Authority shall cover all costs incidental to the public hearing.

Article 48: All projects classified under Impact Level III shall be subjected to a public hearing prior to the decision-making process.

**5.2 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:
(a) Have affordable and reliable energy supplies country wide;
(b) 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;
(c) Enhance the development and utilisation of indigenous and renewable energy sources and technologies,
(d) Adequately take into account environmental considerations for all energy activities,
(e) Increase energy efficiency and conservation in all sectors; and
(f) Increase energy education and build gender-balanced capacity in energy planning, implementation and monitoring.

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.

**Short and medium term policy priority actions**

The priority for Rwanda is to implement projects now, to overcome the current electricity crisis, to prevent the next electricity crisis, to tackle proactively the wood crisis, to begin to provide greater access to modern energy and to reduce reliance on petroleum products due to the oil price crisis. Without implementation further capacity building and studies will have no value.

Our management and institutional capacity has to continue to progress if these projects are to be delivered effectively and efficiently. This will require further external support and guidance.

Several policy actions will be implemented in order to achieve the broad and specific objectives of this energy policy. Strategic financial interventions required to move forward the policy priority actions are indicated alongside the proposed actions.

**Priority policy actions**

1. Meet the crisis of blackouts caused by delayed investment and drought
2. Provide economic power by developing the use of Lake Kivu methane, and by bringing on line more hydro power.
3. Enhance overall electrical infrastructure to meet demand growth and supply quality needs – generation, transmission and major distribution construction and rehabilitation.
4. Deliver a programme of rural electrification on the basis of enhanced distribution networks, micro hydro, and solar power.
5. Implement a wood and charcoal efficiency and substitution strategy to counter the deforestation crisis.
6. Continue steady progress to a viable electricity and gas sector, consistent with meeting social needs.
7. Commence utilisation of Kivu gas for other than power generation.

5.3 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.

The following are the main obstacles that hinder the efficient management of land in Rwanda, necessitating the establishment of a national land policy that would guide the essential land reforms:

- Strong pressure on the already spatially limited land resources by a rapidly growing population;
- Domination of the agricultural sector which lacks any specialization in terms of human resources and equipment, and lack of alternative concrete and realistic options that would reduce the pressure on land resource;
- A land tenure system dominated by customary law which favours land fragmentation, a practice which reduces further the size of the family farms which are already below the threshold of the average surface area that is economically viable;
- A considerable number of landless persons who have to be resettled at all costs;
- Scattered farming plots that are difficult to manage due to the scattered mode of human settlement;
- Lack of a reliable land registration system that would guarantee the security of land tenure;
- Weak and inadequate existing methods of land-use planning and land improvement (outline of land potential, land use and land development; reliable methods of soil and water conservation);
- Disorderly and fraudulent land transactions, necessitating the establishment of regulations that would enable the authorities to give to the land a recognised market value which brings considerable profit to the Government Treasury;
- Unplanned use of marshlands which, in spite of their good agricultural soil, cannot be wholly recovered for agricultural purposes, in view of the following factors:
  - Abundance of water which is necessary as a useful water reservoir;
  - The soil make-up, which does not lend itself easily to the current cultivation methods;
  - The biotic environment and biodiversity which should be protected at all costs;
  - The obvious poor coordination among various institutions which use with land to support their activities;

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).

On the whole, Rwanda’s land tenure system requires comprehensive reforms, from the elaboration of a national land policy to the establishment of a land law and land code, which will guide the judicious use and management of the land resource for the economy to be able to take off in such a way that our country is freed from the grips of poverty.

In the perspective of the harmonious and sustainable development, the overall objective of the national land policy of Rwanda is to establish a land tenure system that guarantees tenure security for all Rwandans and give guidance to the necessary land reforms with a view to good management and rational use of national land resources.

Specific Objectives
• To put in place mechanisms which guarantee land tenure security to land users for the promotion of investments in land.
• To promote good allocation of land in order to enhance rational use of land resources according to their capacity.
• To avoid the splitting up of plots and promote their consolidation in order to bring about economically viable production.
• To establish mechanisms which facilitate giving land its productive value in order to promote the country’s socio-economic development.
• To focus land management towards more viable and sustainable production by choosing reliable and time-tested methods of land development.
• To develop actions that protects land resources from the various effects of land degradation.
• To establish institutional land administration arrangements that enable land to have value in the market economy.
• To promote research and continuous education of the public in all aspects of duties and obligations with regard to land tenure, land management and land transactions.
• To establish order and discipline in the allocation of land and land transactions in order to control and/or curb pressure on land, inappropriate development, land speculation and land trafficking.
• To promote the involvement and sensitization of the public at all levels in order to infuse land use practices that are favourable to environmental protection and good land management.
• To promote conservation and sustainable use of wetlands.

Land tenure may be considered as a set of modes or procedures of land acquisition and ownership. It is, in other words, a combination of rules that define the modes of access, use and control of land and its renewable natural resources. It is therefore a relationship between men or social groups and land or its underlying resources.

Land tenure has a multidisciplinary dimension that includes social, technical, economical, institutional, legal and political aspects. Debates on land issues must deal with various aspects of the environment, including the vision of space and nature, forms of land ownership, the role of the government, etc.

In Rwanda, there are currently two modes of land acquisition, namely acquisition according to customary law or conceptions, and acquisition according to the rules of the written law.

According to custom, land ownership is held by whoever occupies the land first. This rule has always been respected in our society. However, in modern times, land acquisition by occupation has become obsolete.
since all vacant land belongs to the State. Likewise, the provisions of the decree-law No. 09/76 of 4th March 1976, article 1, stipulate that ‘all land not held under the written law and affected or not by customary law or land occupation belongs to the State’.

Customarily, land rights are passed on from father to son through inheritance. Girls are excluded from inheritance of the family land from the father. Concerning inheritance rights of widows, the custom merely gives them the right to use the land that belonged to their deceased husbands.

In its original customary conception, land was owned collectively. Any disposal of land was therefore inconceivable, since such land was considered as family property that belonged to the ancestors, as well as to present and future generations.

With the introduction of the subdivision of land into individual plots due to successive inheritance procedures, each family owner of a plot of land was considered as the real owner of the plot, having the right to dispose of it as it wishes. However, Article 2 of the decree-law No. 09/76 of 4th March 1976 stipulates that nobody may sell off his land rights except with the written authorization of the Minister of Lands upon the recommendation of the Municipal Council where the land is located.

In actual fact, ownership through prescription originates from the written law since traditionally, title deeds were unheard of. Rwandans consider that once a right has been acquired or recognized, even customarily, it is indefeasible. This is why the many existing landless people, not having received any new land, continue to feel cheated and left out because they have no right over the land which they owned customarily over 30 years ago, since the law has fixed the time limit of acquisition by prescription to 10 years.

Method of acquisition through written law

- Tenancy contracts of plots for building purposes for a 3-year period in urban areas.
- Long lease contracts of land for agricultural purposes for a period of 15 years or more in rural areas.
- Free assignment contracts in both rural and urban areas to natural or legal persons for social activities with real impact on the welfare of the people.
- Sale contracts and title deeds for plots that are built in urban areas. This is a system of land tenure by urban residents who first lease plots with the contractual obligation of developing them. The Ministry of Lands delivers the title deeds after confirming that the plots have been developed.
- Right of access: mode of land acquisition which is common for public institutions.

Apart from the above-mentioned different modes of land acquisition and land ownership, there is the case of the landless people who live in rural areas and who must live from farming. These are mostly the refugees of 1959 who were forced into exile for political reasons and left their land behind. These same refugees have now returned to their country and find themselves landless. They cannot claim back their previously owned land which has been occupied by other Rwandans who remained in the country, because the Arusha Peace Accords fixed the time limit for acquisition by prescription to 10 years.

5.4. International Legislations

Rwanda is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant development partners in this project are the World Bank and a number of United Nations agencies.
5.4.1 World Bank Environment and Social Safeguards Policy

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 EIA requirements through the Environmental Assessment Sourcebook (World Bank 1994) which includes sectoral guidelines. The World Bank EIA 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 that 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.

5.4.2 Environment

**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:** An EIA is 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.

**OP/BP 4.04 Natural Habitats (June 2001)**

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.
5.4.3 Rural Development

**OP 4.36 Forests (November 2002)**
Aims to reduce deforestation and enhance, through sustainable economic development, the environmental and social contribution of forests. The Bank does not support projects which involve significant conversion or degradation of critical forest areas or related critical natural habitats.

5.4.4 Social Development

**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.

**OP 4.10 Indigenous Peoples (July 2005)**
Indigenous peoples in particular geographical areas are identified by having: a close attachment to ancestral territories and to the natural resources in these areas; self-identification and identification by others as members of a distinct cultural group; an indigenous language, often different from the natural language; presence of customary social and political institutions; and primarily subsistence-oriented production.

The Bank’s objective is to ensure that indigenous peoples do not suffer adverse effects from Bank financed projects and that they receive culturally compatible social and economic benefits. Effectively the World Bank requires a project to develop a program for addressing issues based on the informed participation of the indigenous people themselves. Any project that affects indigenous peoples is expected to include components or provisions that incorporate an “Indigenous Peoples Development Plan”.

**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 living 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.

**OP 17.50 Disclosures**
This Policy details the Bank’s requirements for making operational information available to the public. The Bank reaffirms its recognition and endorsement of the fundamental importance of transparency and accountability to the development process. In addition, timely dissemination of information to local groups
affected by the projects and programs supported by the Bank, including nongovernmental organizations, is 
essential for the effective implementation and sustainability of projects.

5.5 International Agreements

Rwanda has ratified the following international conventions and protocols pertaining to the environment and which are of relevance to the Project:

- United Nations Framework Convention on Climate Change, 1992
- Convention on Biological Diversity, 5 June 1992
- Convention on the Protection of World Cultural and Natural Heritage ratified 1997.
- Ramsar (wetlands) Convention

The ratified treaties become part of the national laws and their provisions prevail in case of contradictions with the provisions of the national laws. The institutions responsible for the implementation and monitoring compliance to both national and international agreements include:
6.0 PROJECT DESCRIPTION

The Urgent Electricity Rehabilitation Project (UERP) through the Project Coordinating Unit (PCU) is planning to rehabilitate the existing electricity distribution network as well as erecting new transmission and distribution lines within the city of Kigali all aimed at increasing access of electricity to the residents of the city. This project includes the construction of transmission and distribution towers along 5 routes that are described in the section below. 4 mini substations (cabins) will also be constructed at different points in the routing and will be used to step down the electricity from the Medium Voltage to Low Voltage before distributing to the consumers.

6.1 Proposed Activities

The project activities can be classified in the following stages;

1. Design and Planning Phase
2. Construction Phase
3. Post Construction Phase (Operations)
4. Decommission Phase

6.1.1 Design and Planning Phase

During the design phase of this project, the expected activities some of which have already occurred include:

1. Site Selection and Routing

The identification of new transmission and distribution routes require adequate survey and mapping to secure that the eventual transmission and distribution network routing avoids sensitive ecosystems, densely populated areas that would cause immense land acquisition and resettlement. ELECTROGAZ’s Land Surveyors have identified the following routes that will be the path for locating the network.

2. Land Acquisition /Compensation

All the routes identified for the distribution and transmission network including the location for the 4 cabins and creation of Right of Way (ROW) which will fall along land owned by the general public will be acquired in accordance with the Resettlement Policy Framework (RPF) and a separate Resettlement Action Plan (RAP) has been prepared addressing the compensation related concerns of the project.

4 mini sub stations or “cabins” will also be located at different points within the network lines and the construction of these “mini” sub stations will require land acquisition to erect the housing unit.

6.1.2 Construction Phase

During the construction phase, the following key activities are expected to occur;

1. Horizontal and Vertical Clearances

Clearing of the path where the transmission and distribution infrastructure will pass is the initial activity that will occur during the construction phase. This is in order to create the vertical and horizontal clearance required when constructing electricity transmission lines. After the PAPs identified in the ARAP are compensated, all the obstacles along this path will be cleared as required. The clearing process will follow the international dimension in installation of distribution and transmission networks specified below. The horizontal and vertical clearances shall be according to VDE 0210 and as noted in the table below.
Table 4. Clearance dimensions

<table>
<thead>
<tr>
<th></th>
<th>&lt; 36 kV</th>
<th>132 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain available to pedestrians only [m]</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Roads and thoroughfares [m]</td>
<td>8.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Railways [m]</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Power supply circuits [m]</td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Communication circuits [m]</td>
<td>4.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

2. **Provision of Site Access**

The Contractor shall provide and maintain all access from the main highways to the transmission and distribution line routes during erection as required. However, no continuous track for maintenance within the right of way, along the entire line route is foreseen for MV lines.

For overhead lines above 60 kV a track for maintenance shall be provided within the right-of-way. The track shall have a minimum width of 3 m. All vegetation within the track shall be cut down to ground level, all tree stumps and roots grubbed and the track left in a condition suitable for the passage of normal line maintenance vehicles and equipment. Access roads shall be constructed in such a 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 location.

3. **Clearing of Right-of-Way**

An electric line right-of-way (ROW) is a strip of land that an electric utility uses to construct, maintain, repair or replace an overhead or underground power line. The ROW allows the utility to provide clearance from trees, buildings and other structures that could interfere with the line installation, maintenance and operation. It usually is 10 to 20 feet wide unless terrain, vegetation, or unusual construction conditions require a wider easement. This ROW is obtained through an easement from the property owner.

To ensure safe and reliable power, it is important to keep electric distribution lines free of any kind of interference. This means that tall-growing trees should not be placed near to or under existing electric distribution lines. ELECTROGAZ will maintain a regular trimming schedule to keep interference from trees to a minimum.

The Contractor shall clear the right-of-way, fell any vegetation and dispose of waste material along the entire length of a transmission line. The transmission line right-of-way is 15 meters wide for the 30 kV lines symmetrical about the centreline.

All trees, snags, stumps, shrubbery, ant hills and undergrowth exceeding 2 meters in height as measured on the downhill site shall be cut to a maximum stump of 20 cm along the right-of-way.

All trees adjacent to the right-of-way which could fall across the conductors or against the towers shall be cut, this criterion shall apply with the conductors displaced 53° from the vertical in either direction.

In addition to the clearing required on the right-of-way all trees, bush stumps and snags to each tower location shall be cut, regardless of height and clearance to conductor to a maximum stump of 25 cm, in an area of 8 by 8 meters around a 30 kV tower.

In some cases, electric distribution lines are built along wooded areas or near existing trees. This is often the case when electric distribution lines are built along roadways or at the rear of residential lots. Therefore, trees in these areas may need to be trimmed and sometimes removed.
4. Excavation Works

After the transmission and distribution network path has been cleared as specified above, there will be excavation related works related to construction of access and maintenance roads, excavations works for the 4 mini substations and for creating the foundations for erecting the towers.

The excavation works for the towers and 4 cabins will be undertaken using simple hand implements and through manual labour. Because the areas for the tower foundations are small in size, local labourers will use forks, jembes, pick axes etc to excavate.

Excavation and grading works for the access roads will be done using motorised equipment and machinery.

5. Construction of Foundation

Foundations shall be designed for all specified tower types, for any type of soil to be found, both in dry and fully submerged conditions, and for rock. Tower foundations shall normally be of reinforced or mass concrete type. Concrete foundations shall be the standard foundation for the poles and towers. For organic and marshy soil and for montmorillonite or "Cotton" soil, either cast-in-situ or pre-cast concrete footings shall be installed. Excavated material shall be removed and replaced with approved backfill. The Contractor shall carry out the excavation necessary for the approved foundation type. Excavation shall be confined to a minimum working area consistent with efficient operations. The area for the foundation is 225m².

The Contractor shall perform all dewatering required to construct the foundations and to keep the foundation base dry. Excavation in areas of unstable soil conditions shall be adequately protected by sufficient shoring or soil stabilisation. The design of the foundation or the method of installation will be modified if such protection appears to be impractical.

Rock excavation shall include all materials encountered which cannot be removed except by blasting, barraging, or wedging, whether done by either manual or pneumatic means. Boulders and detached pieces of solid rock exceeding 0.5 cubic meter which will have to be removed from natural position within the tower foundation shall also be classified as rock excavation.

6. Erection of Towers

Tower structures that will be erected shall be of the self supporting lattice-type steel frame with square bases. The general outlines of the towers may be varied from those indicated on the drawings below but the general dimensions, phase spacing, clearances, and the configuration of the conductors and earth wire must be approved by the Engineer. They shall be designed as single-circuit type for the conductors and earth wires specified and the voltages designated in the tender documents. Approximately 106 towers will be erected in this project.

The Contractor shall generally be guided by the provision of VDE 0210 for lines up to a rated voltage of 45kV, above EN50341 shall be used in the design of the tower structures.

7. Types of Towers

Where the utilisable heights of the standard body of the basic towers have been found insufficient, the required heights should be obtained by the addition of body extensions.

The height of the standard body of a tower will also be reduced or increased by leg extensions to compensate for variations in ground topography. During staking of tower positions at site the Contractor shall study if additional leg extensions will be required. The tower foundation installation shall include tower
site preparations, levelling, excavation, foundation placement measurements, assembly and placement of the approved foundation, backfill, compacting and cleanup.

The Contractor shall remove all vegetation and other debris from the tower site which will interfere with the operations. Tower preparation shall be done in a manner which will prevent revision of the footing designs or requirements of leg or body extensions.

Figure 7. Similar Type of Towers being installed in a different project.

Figure 8. An existing tower similar to what will be erected in this project

8. Anti-climbing devices
Anti-climbing devices shall be provided on all towers. Each tower shall be fitted with anti-climbing device fixed at a height of between 2 and 4 meters above ground. The anti-climbing device shall be formed by stringing on to projecting steel supporting numbers, stants of $12^{1/2}$ gauge, two strained double spiked, galvanised steel barbed wire or as otherwise approved, at not more than 100 mm centres starting not more than 100 mm from the tower, this overhang distance being maintained at corners. The inner faces of the tower shall also be fitted with the same device. Mounting holes for danger and number plates, anti-climbing and earthing devices, etc., shall be provided on each tower. The anti-climbing device shall have a gate on the side of the step bolts.
9. Rehabilitation and Extension Works
Since modifications in the present network and repair works on existing lines and switchgear equipment are foreseen, the contractor will inspect in a particular way all substations and lines for which rehabilitation and extension works are called for. This inspection is deemed absolutely necessary since the rehabilitation and extension will have to be performed on equipment in operation, in certain cases, since nearly 30 years back.

10. Existing Low Voltage Lines
The existing low voltage networks consist mainly of wooden pole or concrete construction and were originally built up to 20 years ago. Some of the poles are damaged and need to be replaced; also some existing insulators are missing or need replacement. Different types of conductors are used simultaneously: aluminium, copper and stranded conductors. In many cases the cross sectional area of some of these conductors is not sufficient for the actual load. Many bare conductor line shall be replaced by bundled conductor. Rehabilitation shall be done preferably with steel poles, for major angle points and dead end poles. No stay wires shall be used for steel poles. The new LV lines shall be erected on steel poles with low voltage bundled cables.

Figure 9. Existing network that will be rehabilitated.

11. MV/LV Substations” Cabins”
The project will construct 4 MV/LV mini substations or cabins in 4 different sites already identified along the transmission path. These mini substations will step 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.

The construction of these cabins will include the following activities:
- preparation of site
- detailed planning of the civil works
• detailed planning of the electrical equipment
• execution of civil works
• installation of electrical equipment and connection to the MV and LV lines
• installation of small power distribution
• testing and commissioning

6.1.3 Operation and Maintenance Phase
During operation phase the expected activities include, operation and maintenance of the transformers, circuit breakers, circuit switches and capacitors that will have been installed during the construction phase.

1. Line Route (ROW)
A permanent area (40m in width, i.e. 20m clear of the route centre line) of land will be required to accommodate the transmission line, when completed. A parallel strip of land through those sections of the route which pass through vegetation shall be completely cleared. The width of the strip may vary according to the mean height of the vegetation and shall be determined by ensuring that any standing tree would not cause flashover from a conductor deflected up to 45° from the vertical. In determining the flashover clearance and in estimating the mean height of the vegetation due allowance shall be made for seasonal growth. In addition, any tree that may fall in the direction of the overhead line shall be cleared unless located more than 20 m plus the height of the tree clear of the route centre line.

Routine maintenance is carried out along the ROW to ensure the appropriate clearances between towers, conductors and vegetation and other objects are maintained according to the required safety/operation specifications listed above. A 5m wide path along the line route will be required in the absence of a public road. Maintenance is normally carried out twice a year (dependent on site conditions).

2. Substation Maintenance
An ongoing maintenance program will be required for the 4 mini substations. This will involve periodic replacement of coolants/lubricants in the transformers. ELECTROGAZ has indicated that they will no longer use transformers containing PCBs (as commonly used in old equipment) which are toxic to the environment and humans. They also have agreed to a program of replacing old transformers and disposing of any hazardous/toxic materials in accordance with international best practice. Rwanda is a signatory to international conventions on the use and control of hazardous substances (refer to Section 5).

6.2 Project In-Puts, Out-puts and Waste Generated
The proposed project in terms of in-put materials consist of typical construction materials including water for mixing cement, sand, and ballast. These materials will be procured in the local market. The towers, transformers and other electrical equipment will be procured from Europe and shipped by sea to Mombasa port in Kenya and then using ground transport until Kigali.

The wastes that will be generated from this project will mainly be experienced during the construction stage and include;
• Construction material debris like packaging materials, excavated soil, felled trees and scrap metal.
• The trees that will be cleared in order to create the transmission and distribution path will be given back for free to the local community for use.
• The project intends to hold on and time the clearing and excavation process to coincide with harvesting so that crop loss is minimised.
• Construction debris will be disposed in accordance with the regulations and requirements for disposal in Rwanda.

6.3 Project Implementation
In line with similar projects implemented in Rwanda, construction is expected to start after contract signing following international competitive tendering. Pre-construction activities associated with design work include soil investigations and detailed survey of the transmission line route and substation location. The mobilization period includes activities for preparation of material storage areas, camps, water, power, communication and other site facilities.

Construction of the transmission line will then start by preparation of tower foundations, followed by tower erection and conductor stringing. Minor work will be required within the 4 substations at to connect the conductors to the electricity grids. The project is planned to be completed within 18 months from the date of signing of contracts.
7.0 POTENTIAL ADVVERSE PROJECT - ENVIRONMENTAL IMPACTS

The project being a national development agenda in the energy sector has immense benefits that could save the country losses in terms of power rationing and frequent outages. However poor planning of the project could also affect the environment that supports millions of Rwandese through the project potential hazards that the project could pose to the public, pollution of water resources and atmospheric resources.

7.1 Positive Impacts

Positive impacts of these project are various and diverse in nature. They range from employment opportunities, to wealth creation, industrialization, improvement in service delivery to technology transfer and capacity building.

7.1.1 Socio-economic Benefits

The positive impacts are numerous and wide-ranging. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. In the construction phase there will be temporary employment opportunities for local contractors and those who will be employed or supply services and provisions for workers and to contractors. Within the respective project areas there will be opportunities for petty trading and small business service provision along the power line routes.

Significant social benefit will come through employment generation and safer more efficient operation of key services, through provision of electricity access to the villages along the transmission and distribution lines served by the project. Potential beneficiary enterprises affected by and contributing to regional socio-economic transformation will be small industries and other agricultural processing businesses which need electricity.

The long-term direct positive impact is therefore in access to reliable electricity supplies, which will lead to better provision and easier management of goods and services, and enable new facilities for processing and storage. There will be better availability and supply of safe and clean water (which needs pumping); data management with computers is made possible and communication facilities like Internet can be made available, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

Electricity would support overall investment in education and strengthen the ongoing effort of capacity building to overcome critical constraints in the implementation of development programmes. Essential to this effort would be power supply to health facilities for the installation of cold storage facilities for the safe transportation and storage of vaccinations and other vital medications.

As a consequence the quality of life and extent of economic opportunity will be changed for the better. Social and environmental costs, not least in noise and air pollution, associated with existing generator usage will be reduced and there may be a more limited requirement for firewood cutting and collection.
On employment the project expects to employ local casual and skilled labor on-site. This is exclusive of indirectly employed people who will provide support and related services including those trading in foodstuff for the workers on site and construction personnel during the site preparation phase of the project. An estimated total of 200 laborers will be employed in this project over a period of 18 months. At this point it the number of women workers or those directly affected by the project who could be employed is unknown but UERP will advise that this group of persons be given priority.

7.1.2 Environmental Benefits
Increased transmission and distribution of electricity to the Kigali population will ease the pressure on the use of fuel wood that is rampant in the city and in effect would help to conserve the fragile and diminishing forest cover of the country by providing an alternative source of energy.

7.2 Adverse Impacts
Adverse impacts of the proposed distribution and transmission network are those unintended effects of the project that have negative to sustainable development and the environment.

7.2.1 Adverse Impacts
The following adverse impacts are anticipated to occur during the design/planning and construction phase of the project.

1. **Permanent Land Loss/Acquisition**
   In order to construct the substations, create a new transmission and distribution network land will definitely have to be acquired for the “mini” substations, creating the new routes and Right of Way (ROW). The ELECTROGAZ team of surveyors have taken great care to ensure that as little land as possible is acquired by routing the new transmission line away from settled areas. The land to be acquired is required for the following purposes;

2. **Construction of Access Roads**
   The construction of access roads can impact the environment through vegetation clearance and compaction of land and a permanent loss of land. Provided temporary access roads are rehabilitated and existing roads/tracks are used for access to minimise the number of new roads required, the impact is not expected to be significant.

3. **Construction of Right of Way (ROW)**
   Possible interference with or fragmenting of land uses along the ROW. Opening of remote lands to human activities such as settlement, agriculture and vegetation. These effects can be significant if natural areas such as wetlands are affected. The routes identified are well established corridor for transport of goods and the cumulative affects from the Project will not be significant.

4. **Construction of Transmission Line Towers**
   Clearing of vegetation, site compaction and land acquisition has the potential to change land use patterns. However, the area required for each tower (approximately 225m2) and the 40m ROW for the transmission line is not expected to have a major adverse impact on land use patterns.

**Size of Land expected to be Acquired**
Only 2.35ha of land will be permanently lost to the tower bases. This will impact upon a total of 106 persons who own land with each land acquired from the 106 persons being 225m2. The farming of crops will be allowed to continue once tower construction is completed. Disruption to crop production will therefore be experienced for a period of one year only.
<table>
<thead>
<tr>
<th>No of Towers</th>
<th>No. Permanently Affected area (tower bases)</th>
<th>No. Temporarily Affected Hectares (RoW)</th>
<th>No. of Buildings within Residential Households to be Permanently Relocated</th>
<th>Main area of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>106</td>
<td>23,850m2</td>
<td>10 ha</td>
<td>2</td>
<td>ROW</td>
</tr>
</tbody>
</table>

The estimated total cost of compensation for permanent and temporary loss of assets is **RW 154,876,611** or approximately **30,000 USD**.

A compensation plan, detailed budget and implementation plan is included in the ARAP Report which addresses both permanent and temporary loss of assets.

**Mitigation Measures**

Efforts have been made during the identification of the transmission and distribution line routes to ensure that the paths are routed in areas with minimal settlement as possible to avoid land acquisition or displacement. According to the ARAP only 2 structures are along the identified routes and the PAPs will be compensated for the land to be and destroyed structures to pave way for the construction of the sub stations in accordance with the ARAP already prepared.

5. **Establishing/Pegging Final Alignment of Transmission Line**

The first site activities before mobilisation of equipment will be final survey and soil investigations required for final design of line and tower foundations. After determining tower locations, and before commencement of civil works the Contractor will make a terrain reconnaissance which may include rock drilling tests at each tower location. This provides a final opportunity to make minor realignments to the route to avoid any further environmental and social impacts.

6. **Determination of Final Alignment at Survey and design Stages**

- Avoid siting transmission line through protected areas, other environmentally sensitive areas or through mature forest stands.
- Avoid cultural and heritage sites.
- Site transmission line towers on high points of land such that conductors can be strung over valleys thereby eliminating the need to remove trees.
- Locate transmission lines along the base of mountain slopes, rather than down the centre of valleys where large birds could come into contact with conductors.
- Locate transmission lines to avoid running through villages and instead run lines behind villages.
- Consult villagers regarding location of valued village resources and locate transmission lines to avoid these features.
- Situate transmission lines not far away from roads, but behind roadside forested areas so as to minimise visual intrusion.
- Minimise the need to construct new access tracks wherever possible.
- Use existing access roads and tracks wherever available.
- Ensure minimum clearance distances between conductors and ground, waterways, road crossings, buildings, communication systems etc. are incorporated into design.
7. **Permanent Minor Loss and Destruction of vegetation cover/crops**

The route for the 3 transmission lines are generally agricultural land where the following variety of crops including Avocado trees, Tomato, Orange trees, Mango trees, Grevillea, Pepper, Ficus Trees, Eucalyptus Trees, Euphorbia Trees, Flowers, Cassava, Euphorbia live fences, Maracuja, Cactus tree, Lemon trees, Papaya trees among others are present. These crops and trees will inevitably have to be removed to pave way for the construction of the transmission line which includes the “cabins”, towers and creating the Right of Way. However, the area required for each tower (approximately 225m2) and the 40m ROW for the transmission line is not expected to have a major adverse impact on land use patterns.

**Mitigation Measures**

This impact is unavoidable and the crops destroyed will be compensated at full market value before any construction works commence. The compensation and resettlement process is under preparation and an ARAP is being prepared for approval by the bank and REMA/RDB.

- Limit ROW to 40m width, however, the undergrowth in the ROW should be allowed while only leaving a narrow strip to be completely cleared to allow stringing of the line conductors.
- Strictly define ROW clearing activities in the contract specifications and in the Environmental Management Plan (EMP).
- String conductors under tension to minimise potential damage to remaining ground vegetation.

8. **Disruption in Daily Living and Movement Patterns**

It is anticipated that the construction activities will result in some intrusions and disruptions in the daily living and movement patterns of the property owners. Such disruptions are anticipated to be of high significance, but of a short-term nature, and could be caused by the movement of construction vehicles and frequent entries to the properties as a result of the construction activities. This would especially occur in the following cases:

- Where private dwellings and farm worker accommodation are situated near to the proposed transmission lines.

**Mitigation Measures**

The negative social impacts on the living and movement patterns of the property owners during the operation phase of the project are anticipated to be of low significance and of a short duration, as maintenance of the transmission lines would not be undertaken on a daily basis.

9. **Aesthetics and visual related impacts - visual intrusion on the landscape**

Construction works especially when construction the 4 cabins and towers are likely to cause visual related impacts mainly by having activities out of touch with the natural environment in some cases. The tower structures are regarded as being the most visually intrusive component of transmission lines. It is anticipated that the construction of the proposed transmission lines will impose a visual impact on the immediate surrounding area. However, it is proposed that the new transmission line be constructed using CRS towers for the majority of the route. These towers are smaller, less steel-intensive, and less visually intrusive.

**Mitigation Measures**

The frame-like structure of the Transmission line tower presents a low degree of view obstruction as a result of it not being a solid structure, and allows for blending with background colour/patterns of most landscapes. With the use of the CRS towers, the degree of view obstruction will be further reduced as these towers are
less steel-intensive. Shortly after erection, once natural weathering of the steel frame has occurred, the towers are typically marginally shiny and reflective.

10. Water Resources
The construction of towers may interfere with the natural drainage systems and modify flow of surface water, and these changes can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams and other drainage channels.

- The contractor should aim to keep to areas of lower elevation as far as possible, in order to minimize the visual impacts associated with the proposed transmission lines.

11. Disruption of Infrastructure and Services
Without the implementation of appropriate management measures, general services (such as underground pipes, existing distribution lines) could be damaged during the construction period. Any disruption in the services (especially in the local electricity supply should distribution lines be damaged) could potentially have a negative impact on local enterprises (e.g. businesses activities). The nature and extent of the impact will depend on the length of the interruption in general services. The contractor is expected to undertake the rehabilitation works and construction works sometimes in the vicinity of energized lines. This could lead to frequent power interruptions and black outs or even de-energisation of lines.

Mitigation Measures
- The contractor should establish whether there is any infrastructure located near or inside the transmission lines servitude in order to avoid any damage to these during the construction phase.
- Discussions should be held with the relevant parties whose infrastructure could be negatively affected.
- The Local Authorities should be informed of the construction schedules to ensure the minimum disruption of such infrastructure.
- The contractor shall make sure that the Time Schedule provides for adequate advance notice to the Employer as to when shut-downs and/or partial de-energizing of existing equipment are required. The Contractor shall make provisions to be able to shift teams and equipment in order to continue work at other sites if the shut-down cannot be granted for the requested period at the requested dates. He shall be able to resume the works scheduled during shut-downs when they are granted, with a reasonable advance notice. The required interruptions shall be kept to a minimum in terms of length of the shut-down.
- Property owners and nearby communities should be informed well in advance of the construction schedule and any changes to this work schedule.
- Heavy vehicles should make use of the existing access roads on private properties as far as possible. In cases where private roads are to be used, this should be negotiated with the property owner before the construction period commences.
- Construction vehicles should keep to the speed limit and should avoid busy roads, as far as possible.
- Construction activities should not be undertaken after-hours or over weekends.
- Construction should preferably not take place during the harvesting season.
- Property owners should be informed when maintenance of the transmission lines will be undertaken on their properties.

12. Temporary /Limited Fugitive Dust and Noise
Noise resulting from access road and transmission line construction may disturb neighbouring communities and local fauna. This impact will be of a temporary nature only and can be minimised by adopting
appropriate mitigation measures including maintaining equipment and vehicles to manufacturers’ standards and limiting operating times to daylight hours.

Dust will be an issue during the construction of access roads and clearing of vegetation along the ROW, especially since it is recommended that construction take place during the dry season. However, as most construction activities will be undertaken remote from residential areas, the impact is not expected to be major.

Fugitive dust will be localised and may be emitted from construction works e.g., excavations and stock piles of materials including machinery as well as from truck traffic during the construction phase including installation of the towers, construction of access roads and “cabins”. This could cause health related impacts to the communities around and workers in the project site. Dust impacts will be localised and experienced only in the specific areas where the excavation for tower installation and sub station construction will occur.

Vehicular movement on gravel roads could lead to dust pollution in some areas during dry conditions. This impact would be of a short duration during the construction phase. Dust pollution could also take place during maintenance and inspection of the lines. This impact will be localized and of a short duration, and is anticipated to be of low significance.

**Mitigation Measures**

- The dirt roads and exposed construction areas should be moisturised during the dry season to prevent or minimise the fugitive dust emissions.
- Proper location of material stockpiles, especially sand and soil downwind from the commercial, residential and other establishments will be required; Frequent wetting of the stockpile and working area; screening of or providing wind breaks for stockpiles;
- Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry to mitigate dust impacts
- Routing of the lines should preferably not be in close proximity to residential dwellings.
- The construction schedule should be communicated with potentially affected parties.
- Construction timetables should be discussed with property owners.
- Dust-suppression techniques should be used along gravel roads, when required.

13. Wildlife

There are no protected wildlife conservation areas along the alignment so there is likely to be only minor impacts on wildlife during the construction phase as a result of disturbance from movement of people and machinery and loss of habitat from the establishment of the 40m ROW along the length of the route. The proposed route passes mainly through a landscape that has already been greatly disturbed by mixed subsistence farming. Wildlife populations have already been severely impacted both in numbers and diversity.

14. Soil Erosion

During the construction phase, activities involving preparation, stripping, grading, soil removal, backfilling, compacting, disposal of surplus and excavation of the earth surface to pave way for the installation of the “substations” and erection of the towers will lead to localized soil erosion and run off when rains are experienced.

The building of foundations for transmission line towers can potentially exacerbate soil erosion. In addition to the loss of productive land due to soil erosion and land acquisition for tower construction, soils can be impacted as a result of disposal of waste materials, and compaction with heavy machinery used for the establishment of towers and the transmission line. This impact is only expected to occur in the areas where...
excavation works will be carried out either to construct a substation or erect a tower. These impacts can be managed by restricting the use of heavy machinery and vehicles to designated work areas and installing soil protection works in areas sensitive to erosion prior to construction.

**Mitigation Measures**
- To prevent soil erosion during site preparation, disturbed soils should be compacted immediately.
- Wind blown erosion is to be prevented by soil compaction and wetting the ground to prevent rising of soil particles.
- The final site grade in the cabins should include an adequate drainage channel that should facilitate drainage and avoid flooding and pooling. A site drainage plan should be developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.
- Design and construct transmission line towers with staggered legs so as to eliminate the need to excavate a level pad into slopes on which to construct towers.
- Clear only a narrow path to facilitate pulling the nylon rope between towers to string conductors.

**15. Accidents/Hazards**
As a result of the operation of equipment and machinery during construction, there is a likelihood of accidents occurring especially to the workers.

**Mitigation Measures**
- All workers need to be provided with the recognised and appropriate Personal Protective Equipment while at the construction site including gloves, dust masks, boots, goggles, and overalls among others.
- ONLY competent workers and staff should be allowed to operate any machinery and equipment to reduce the incidents of accidents.
- During the construction the project site should be completely sealed off and warning signs erected informing the general public to keep off the construction site when construction is in progress.
- Personal protection gear must be provided and its use made compulsory to all.

**16. Storage and Management of solid waste**
Solid waste materials during the construction include paper wrapping, scrap metal, excavated soils, polythene, plastic and metal will cause pollution and littering of the immediate and localized environment.

**Mitigation Measures**
- The contractor should engage a refuse handling company to remove the wastes from the site to the recommended dumping site.
- Warning signs against littering and dumping within the construction site should be erected by the contractor.
- Excavated top soil should be used as backfill by the contractor.

**7.3 Adverse Impacts**
The following adverse impacts are anticipated to occur during the operation and maintenance phase of the project.

Two universal concerns about transmission line projects are (1) disposal of polychlorinated biphenyls (PCBs) once used in electrical equipment, and (2) possible health impacts of electromagnetic fields (EMF) associated with power transmission lines.
1. Polychlorinated biphenyls (PCBs) Impacts

PCBs used to be widely used as insulators in electrical equipment, including transformers, capacitors, switches, voltage regulators etc. They are of concern because they are powerful toxins, even at low concentrations, and they persist and bio-accumulate in the environment creating adverse health impacts and adverse ecological changes. Intentional PCB production was ended in most countries by 1980 and most transformers and capacitors built after 1980 do not contain PCBs. The major exception to this is transformers and other PCB applications produced since 1980 in the former Soviet Union.

The Basel Convention on Persistent Organic Pollutants lists PCBs as one of 12 target persistent organic pollutants requiring particular attention. This is also reflected in the WB EA Sourcebook update dealing with “Privatisation and Environmental Assessment: Issues and Approaches” (March 1994). This states that the WB considers the use of PCB containing transformers a “red flag”.

Refurbishment of any substations for this Project will need to check whether any such old transformers/equipment will be replaced and appropriate safeguards taken. This is not an issue with new transformers, as they will not contain PCBs.

2. Health Effects of Electromagnetic Fields (EMF) Impacts

Electric and magnetic fields (EMF) are invisible lines of force that surround any electrical device. Power transmission lines, electrical wiring, and electrical equipment all produce EMF. There are many other sources of EMF as well. Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per metre (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T). Most electrical equipment has to be turned on, i.e., current must be flowing, for a magnetic field to be produced. Electric fields are often present even when the equipment is switched off, as long as it remains connected to the source of electric power. In summary, voltage produces an electric field and current produces a magnetic field. The US National Institute of Environmental Health Services and the National Institutes of Health has prepared a comprehensive report on electric and magnetic fields associated with the use of electric power which is available on the World Wide Web at: http://www.niehs.nih.gov/emfrapid.

Electric fields are shielded or weakened by materials that conduct electricity—even materials that conduct poorly, including trees, buildings, and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. However, both electric fields and magnetic fields decrease rapidly as the distance from the source increases. As a precautionary measure, ELECTROGAZ has adopted internationally accepted standard ROW width of 40m along their high voltage transmission lines. All habitation and structures are excluded from the ROW to ensure safety of people and animals from EMFs as well as from direct electric shocks and “flashover”.

With respect to substations, in general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels (http://www.niehs.nih.gov/emfrapid).

Based on a recent in-depth review of extensive scientific literature (World Health Organisation’s International EMF Project), the WHO has concluded that “despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health” (http://www.who.intpeh-emf/WhatsEMF/en.html). The low levels referred to by the WHO are levels expected to be found outside the 40m ROW proposed for the Project. It is concluded therefore that provided the
proposed 40m ROW is enforced along the proposed transmission line route, there will not be any adverse health affects to people along the route.

3. **Accidents at the work place from operating of machineries and equipment by workers**
The potential for accidents and hazards occurring in the “substation” during the operation of the equipment is a likely adverse impact that could lead to loss of life or injury to the workers.

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

**Mitigation Measures**
- All workers entering the construction site must be equipped with PPE including goggles, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meeting the international standards of PPE.
- Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.
- Training given to the employees should be backed by regular on-site training in safety measures.
- Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
- The contactor must develop a workers Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- At tower positions where occasional flooding may cause damage to towers or foundations, protective embankments shall be erected or alternative measures shall be proposed by the Contractor.

4. **Maintaining Access Roads**
The maintenance of access roads can impact the environment through vegetation clearance and compaction of land and a permanent loss of land. Provided temporary access roads are rehabilitated and existing roads/tracks are used for access to minimise the number of new roads required, the impact is not expected to be significant.

**Mitigation Measures**
- Use existing access roads and tracks wherever available.
- Decommission and rehabilitate excess temporary access tracks as soon as they are no longer required.
- Where access is required across agricultural lands use temporary access paths during the dry season involving placement of geo-textile over aggregates where necessary.
- Minimise the need for access tracks whenever possible.
- Construction to proceed in the dry season if possible to minimise soil erosion and mass wasting and to limit loss of crops (which are not grown in the dry season); where construction is required in the rainy season, potentially unstable slopes to be avoided.
5. Fire risk

The risk of fire outbreaks during bad weather e.g. storms, winds etc cannot be overruled especially when the towers 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.

Mitigation Measures

- A robust fire prevention program and fire suppression system should be developed by the contactor for use in each cabin.
- All of the 4 cabins site must contain fire fighting equipments of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others.
- A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported.
- ELECTROGAZ should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance.

6. Bird Strikes/Collusions

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

Mitigation Measure

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

7. Aesthetics and visual related impacts- visual intrusion on the landscape

Construction works especially when construction the 4 mini substations are likely to cause visual related impacts mainly by having activities out of touch with the natural environment in some cases. The tower structures are regarded as being the most visually intrusive component of transmission lines. It is anticipated that the construction of the proposed transmission line will impose a visual impact on the immediate surrounding area.

Mitigation Measures

However, it is proposed that the new transmission line be constructed using CRS towers for the majority of the route. These towers are smaller, less steel-intensive, and less visually intrusive.

7.4 Project Decommissioning

Decommissioning of the project will involve dismantling and removing all the structures from mini sub station sites, dismantling the supporting infrastructure (towers) and all those structures that were associated with this project implementation. Some of the impacts of this project phase are similar to those that have been discussed during construction and operational phase.

Some of the impacts of this project phase are similar to those that have been discussed during construction and operational phase.
But there are those impacts that are specific to project decommissioning after the project life is over. After the project decommissioning, the proponent will be required to rehabilitate the site to its former status or near what it was before the project was commissioned. ELECTROGAZ will be responsible for preparing the decommissioning plan because it is the proponent and as specified by the Organic Law, the project proponent remains responsible for this. As per the regulations of REMA the proponent will bear the costs for decommissioning and site rehabilitation.

In addition to the environmental management principles outlined above, a set of best practice guidelines have been included in Appendix 2 to provide guidance for Contractors during construction. Adherence to these guidelines will further reduce the potential adverse impacts which may arise during construction.
8.0 PUBLIC DISCLOSURE AND CONSULTATION PROCEDURE

Public consultation formed an integral part of the process used for gathering data, understanding community and individual preferences, selecting project alternatives, and designing viable and sustainable mitigation and compensation plans. Recommendations for ongoing consultation during final design as well as during Project implementation are included in the EMP (Section 9) and in the recommendations contained in the separate ARAP Report.

8.1 Objectives of Public Consultation and Information Dissemination Programme

In the context of resettlement, public participation includes both the information exchange (dissemination and consultation), and collaborative forms of decision-making and participation. Dissemination refers to transfer of information from Project authorities to the affected population. Consultation, on the other hand, generally refers to joint discussion between Project authorities and the affected population serving as a conduit for transfer of information and sharing of ideas. Public participation is an ongoing process throughout resettlement planning and implementation, not an event. The level of information which is disseminated or the issues on which consultation takes place vary with the progress in the Project process and resettlement activities. Specific objectives of the public information campaign and public consultation are as follows:

- To share fully the information about the proposed Project, its components and its activities, with the PAPs.
- To obtain information about the needs and priorities of the PAPs, as well as information about their reactions to proposed policies and activities.
- To inform PAPs about various options for relocation and rehabilitation.
- To obtain the cooperation and participation of PAPs and related communities in activities required to be undertaken for resettlement planning and implementation.
- To ensure transparency in all activities related to land acquisition, resettlement and rehabilitation.
- To establish a clear, easily accessible and effective complaints and grievance procedure.

8.2 Public Participation during the RAP Study

Public consultation took place on a number of levels and at several stages of the RAP process. In so doing, it ensured that there was open and interactive communication between stakeholders, that disclosure to all relevant stakeholders.

Persons and organizations consulted during the EIA and ARAP studies included:

- People who are affected by the Project, both those who are potential beneficiaries and/or losers;
- Officials from relevant ministries and government agencies;
- Officials from regional and local administration: relevant bureaus and departments, municipalities, local administration offices, and/or peasant associations;
- Local elders who are familiar with the social and economic environment. They would also know sites of significance related to religious or cultural traditions;
• Women as local users of natural resources;
• Local NGOs and CBOs.

Public consultation formed an integral part of the process used for gathering data, understanding community and individual preferences, selecting project alternatives, and designing viable and sustainable mitigation and compensation plans. Recommendations for ongoing consultation during final design as well as during Project implementation are included in the EMP (Section 9) and in the recommendations contained in the separate ARAP Report.

The following is a List of Interested and Affected Parties (IAPs), including Non-government organizations (NGOs) with respect to the bio-physical resources which were consulted during the preparation of the EIA.
1. REMA Environmental Management Authority
2. ORTPN
3. Nile Basin Discourse Initiative
4. Rwanda Wetland Working Group

The following Heads of the Sectors where the project is going to have an impact were consulted on several occasions during the month of January-March.
1. Kimenyi Sylvain-MASORO Cell
2. Gatera Emmanuel-MURAMA Cell
3. Mukamana Verene-GASHARU Cell
4. Mvuriye Alexis-NYABISINDU Cell
5. Umuhirwa Fina-BIBARE Cell
6. Ntagengerwa Augustin-KIBAGABAGA Cell
7. Twagiramungu Gerard-NGARA Cell
8. Ndabaga Alexandre-KINYAGA Cell
9.0 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Environmental Mitigation and Management Measures

An Environmental Management Plan (EMP) has been developed for this project and will be implemented by the contractor, ELECTROGAZ and the relevant implementing agencies namely Ministry of Infrastructure (MININFRA), Rwanda Environmental Management Authority (REMA) and RURA.

This EMP defines the measures needed to prevent, minimize, mitigate, or compensate for adverse impacts, and to improve environmental performance while ensuring compliance with applicable environmental standards during the planning and design phase, construction and operation and eventual decommissioning of the project.

In order to develop institutional capacity in implementing and enforcing the EMP, training should be provided with adequate budgets to ensure satisfactory achievement of sound environmental performance. The training proposed here should include capacity building and training in environmental assessment, environmental mitigation plans, and environmental monitoring. In some cases, it may be appropriate to include the staff from the environmental implementation agencies, such as REMA, and other relevant ministries involved in the implementation of the UERP.

Training and capacity building will be vital in implementing the EMP especially ELECTROGAZ staff who will be responsible for primarily ensuring that mitigation and monitoring of the key activities are followed. The proposed training will target relevant UERP, ELECTROGAZ, REMA, RURA and MININFRA staff and will entail training in monitoring and evaluation, impact mitigation and internal self environmental audit.

9.2. Responsibility of Institutions in Implementing the EMP

The company that will be awarded the contract to construct and install the towers and mini substations will remain the key responsible institution for undertaking the mitigation measures proposed as well as the monitoring activities/measure associated with this mitigation plan. The other institutions mainly ELECTROGAZ, REMA, UERP/PCU, etc. will be solely involved in supporting the monitoring to ensure compliance. The tender documents clearly specify the mitigation measures that the contractor must institute during construction phase to minimise adverse impacts.

Upon successful installation, commissioning and handing over of the substation to ELECTROGAZ by the contractor, ELECTROGAZ shall henceforth become the sole and lead institution responsible for ensuring proper mitigation measures and monitoring as indicated in the EMP document is followed. However the contractor will provide one technical advisor for a period of one year to provide capacity building support in all the related management and maintenance field.

Specifically in Monitoring and Evaluation the following institutions will play the following roles namely;
9.2.1 Roles of Rwanda Environment Management Authority (REMA):

Oversight Monitoring
As the lead agency responsible for the protection of environment in Rwanda, REMA will play the leading oversight role of monitoring the activities of the project according to the legislation establishing REMA and its functions.

Site Inspection Visits
REMA will undertake regular site visits to inspect and verify for themselves the nature and extent of the impacts. They will then be expected to make viable recommendations based on their findings to the EA, World Bank, UERP and ELECTROGAZ. REMA is mandated by the Organic Law to conduct period visits and site inspections at will in any facility in Rwanda. They have a budget for this type of work, they have conducted visits for other projects and it is expected that they will continue providing this regulatory and enforcement role in this project.

Periodic Reports
REMA will prepare periodic environmental consolidated reports on the monitoring progress of the substation plant and submit to the proponent in this case ELECTROGAZ as required and stipulated by the Organic Law.

9.2.2 Role of the Contractor

Daily and Routine Monitoring
The company that will be awarded the contract will undertake the major role of ensuring the mitigation measures in the EMP are followed to the detail during construction phase.

During construction the contractor will undertake regular monitoring of all the activities occurring in the project site to ensure compliance to the EMP.

The contractor will bear all the costs related to monitoring activities during the construction and installation phase of the substation.

9.2.3 Role of the Environmental Adviser/UERP

The UERP/PCU assisted by the Safeguards Advisor will undertake regular monitoring of all their planned activities during all the phases of the project as specified in the EMP document.

The Safeguards Advisor will assist the UERP/PCU to develop suitable records of the site inspections and visits for submission to REMA and the World Bank. This will involve efforts towards building the capacity of the UERP/PCU towards this end as well.

The Safeguards Advisor will also be responsible for assisting in building capacity of the UERP/PCU in monitoring the impacts and mitigation measures resulting from the action of the contractors, transporters and suppliers and all third parties in the course of their duties under the project.

9.2.4 Kigali Fire Brigade

Site Inspection
During the construction and installation of equipments in the project area, the Kigali Fire Brigade which is the agency responsible for fire management in the City Kigali will undertake site inspection to verify if a fire management plan is in place before construction works begin. Thereafter upon commissioning of the
project, this agency will further ascertain that the correct fire management equipments as stipulated in the fire response plan are in place and in the right points.

Fire Drills
The EMP provides for regular fire drills preferably once annually. The overall objective is to ensure that there is a high level of preparedness against fire outbreaks at all times. ELECTROGAZ will organise its own fire drills but efforts will be made to bring on board the Kigali Fire Brigade depending on resource availability and if the brigade is available to conduct these drills.

9.2.5 World Bank
Approval
The World Bank will provide approval to the final EMP and ARAP for the development before construction activities begin. This approval will only be given if the World Bank is satisfied with the EMP and ARAP developed.

9.2.6 Role of ELECTROGAZ
Routine Monitoring
ELECTROGAZ will provide routine monitoring at all the stages of the project implementation as indicated in the EMP. More specifically during the operation phase of the plant, ELECTROGAZ will be the main responsible institution for undertaking all the mitigation and monitoring requirements in the EMP.

9.3 Clarification of Responsibilities Related to Monitoring

9.3.1 Contractor
The contracted company will be solely responsible for ensuring that monitoring and adherence to the EMP beginning from the construction phase up to the point where they install the substation and it is commissioned. Thereafter there responsibility to the project monitoring ceases henceforth. However, the contractor will for a period of one year provide one technical person to provide capacity building support in all the related management and maintenance field.

9.3.2 UERP/PCU
The UERP PCU will provide oversight monitoring of the project in accordance with the EMP up until the 4 year life span of the project. Upon the end of the project duration, the UERP PCU will no longer be responsible for any monitoring activities associated with the project thereafter.

9.3.4 ELECTROGAZ
ELECTROGAZ will remain the sole institution that will fundamentally be responsible for undertaking monitoring through out the project phase, when the contract hands over the project and also after the UERP PCU winds up as a project. ELECTROGAZ will be expected to ensure monitoring through out the project phase until if it gets decommissioned.
<table>
<thead>
<tr>
<th>Activity/Adverse Impacts</th>
<th>Mitigation Measure(s)</th>
<th>Implementation Schedule</th>
<th>Responsible Person(s)</th>
<th>Cost Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Acquisition</strong></td>
<td><strong>Conflicts over land acquisition, ownership and compensation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dispute and possible conflict over the land identified can arise owing to forced eviction, and absence of compensation and dialogue with the PAPs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensure that the land identified for the project is acquired as per the requirements of the Government of Rwanda and World Bank guidelines in relation to land acquisition, resettlement and compensation.</td>
<td>Before the commencement of construction</td>
<td>UERP/PCU</td>
<td>Costs are reflected in the ARAP and will be met by ELECTROGAZ through UERP/PCU</td>
</tr>
<tr>
<td></td>
<td>Inform all communities along transmission route of schedule of implementation of Project and their rights to compensation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete all necessary land and building acquisition in accordance with ARAP and entitlement Framework prior to the commencement of any construction works.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site Selection</strong></td>
<td><strong>Inappropriate/Incompatible site selected.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor selection of project site and route can cause conflict over environmental degradation including the destruction of sensitive ecosystems and or protected areas, visual impacts, erosion and drainage patterns, disturbance of existing land use, creation of increased access, aesthetics, interference with other utilities</td>
<td>Before the commencement of construction</td>
<td>ELECTROGAZ Contractor</td>
<td>No cost implication</td>
</tr>
<tr>
<td></td>
<td>Select right of way that avoids sensitive habitats and limits conflicts with existing uses.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use common corridors to minimize impacts on undisturbed areas and lessen increased access to undeveloped areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incorporate appropriate buffer zones.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not select sites that trigger any of the World Bank’s Operational policies on: Natural Habitats; Forestry; Cultural Property.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CONSTRUCTION PHASE

<table>
<thead>
<tr>
<th>Activity/Adverse Impacts</th>
<th>Mitigation Measure(s)</th>
<th>Indicators</th>
<th>Implementation Schedule</th>
<th>Responsible Person(s)</th>
<th>Cost Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal/destruction of all vegetation from the project site./Site Clearing/Civil Works/Earth Moving</td>
<td>Impacts that cannot be avoided through siting can often be lessened through planning and design. Implement erosion control plan Construct scheduling and sedimentation control Restrict corridor width and avoid unnecessary clearing. Clearly mark out the extent of clearing within the approved worksite areas with pegs at 50-m intervals or less. Identify and mark individual trees for retention within the marked extent of clearing. Seek approval for clearing from the Engineer at least 1 week prior to any proposed clearing. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts. Inspect and approve all correctly located and pegged clearing sites. Vegetation clearance shall only be undertaken once consent to clear</td>
<td>Existence of a drainage system including ditches Availability of compensation plan approved by World Bank and REMA Evidence in terms of records showing cash compensation to PAPs including copies of cheques issues and amounts.</td>
<td>Before clearing the vegetation along a section of the road During the construction and to continue after completion of construction</td>
<td>Contractor</td>
<td>Costs are reflected in the ARAP and will be met by ELECTROGAZ through UERP/PCU</td>
</tr>
</tbody>
</table>
strip plantation / individual trees along the alignment has been obtained from each owner. Instruct all construction workers to restrict clearing to the marked areas and not to harvest any forest products for personal consumption.

Stockpile cleared shrub foliage where possible within the ROW for later use as a brush layer.

Prior to commencement of works construct necessary temporary/permanent erosion and sedimentation control structures.

Following completion of works prepare areas for rehabilitation by revegetation or engage local community to plant vegetation.

Ensure topsoil is left in a non-compacted condition following completion of works. Ensure re-vegetation at the earliest time.

Where culverts or pipes have been installed, line waterflow exit points with stone or cement rip-rap for a length of two metres.

| Sedimentation/Soil Erosion | Identify and map all areas where soil disturbance will occur. For each of these areas, identify appropriate sediment control structures and | Prior to commencement of construction | Contractor | To be met by the contractor. The actual cost will be reflected by |
install structures prior to commencement of work.

If possible, schedule works requiring large areas of soil disturbance or newly formed embankments to avoid the rainy season.

on the down slope of the construction areas to divert run-off to sediment control structures. The bund or trench shall be removed upon completion of construction works.

### Archaeological sites/Genocidal sites uncovering

**Fence off archeological sites, and sites of contemporary historical importance**, if any sighted / uncovered during works and reports it to the appropriate authority.

**Number of sites discovered and reported**

**Prior to the commencement of works and throughout construction**

**Contractor**

To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component

### Protection of sensitive environmental areas

Identify natural areas in site plans, especially environmentally sensitive or ecologically fragile areas.

- Locate construction sites/activities away from sensitive areas.
- Ensure those involved in construction are aware of these areas and the usage limits of such areas.
- Provide training to construction teams to ensure an understanding of

**Availability of site plans with already mapped ESA**

**During site preparation**

**Prior to construction**

**Prior to commencement of construction**

**Contractor**

To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component.
<table>
<thead>
<tr>
<th><strong>Water Pollution</strong></th>
<th>Requirements</th>
<th>Verification</th>
<th>Responsible Party</th>
<th>Additional Info</th>
</tr>
</thead>
</table>
| Ensure that potential sources of petro-chemical (including bituminous materials) pollution are handled in such a way to reduce chances of spills and leaks.  
• Train work crews in safe handling of petro-chemicals.  
• Minimise soil sedimentation as outlined under sediment control. | Availability of pollution control plan | Prior to commencement of construction | Contractor | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component. |

<table>
<thead>
<tr>
<th><strong>Dust Emissions</strong></th>
<th>Requirements</th>
<th>Verification</th>
<th>Responsible Party</th>
<th>Additional Info</th>
</tr>
</thead>
</table>
| Fugitive dust may be emitted from construction works and stock piles of materials including machinery as well as from truck traffic. This could cause health related impacts to the communities around and workers in the project site. | The dirt roads and exposed construction areas should be moisturized during the dry and windy season to prevent or minimize the fugitive dust emissions.  
Proper location of material stockpiles, especially sand and soil downwind from the commercial, residential and other establishments will be required; Frequent wetting of the stockpile and working area; screening of or providing wind breaks for stockpiles;  
Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry but not limited to safety helmets, boots, dust masks, gloves, overall, goggles etc. | Verification on siting of the stockpiles.  
Verification of PPE availability through observation during the construction if workers are in PPEs.  
Routing of the lines should | Contractor | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component. |
| **Noise Equipment Operation** | Noise from construction activity may be significant but nevertheless localized especially only to the workers and personnel on the project site during construction. | All workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE). Avoid construction activities at night. Trial run of Contractor’s plants, machinery and vehicles for ascertaining that their emission and noise levels conform to the standards stipulated by relevant laws. Use well maintained equipment (with mufflers where appropriate). • Use noise screens or mounds near residences, schools and health centres. Carry out noisy construction activities during daylight. Advise local people when there will be unusually high levels of noise. Vehicles delivering materials shall be covered to reduce spills and dust blowing off the load. Use of water tankers to control dust at construction sites adjacent villages/houses. Workers in vicinity of strong noise will wear earplugs and their working time should be limited. | Verification of PPE availability through observation during the construction if workers are in PPEs. Noise will also be monitored at any time if legitimate complaints of excessive noise are received from the local community. Before commencement of construction and to continue after completion of construction into the operational phase. | **Contractor** | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component. |
| **Storage and management of Wastes** generated from construction and demolition activities | Wastes to be sorted and placed in temporary storage on-site. Subsequently, removed by licensed contractors for disposal at government-approved sites, or sold for reprocessing to companies with legitimate operating permits. Contractor should develop a solid waste disposal plan which includes the provision of receptacles at strategic points within the construction site, recycling programmes for recyclable wastes, separation of wastes. Contain all solid wastes at designated location within construction sites. • During site clean-up, burn all spilled fuel oils and bituminous waste materials. • Crush, burn and bury all inorganic solid waste in an approved disposal area. • Remove disabled equipment, including machinery from the area. • Use above-water table pit latrines at major construction sites. • Compost all green or | Availability of a solid waste disposal plan. Presence of receptacles for dumping solid wastes observed before construction works begin. Records showing private refuse handling collecting wastes. Solid wastes must be collected from the site daily and disposed as per the requirements in the solid waste plan. | **Contractor** | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component. |

Solid waste materials during the construction include paper wrapping, scrap metal, excavated soils, polythene, metals, wood, concrete, etc will cause pollution and littering of the immediate and localized environment.
| **Accidents at work place during construction from operating of machineries and equipment by workers** | All workers entering the construction site must be equipped with PPE.  
  The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.  
  Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.  
  The contractor should develop an Emergency Response Plan for handling any emergencies arising thereof during the construction. | Verification of PPE availability through observation during the construction if workers are in PPEs.  
  Background records including resume of all staff operating machines and equipments.  
  Availability of a supervisor on site at all times. | During the construction and to continue after completion of construction into the operational phase | **Contractor** | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component |
|---|---|---|---|---|
| **Fire Hazards/Accidents** | A robust fire prevention program and fire suppression system should be developed by the contractor.  
  The construction site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. This should include Dry chemical systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers.  
  All workers must be trained on fire | Availability of a fire response plan.  
  Evacuation Plan posted in strategic places in the plant as required in the Fire | Before the construction and to continue after completion of construction into the operational phase | **Contractor** | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component |
| Disruption of Services | Power black outs, damage to underground utility pipes, distribution lines etc | Establish whether there is any infrastructure located near or inside the Transmission line servitude in order to avoid any damage.  
Local Authorities should be informed of the construction schedules to ensure the minimum disruption of such infrastructure.  
Inform public in advance when disruptions are expected  
Work using shifts to avoid disruptions  
Construction activities should not be undertaken after-hours or over weekends | Existence of a plan/schedule for informing public when disruptions are anticipated including date, time and duration.  
Availability of newspaper advertisements informing public on disruptions  
Availability of a blue print/map of all the underground utility pipes and lines | During the construction and to continue after completion of construction | Contractor | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component |
|---|---|---|---|---|---|---|
| Alteration of Drainage | In sections along water courses, earth and construction waste will be properly disposed of so as to not block rivers and streams, resulting in adverse impact on water quality.  
All necessary measures will be taken to prevent earthworks from impeding cross drainage at rivers/streams, canal/existing irrigation and drainage systems. | Existence of plan to protect drainage systems | Whenever encountered during construction | Contractor | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component |
| Contamination from fuel and lubricants | Vehicle maintenance and refuelling will be confined to areas in construction camps designed to contain spilled lubricants and fuels. Waste petroleum products must be collected, stored and taken to | Vehicle maintenance plan and absence of contamination | Throughout construction | Contractor | To be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component |
approve disposal sites, according to regulations.

<table>
<thead>
<tr>
<th>Bird Strikes/Collusion</th>
<th>Avoid routing the lines in paths frequented by birdlife</th>
<th>Absence of bird strikes</th>
<th>Throughout construction</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential source of bird strikes that get entangled to the lines causing their injury or even instant death.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

proposal which includes this component to be met by the contractor. The actual cost will be reflected by tenders in the financial proposal which includes this component.
<table>
<thead>
<tr>
<th>Activity/Adverse Impacts</th>
<th>Mitigation Measure(s</th>
<th>Indicators</th>
<th>Implementation Schedule</th>
<th>Responsible Person(s)</th>
<th>Cost Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric and magnetic field strength at ground level</td>
<td>Any new equipment purchased shall limit electromagnetic field levels to within Rwanda standards and/or in accordance with good international practices. ROW should be 40 m from residents to reduce EMF.</td>
<td>Compliance to ROW distance for EMF</td>
<td>Through out the project construction and operation phase</td>
<td>ELECTROGAZ CONTRACTOR</td>
<td>Captured in tender documents and met by contractor</td>
</tr>
<tr>
<td>Fire Hazards/Accidents/safety</td>
<td>A robust fire prevention program and fire suppression system should be developed by the contractor. The construction site must contain fire fighting equipments of recommended standards and in key strategic points all over the site. This should include Dry chemical systems, Carbon dioxide systems, Detection/alarm systems, Portable fire extinguishers. All workers must be trained on fire management and fire drills undertaken regularly. Frequent clearing of overhanging branches in ROW to minimise lines being affected by branch falls.</td>
<td>Availability of a fire response plan. Availability of all the observable fire containment equipments specified in the tender documents and fire response plan including: Fire detection, alarm and protection equipment and standards. Availability of a ROW maintenance schedule.</td>
<td>Before the construction and to continue after completion of construction into the operational phase. Availability of records (log books) showing trainings conducted by a competent firm on fire management regularly but at least bi-annually.</td>
<td>ELECTROGAZ</td>
<td>Captured in tender documents and met by contractor</td>
</tr>
<tr>
<td>Right-of-way (ROW) maintenance and related impacts including intrusion, erosion, disruption of services</td>
<td>Clearance of the area to be performed by manual and/or mechanical means Any Wood should be sold locally.</td>
<td>Availability of a ROW maintenance schedule. Absence of growth in ROW.</td>
<td>After completion of every 10km of ROW section Every six months for two years after re-vegetation</td>
<td>ELECTROGAZ</td>
<td>Minor</td>
</tr>
</tbody>
</table>
## DECOMMISSIONING PHASE

<table>
<thead>
<tr>
<th>Activity/Adverse Impacts</th>
<th>Mitigation Measure(s)</th>
<th>Monitoring Program/Indicators</th>
<th>Implementation Schedule</th>
<th>Responsible Person(s)</th>
<th>Cost Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Debris from Equipments and Machines when mini substations are dismantled.</td>
<td>Ensure all the machines and equipment are disposed in the right places</td>
<td>Site supervision during the decommissioning</td>
<td>During decommissioning</td>
<td>ELECTROGAZ</td>
<td>All costs related to decommissioning will be met by ELECTROGAZ</td>
</tr>
<tr>
<td>Noise and dust impacts during the dismantling</td>
<td>Apply the noise reduction /mitigation impacts specified in the construction phase of the project</td>
<td>Site supervision during the decommissioning</td>
<td>During decommissioning</td>
<td>ELECTROGAZ</td>
<td>All costs related to decommissioning will be met by ELECTROGAZ</td>
</tr>
<tr>
<td>Accidents during decommissioning</td>
<td>Apply the accidents reduction /mitigation impacts specified in the construction phase of the project</td>
<td>Site supervision during the decommissioning</td>
<td>During decommissioning</td>
<td>ELECTROGAZ</td>
<td>All costs related to decommissioning will be met by ELECTROGAZ</td>
</tr>
</tbody>
</table>
9.4 Monitoring Protocol for Transmission/Distribution Lines

9.4.1 Monitoring Plan

A detailed environmental monitoring plan has been developed 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 provides for dust, noise, visual impacts, service disruption and safety monitoring.

During the operation period, monitoring is planned in terms of routine inspection of the health and safety of the workers, disruption impacts during maintenance of ROW, fire hazards. The Monitoring Plan is developed is presented at the end of this report as part of the EMP.

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 is responsible for reporting the monitoring to the implementing agencies, ELECTROGAZ. It is not the Contractor’s responsibility to monitor land acquisition and compensation issues.

ELECTROGAZ should in turn 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. ELECTROGAZ also have the direct responsibility to implement and monitor land acquisition and compensation issues as outlined in the ARAP. Their Project teams should include an environmental monitoring and management specialist as well as a sociologist experienced in land acquisition and compensation issues.

REMA 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 the Project unless some specific major environmental issue arose.

Environmental monitoring of the following parameters is recommended as a minimum for the Project.

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 in the first instance to identify the level of monitoring required.

2. **Soil Erosion Monitoring**

   The excavation of earth for the establishment of towers, 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.

3. Monitoring of Vegetation Clearing
Unique stands of indigenous trees should not be removed for the establishment of towers. The Contractor’s environmental inspectors should make sure that the unique tree stands identified during the present study should not be removed.

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 ELECTROGAZ environmental staff.

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:
- ELECTROGAZ will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The construction supervision consultant should assist ELECTROGAZ in this process in order to make sure that contractors fulfil the environmental requirements.

The following parameters could be used as indicators:
- Presence of posted visible signs on towers, etc.;
- Level of awareness of communities pertaining to dangers/risks associated with power lines;
- Presence/absence of unique stands of indigenous trees along the power line establishment route; and
- Accident reports. Records on actual accidents associated with the establishment of the transmission line could be compiled with the help of local peasant association officials, teachers/students of local schools.

9.4.2 Responsibilities and Costs for Environmental Mitigation Measures
Table below outlines the overall package of environmental mitigation measures that will be implemented in relation to the facility as outlined in detail in the EMP document. The table also assigns general responsibilities for implementing each group of mitigation measures. A detailed implementation schedule has also been developed.

Consistent with the UERP/PCU and World Bank’s contracting strategy of integrating environmental protection and mitigation activities into the Contractor’s Scope of Work, the specifications for many of the activities were included in the bid package upon which the Contractor is developing its base rates. Therefore, since many of the costs associated with environmental protection and mitigation activities are included in the Contractor’s base rates, it is not possible to present a detailed accounting of all the monies devoted to the project’s construction phase environmental protection and mitigation activities.

These costs are therefore described as ‘Within contract budget’ in Table below. Similarly, mitigation or monitoring measures that will be carried out by ELECTROGAZ staff, with no additional expenditure required, are described as ‘Within operational budget’ in Table below.
## Monitoring Plan

<table>
<thead>
<tr>
<th>What Parameter to be Monitored</th>
<th>Where is the parameter to be monitored?</th>
<th>How is the parameter to be monitored/ type of monitoring equipment?</th>
<th>When is the parameter to be monitored frequency of measurement or continuous?</th>
<th>Monitoring Cost</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Acquisition and Compensation</td>
<td>Along ROW for all PAPs</td>
<td>Ensure compensation paid as per RAP</td>
<td>Monthly until complete</td>
<td>Refer to ARAP</td>
<td>ELECTROGAZ</td>
</tr>
<tr>
<td>Noise Levels</td>
<td>Noise level metre kept at a distance of 15m from edge of ROW</td>
<td>Noise levels on dB (A) scale</td>
<td>Readings to be taken at 15 second interval for 15 min every hr and then averaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetation Clearing</td>
<td>Along ROW and works areas</td>
<td>clearing to ensure consistent with EMP</td>
<td>Through out the clearing process</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Worker health</td>
<td>At construction site</td>
<td>Visual: Worker wearing Equipment</td>
<td>Weekly: random times</td>
<td>Minor</td>
<td>Construction Contractor</td>
</tr>
<tr>
<td>Dust levels</td>
<td>At construction site</td>
<td>Visual: Dust visible</td>
<td>Weekly, more frequently during dry, windy weather</td>
<td>Minor</td>
<td></td>
</tr>
<tr>
<td>Accidents</td>
<td>Along ROW</td>
<td>Safety training for workers, accident reports, community consultation</td>
<td>Monthly</td>
<td>Construction Contractor</td>
<td></td>
</tr>
<tr>
<td>Machinery engine emissions</td>
<td>At construction site</td>
<td>Visual: Examine engine exhaust Certification</td>
<td>Equipment first comes to project site</td>
<td>Minor</td>
<td>Construction Contractor</td>
</tr>
<tr>
<td>Building Demolition waste materials transport and disposal</td>
<td>At construction site</td>
<td>Visual: Trucks covered or watered</td>
<td>Weekly: Random times Weekly</td>
<td>Minor</td>
<td>Construction Contractor</td>
</tr>
<tr>
<td></td>
<td>At disposal site</td>
<td>Material properly deposited</td>
<td></td>
<td>Minor</td>
<td></td>
</tr>
</tbody>
</table>

**Responsibility**

- ELECTROGAZ
- Contractor
<table>
<thead>
<tr>
<th><strong>Right-of-way (ROW) land clearance</strong></th>
<th><strong>ROW</strong></th>
<th><strong>ROW Visual:</strong> Manual or Mechanical methods</th>
<th><strong>Weekly</strong></th>
<th><strong>Minor</strong></th>
<th><strong>Construction Contractor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Used Wood properly disposed</strong></td>
<td></td>
<td><strong>Weekly</strong></td>
<td></td>
<td><strong>Minor</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **ROW erosion control**            | **ROW** | **Visual:** Proper procedures followed       | **Monthly, and during or after heavy rainfall** | **Minor** | **Construction Contractor** |
| **(particularly at steep slopes)** |         |                                              |                                                     |           |                            |

| **Access road construction**       | **Equipment and material delivery routes** | **Visual:** Existing roads used                    | **Weekly** | **Minor** | **Construction Contractor** |
|                                   |         |                                              |           |           |                            |

| **Disruption of local traffic patterns** | **Roads at or near construction site** | **Visual:** Alternate routes clearly indicated | **Monthly** | **Minor** | **Construction Contractor** |
|                                          |         |                                              |            |           |                            |

* Items indicated to be the responsibility of the contractor shall be specified in the bid documents*
9.4.3 Capital cost related activities

The table below provides a summary of the capital (one off) costs that will be incurred by either the contractor or Electrogaz during monitoring. The costs to be met by the contractor in ensuring mitigation will be contained in the final bid document and for this reason cannot be reflected in this table at this point in time.

The costs for resettling and compensating the PAPs will be met by ELECTROGAZ and is contained in the separate Abbreviated Resettlement Action Plan already developed as a separate document.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated Cost in (USD)</th>
<th>Cost to be met by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation for displaced persons or destroyed crops and vegetation</td>
<td>154,876,611 (RFW) OR 30,000 USD.</td>
<td>ELECTROGAZ</td>
</tr>
<tr>
<td>Mitigating Impacts of civil construction related works</td>
<td>Within Contractor’s Budget. The costs associated to mitigating the impacts of the construction activities will be met by the contractor.</td>
<td>Contractor</td>
</tr>
</tbody>
</table>

**TOTAL CAPITAL COSTS**

9.4.4 Recurring cost related activities

Recurring costs imply costs that will be met by ELECTROGAZ either on annual or monthly basis. At this point in time, the costs related to replacement of new PPE will largely depend on the rate of wear and tear, however and is part of the overall budget for ELECTROGAZ.

Cost related to maintenance of the fire equipment will be met bi annually and costs towards solid waste disposal will be monthly throughout the project life.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated Cost in (USD)</th>
<th>Cost to be met by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement of PPE for ELECTROGAZ staff</td>
<td>Costs to be incurred depending on the rate of wear and tear of the PPE.</td>
<td>ELECTROGAZ</td>
</tr>
<tr>
<td>Regular Maintenance of Fire Equipment</td>
<td>1,000.00 after every 6 months Per Cabin</td>
<td>ELECTROGAZ</td>
</tr>
<tr>
<td>Total Recurring Costs</td>
<td>4000.00</td>
<td></td>
</tr>
</tbody>
</table>
10.0 CONCLUSION AND RECOMMENDATIONS

Based on field work and consultations with Project affected people, local, regional and national government agencies and other organisations it is unlikely that the Project will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures in the EMP for the Project such that the overall benefits from the Project will greatly outweigh the few adverse impacts.
REFERENCE

d. MINITERE: Organic Law carrying management and protection of the environment, the law N° 4//2005 of April 8, 2005
e. MINITERE: Organic Law carrying regime fundamental N°08/2005 of the 14/07 /2002
f. REMA EIA Regulations and Guidelines 2006.
g. UERP, 2004: Environmental and Social Management Framework
h. UERP, 2004: Resettlement Policy Framework
ANNEX

Annex 1. Map showing the route of the transmission lines.-See Separate attachment for the map.
ANNEX 2. GENERAL ENVIRONMENTAL MANAGEMENT CONDITIONS

This section describes the general environmental management conditions to be observed and complied with during the construction of the sub station. These general conditions have been presented here but are also expected to be included in the construction contract with the aim of guiding the contractor on the conditions to comply with. It is expected that the procurement department of the UERP/PCU will include this section as an attachment to the construction contract.

• In addition to these general conditions, the Contractor shall comply with any specific Environmental Management Plan (EMP) for the works he is responsible for. The Contractor shall inform himself about such an EMP, and prepare his work strategy and plan to fully take into account relevant provisions of that EMP. If the Contractor fails to implement the approved EMP after written instruction by the Supervising Engineer (SE) to fulfill their obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.

• Notwithstanding the Contractor’s obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an EMP. In general these measures shall include but not be limited to:

(a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity dust producing activities.

(b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

(c) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.

(d) Upon discovery of ancient heritage, relics or anything that might or believed to be of archeological or historical importance during the execution of works, immediately report such findings to the SE so that the appropriate authorities may be expeditiously contacted for fulfillment of the measures aimed at protecting such historical or archaeological resources.

(e) Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.

(f) Ensure that garbage, sanitation and drinking water facilities are provided in for construction workers.

(g) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.

(h) Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.
• The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.

• The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan / strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.

• Besides the regular inspection of the sites by the SE for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authority (REMA) may carry out similar inspection duties. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

**Worksite Waste Management**

• All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be bunded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.

• All drainage and effluent from storage areas, workshops shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.

• Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be re-used or sold for re-use locally.

• Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.

• Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.

• If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.

**Material Excavation and Deposit**

• The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas.
• The location of quarries and borrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or borrow areas fall in traditional land.

• New extraction sites:

  a. Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas.

  b. Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels. Where they are located near water sources, borrow pits and perimeter drains shall surround quarry sites.

  c. Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall proceed with great care and shall be done in the presence of government authorities having a mandate for their protection.

  d. Shall not be located in forest reserves. However, where there are no other alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted.

  e. Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.

  f. Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.

• Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.

• Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.

• The Contractor shall deposit any excess material in accordance with the principles of these general conditions, and any applicable EMP, in areas approved by local authorities and/or the SE.

• Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.

**Rehabilitation and Soil Erosion Prevention**

• To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.

• Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.

• Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
• Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.

• Locate stockpiles where they will not be disturbed by future construction activities.

• To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.

• Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.

• Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.

• Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.

• Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.

• Minimize erosion by wind and water both during and after the process of reinstatement.

• Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.

• Revegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people.

Water Resources Management

• The Contractor shall at all costs avoid conflicting with water demands of local communities.

• Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

• Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.

• Temporary damming of streams and rivers shall be done in such a way avoids disrupting water supplies to communities down stream, and maintains the ecological balance of the river system.

• No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.

• Wash water from washing out of equipment shall not be discharged into water courses or road drains.

• Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

Traffic management

• Location of access roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access roads shall not traverse wetland areas.
• Upon the completion of civil works, all access roads shall be ripped and rehabilitated.

• Access roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.

**Disposal of unusable elements**
• Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client’s premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.

• As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.

• AC-pipes as well as broken parts thereof have to be treated as hazardous material and disposed of as specified above.

• Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

**Health and safety**
• In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.

• Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.

• Construction vehicles shall not exceed maximum speed limit of 40km per hour.

**Repair of private property**
• Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner’s satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

• In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

**Contractor’s environment, health and safety management plan (EHS-EMP)**
Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works. The Contractor’s EHS-MP will serve two main purposes:

• For the Contractor, for internal purposes, to ensure that all measures are in place for adequate EHS management, and as an operational manual for his staff.
• For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the EHS aspects of the project, and as a basis for monitoring of the Contractor’s EHS performance.

The Contractor’s EHS-MP shall provide at least:

• a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
• a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
• a description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
• the internal organizational, management and reporting mechanisms put in place for such.

The Contractor’s EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor’s EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

EHS Reporting
The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor EHS report is given below. It is expected that the Contractor’s reports will include information on:

• EHS management actions/measures taken, including approvals sought from local or national authorities;
• Problems encountered in relation to EHS aspects (incidents, including delays, cost consequences, etc. as a result thereof);
• Lack of compliance with contract requirements on the part of the Contractor;
• Changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects; and
• Observations, concerns raised and/or decisions taken with regard to EHS management during site meetings.

It is advisable that reporting of significant EHS incidents be done “as soon as practicable”. Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-weekly reports. Example formats for an incident notification and detailed report are given below. Details of EHS performance will be reported to the Client through the SE’s reports to the Client.

Training of Contractor’s Personnel
The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project EMP, and his own EHS-MP, and are able to fulfill their expected roles and functions. Specific training should be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP. General topics should be:

• EHS in general (working procedures);
• emergency procedures; and
• Social and cultural aspects (awareness raising on social issues).
Cost of compliance
It is expected that compliance with these conditions is already part of standard good workmanship and state of art as generally required under this Contract. The item “Compliance with Environmental Management Conditions” in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable EHS impact.