

**REPUBLIC OF RWANDA**  
**Ministry of Infrastructure**

**ENERGY WATER AND SANITATION  
AUTHORITY (EWSA)**



**Electricity Access Rollout Programme  
(EARP)**

Head Office: Avenue de l' Ihema,  
P.O.Box 537, Kigali-Rwanda  
Tel: (250) 598202 or 573666  
E-mail: [elgz@rwanda1.com](mailto:elgz@rwanda1.com)  
Website: [www.ewsa.rw](http://www.ewsa.rw)

**PROJECT BRIEF FOR THE REHABILITATION AND  
UPGRADING OF THE EXISTING 30/110 KV  
SUBSTATION AT GIFURWE**

September 2011

## TABLE OF CONTENT

TABLE OF CONTENT.....	2
LIST OF ACRONYMS .....	3
BACKGROUND .....	4
Objectives of the Subproject.....	5
Current Situation .....	5
Subproject Expected Results.....	5
DESCRIPTION OF THE SUB PROJECT .....	7
Subproject Location .....	7
Subproject Activities .....	7
• Rehabilitation of the small power supply and outdoor lights.....	7
• Rehabilitation of the water supply including installation of a pressurizer pump, water reservoir, connection to the public water network, .....	7
• Rehabilitation of the pipes, sanitary installations, showers and washbasins in the power house building and office. ....	7
• Adaptation of all cable channels, cable tranches inside and outside the power house. ....	7
General Technical Specifications .....	9
DESCRIPTION OF THE ENVIRONMENT .....	12
Location.....	12
Description of the Physical Environment: Meteorology, Hydrography, Geology, Relief and Biodiversity.....	13
Description of the Socio-economic Environment .....	14
POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK .....	16
Policies Relevant to the Project.....	16
Organic law on Environmental Protection and Management.....	20
Environmental Clearance Procedures .....	22
International Legislations Relevant to the Project.....	22
PROJECT ALTERNATIVES .....	26
Analysis of Alternatives .....	26
Comparison of Alternatives .....	26
ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES.....	27

## LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
EMF	Electromagnetic Fields
EA	Environmental Audit
EIA	Environmental Impact Assessment
RAP	Resettlement Action Plan
EMP	Environmental Management Plan
IAPs	Interested and Affected Parties
IDA	International Development Association
LV	Low Voltage
MV	Medium Voltage
MININFRA	Ministry of Infrastructure
EDPRS	Economic Development and Poverty Reduction Strategy
NDF	Nordic Development Fund
PPE	Personal Protective Equipment
PCBs	Polychlorinated biphenyls
PAPs	Project Affected Persons
PCU	Project Coordination Unit
RPF	Resettlement Policy Framework
ROW	Right Of Way
REMA	Rwanda Environment Management Authority
EARP	Electricity Access Roll-Out Program
MINIFOM	Ministry of Mines and Forests
MINELA	Ministry of Environment and Lands
KCC	Kigali City Council
EWSA	Electricity Water and Sanitation Authority

## BACKGROUND

The Government of Rwanda, in its effort to sustain economic growth, has increased and stabilised the power production since the severe power shortages in 2004. However, infrastructure bottlenecks in the urban areas and limited access in the rural areas have emerged as a significant constraint. One of three major strategic objectives of the Economic Development and Poverty Reduction Strategy (EDPRS 2008-2012) is to expand access while also improving the quality and lowering the cost of economic infrastructure – especially transport, power, and communications. The Government of Rwanda (GoR) also exercises a strong leadership role in donor coordination and has begun to work with donors on a clearer division of labour by identifying areas of individual donor comparative advantage.

In connection with the mentioned strategy, the Government of Rwanda through the electricity, water and sanitation authority (EWSA) is embarked on a country-wide **Electricity Access Program** to realize the primary EDPRS target for the electricity sector of tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration. This will require about 230,000 with new grid connections, and will also include efforts to reach rural consumers and service providers currently off the national grid.

In this regard, EWSA has established a new Electricity Access Scale-up Roll-out Program (EARP) as a part of its corporate structure. The program will be implemented within the framework of a Sector Wide approach (SWAp) to encompass all donors active in the sector under one common sector investment program. The overall investment envelope for the first SWAp time (2009-2013) is estimated at \$378 million, for the program period covered by the Prospectus that has been endorsed by all the Partners and key sector institutions in Rwanda, including EWSA.

The Prospectus outlines the overarching spatial least cost rollout plan and priority connection targets through the medium term, the rollout strategy and the financing policy platform for the EARP. Additionally, the EARP implementation will be subject to a monitoring, evaluation and results framework as well as the oversight and accountability process of regular reviews as agreed with the energy sector working group (SWG), chaired by MININFRA on advice from the Partners.

In 1994 the power Transformer has been damaged and the northern region has been supplied via NTARUKA Power Plant using a long 30kV overhead line. However, due to the increasing demand of electricity that was accelerated by the increasing social-economic activities like the ongoing expansion of businesses like the construction of Hotels, Transport industry, increasing number of shops, increasing number of schools, hospitals among others.

It is in this regard that two Business Centres of BURERA and KIRAMBO have currently an important growth as mentioned above, and it proves to be necessary that GIFURWE substation must be rehabilitated and upgraded to assure an efficient Power supply that prevents the voltage drop caused by the length of the line NTARUKA – GIFURWE.

A number of development partners so far committed to support the program including Government of Rwanda, EWSA, and major Donors such as World Bank IDA, World Bank

GEF/ESMAP CEIF, African Development Bank, BADEA, OFID, Saudi Funds, Netherlands, and Japan.

It is in this regard that **Rwandan** government through its cooperation with **the African Development Bank** applied for grant to undertake rehabilitation and upgrading of Gifurwe substation in Burera district.

### Objectives of the Subproject

The Purpose and objectives of this subproject as follows:

- Reducing poverty through increase of electricity access rate by direct or indirect job creation
- Reduce Co2 emissions from kerosene by providing clean electric energy
- Uplift living standards in the targeted areas as investors have been limited by having no electricity guarantee
- To reduce the use of charcoal which result in deforestation and end up causing soil erosion
- To create foundation for other infrastructure like ICT infrastructure and other investments that require electricity

### Current Situation

The GIFURWE substation was commissioned in 1982 and the main goal was to supply the current BURERA and KIRAMBO Business Centres. In 1994 the power Transformer has been damaged and the region has been supplied via NTARUKA Power Plant using a long 30kV overhead line. The two Business Centres of BURERA and KIRAMBO have currently undergone an important growth, and it proves to be necessary that GIFURWE substation must be rehabilitated and upgraded to assure an efficient Power supply that prevents the voltage drop caused by the length of the line NTARUKA – GIFURWE.

### Subproject Expected Results

As described in the current situation and its need to rehabilitate the Gifurwe substation, it is expected that this rehabilitation of this substation will be concerned with the replacement of Indoor MT 30kV with that of the outdoor 110kV Switchyard, as well as the Protection, Control and Command system.

The individual approach lead to dramatic changes in the daily life of everyone who has experienced the transformation from the 'dark' to the 'light' - not only in terms of practical changes like cooking and heating habits, hygiene and health, spare time, new education facilities etc., but also in terms of changes within the epistemological dimension of thinking about life, anticipating the future, being connected to the outside world (through new media), etc. For the vast majority of experiences, electrification has meant a tremendous change in their personal lives and lifestyles. Living in poor rural societies, some had feel 'neglected' before electrification, especially those who have some experience of the 'outside world' (as labour migrants or as visitors to the national capital). In most cases, this feeling of 'forgotten remoteness' has now has to be replaced by a positive identification with the new conditions of village life after getting connected to the grid.

The societal approach involves two different areas as per rural electrification is concerned. The socio-cultural impact on the societal level is also tremendous - village life will change not only individually but also collectively. Electricity empowers communities, resulting in more community activities and strengthening solidarity among members of the community. On the other hand, the socio-economic impact - interpreted from the macro-economic level will be evident. In the current situation, community economies are too weak to permit investment in new machinery or equipment that could raise agricultural productivity. Very few farmers can afford to buy new electrically powered rice-mills, for instance. As yet, the impact of rural electrification on the local economies cannot be seen directly, in terms of higher family incomes through the use of new techniques, or greater agricultural productivity - only indirectly: Having more spare time enables the villagers to engage in additional income activities like weaving, kitchen gardening, small services, etc. But here it must be borne in mind that electricity is a prerequisite for further investments in the agricultural sector. Once the density of monetarization (the actual amount of money circulating in local rural economies) will increase, and there will be more investments in new machines and technologies to strengthen local agricultural productivity.

Health: Providing poor households with electricity in partial replacement of traditional fuels like firewood, kerosene, dung and agricultural residue reduces indoor pollution and consequent health hazards associated with combustion and traditional fuels. Before getting connected to the grid and before the installation of improved stoves (with chimney) in some households the thick smoke all day long with no outlet - created an extremely unhealthy environment.

Eye diseases, skin infections, diarrhoea and respiratory problems and malaria are very common in many rural setting in Rwanda. With the households connected to the grid and the widespread use of electric kitchen appliances like rice-cookers and electric kettles, this situation will change dramatically. The most vulnerable population are females - of all ages - and they were the ones who suffer the most from various health problems before electrification. Since women do most of the kitchen and food-preparation work, they are the first to benefit from the greatly improved hygiene and sanitation situation at home.

## DESCRIPTION OF THE SUB PROJECT

### Subproject Location

The GIFURWE substation is located in the locality of North District and GPS coordinates are following:

S	E	H
1°32,272'	29°47,804'	2167m

The GIFURWE substation has been commissioned in 1982 and the main goal was to supply BURERA and KIRAMBO Business Centres. In 1994 the power Transformer has been damaged and the region has been supplied via NTARUKA Power Plant using a long 30kV overhead line. The two Business Centres BURERA and KIRAMBO have currently an important growth, and it proves to be necessary that GIFURWE substation must be rehabilitated and upgraded to assure an efficient Power supply that prevents the voltage drop caused by the length of the line NTARUKA – GIFURWE.

The rehabilitation of the substation concerns the replacement of the outdoor 110kV Switchyard, the replacement of the Indoor MT 30kV Switchgear as well as the Protection, Control and Command system.

### Subproject Activities

The existing power house was initially designed to contain the Protection, Command and Control equipment as well as the AC and DC distribution Board.

This power house must be extended to allow the 30kV indoor switchgear, and the extension must consider that the switchgear its self can be extended by two additional cubicles.

Following works must be done:

- Rehabilitation of the small power supply and outdoor lights
- Rehabilitation of the water supply including installation of a pressurizer pump, water reservoir, connection to the public water network,
- Rehabilitation of the pipes, sanitary installations, showers and washbasins in the power house building and office.
- Adaptation of all cable channels, cable tranches inside and outside the power house.

After the rehabilitation and extension of the power house must have following rooms:

One (1) office room;

One (1) switchboard room;

One (1) AC, DC distribution boards, battery charger

Control and command room;

- One (1) battery room;
- One (1) store room;
- One (1) combined interior bathroom and toilet room;
- One (1) exterior toilets room;
- One (1) telecommunication room;

Transformer foundations and firewalls shall be designed according to the actual requirements and size of the transformers. The oil-collecting pit for each transformer shall have a capacity for 120 % oil of one transformer. A water/oil evacuating system using a pump shall be installed for the oil/rain water collecting pit.

The rehabilitation of the substation concerns the replacement of the outdoor 110kV Switchyard, the replacement of the Indoor MT 30kV Switchgear as well as the Protection, Control and Command system.

The substation will have the following important parts:

- Outdoor Switchyard 110kV
- Transformer Bay 110/30 kV

The 110 kV Outdoor Switchyard will be of the open air type connected on the 110kV Overhead line as a T-off substation. During the erection, the existing gantries and Steel structures must be reused for the erection of the new equipments. The Switchyard will be equipped with the following equipments:

- one (1) power transformer 110/30kV, 6MVA YN0d11
- one (1) busbar disconnect or, outdoor, 3-pole, rotary type, 1.250 A, manually gang-operated and motor drive
- three (3) 110kV current transformers, outdoor, 100-200/1/1/1 A
- one (1) circuit-breaker, 3-pole, 1.250A, 31,5 kA rated short time withstand current (3s), with motor drive 110 V DC
- three (3) lightning arresters, outdoor, 110 kV, 20 kA discharge current, with discharge counters,
- One (1) Earthing Transformer 30/0,4kV 160kVA
- post insulators, outdoor,
- terminal cubicle for all low voltage cable (command, control and protection)

The Power transformer to be used is 110/30kV 6MVA and YN0d11 as vector group. This vector group has been chosen to permit the Single phase or Duo phase Medium Voltage distribution for Rural Electrification Program.

The power transformer must have the transformer earthing with Zigzag-Star as vector group to be connected on the delta side and the neuter point will be used for artificial neutral system. The earthing transformer will be used also as Auxiliary transformer for the substation.



## General Technical Specifications

### Indoor Switchgear 30kV

The MV switchboard shall be of the Gas Insulated (GIS type), SF6 insulated, metal-enclosed and metal-clad, with vacuum circuit-breakers.

The 30 kV switchgears will be of the indoor type with rated busbar current 1.250A, short circuit capacity 25kA, rated feeder current 1.250A, composed of the following cubicles:

**One (1) incoming feeder for transformer 110/30 kV**

**Two (3) outgoing line feeders**

**One (1) outgoing spare feeder**

### Details of 30kV Equipment

30 kV indoor arrangements with a single busbar system with the following data:

- Rated Current Busbar 1250 A
- Rated Short Circuit Withstand Current common for all equipment 25 kA (3 sec)
- six voltage transformers  $\frac{30kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{3}$

The Transformer Feeder Incoming will be composed of the following:

- One (1) three pole three position switch 1.250 A
- one (1) three pole circuit breaker 1.250 A, 25kA
- three (3) current transformers 200-400/1/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for six single core cables
- low voltage compartment with the CPU of the control and protection equipment as specified in this document
- three (3) voltage transformers  $\frac{30kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{3}$

The Line Feeder NTARUKA will be composed of the following:

- One (1) three pole three position switch 1.250 A
- one (1) three pole circuit breaker 1.250 A, 25kA
- three (3) current transformers 200-400/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables
- low voltage compartment with the CPU of control and protection equipment as specified
- three (3) voltage transformers  $\frac{30kV}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{3}$

The Line Feeder BURERA will be composed of the following:

- One (1) three pole three position switch 630 A
- one (1) three pole circuit breaker 630 A, 25kA

- three (3) current transformers 100-200/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables
- low voltage compartment with the CPU of control and protection equipment as specified

The Line Feeder KIRAMBO will be composed of the following:

- One (1) three pole three position switch 630 A
- one (1) three pole circuit breaker 630 A, 25kA
- three (3) current transformers 100-200/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables
- low voltage compartment with the CPU of control and protection equipment as specified

The Spare Feeder will be composed of the following:

- One (1) three pole three position switch 630 A
- one (1) three pole circuit breaker 630 A, 25kA
- three (3) current transformers 100-200/1/1 A
- cable compartment for plug-in SF6/ cable sealing ends for three single core cables
- low voltage compartment with control and protection equipment as specified

The 30 kV switchgear room shall be adapted such as to have space for at least 2 additional feeders. The details technical specifications are indicated in this document

### **Control and Protection Panels**

One (1) combined control and protection panel for 110 kV bay and 30kV switchgear, complete with:

- One (1) Differential line for a T-off substation with four end
- One (1) micro-processor Bay Control Unit (BCU) for 110kV transformer bay as per specification in this document.
- Key-lockable selector switch for control positions LOCAL-OFF-REMOTE (may be included in BCU)
- Five (5) micro-processor Bay Control Unit (BCU) for 30kV Switchgear as per specification in this document
- One (1) Differential Transformer
- Set of material such as panel, wiring, terminals, etc.

### **Voltage Regulation**

The Power transformer tap-changer will be controlled by an Automatic Voltage regulator equipped with the following equipment:

- One automatic numerical controlled voltage regulator
- One numerical controlled parallel operation control unit, if not included in the voltage regulator
- Control selector switch (positions: AUTO-MANUAL-REMOTE)
- Tap-change control switch for 2 push-buttons for operation of the tap changer for RAISE/LOWER
- one digital tap position indicator
- Temperature indicator with selector switches to select oil temperature and winding temperatures primary and secondary.
- Alarm unit
- Set of indication and operation lamps
- Set of material such as panel wiring, terminal etc.
- One (1) Digital Voltage indicator 110kV
- One (1) Digital Voltage indicator 30k
- One (1) Scada communication interface IEC 103 protocol

### **SCADA system**

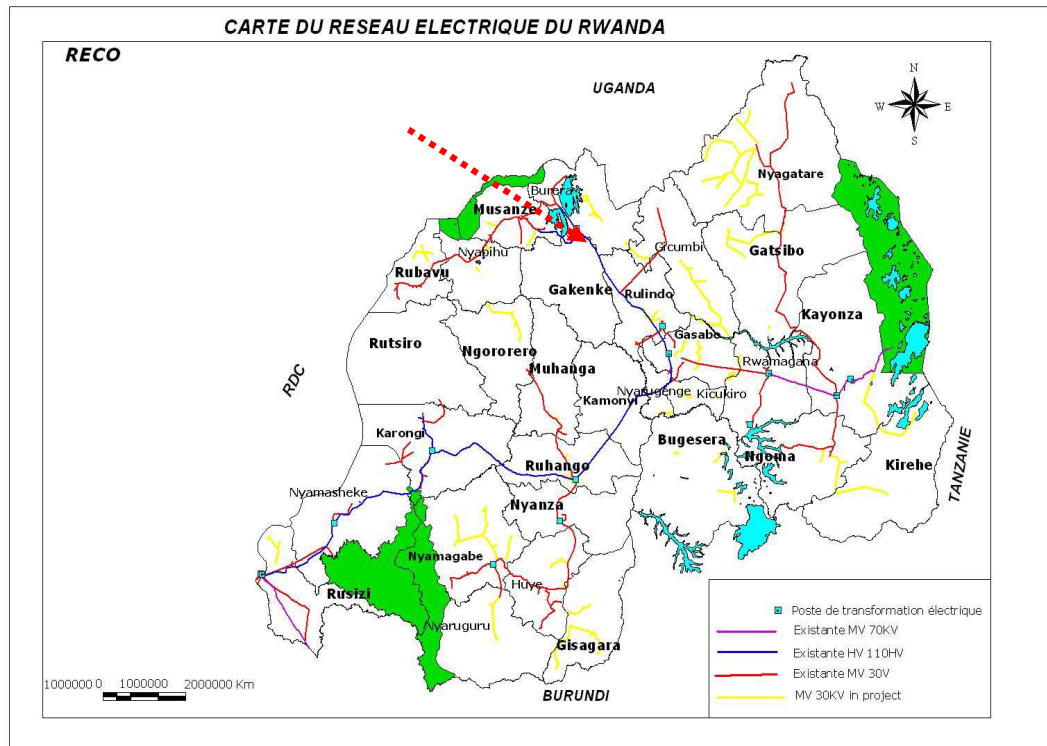
The substation must be equipped with the SCADA equipment to allow the integration of the substation in the existing national SCADA system. The system must be serial type and will be composed by following equipments:

- **One (1) RTU serial type**
- **One (1) communication equipment**
- **One (1) Splice box for optical fibre**

## DESCRIPTION OF THE ENVIRONMENT

### Location

Below the map indicating all the districts of Rwanda and the dotted arrows show the location of the Gifurwe substation situated in the district of Burera in the northern part of the country. The Gifurwe substation is located between Mukungwa in Musanze district with an approximate of 18 km and and 20 km from Rulindo substation.



## Description of the Physical Environment: Meteorology, Hydrography, Geology, Relief and Biodiversity

The project area is situated in the Northern zone in Burera district which is one of the five districts of the North Province, Burera is located in a mountainous area with abundant rainfall, water systems typically utilize springs with gravity-fed systems. Combinations of limited individual connections and public water points or kiosks exist at the village level. Community water supplies are increasingly managed by private operators with a growing network of technical support



*Type of Physical landscape in Burera District*

### Constraints and Potentialities of the Project Environment

General constraints of Northern zone are as follow:

#### **i) Physical constraints of the Project Area**

- A topography strongly marked with hilly landscape which make planning difficult;
- Existence of Landslides and soil erosion during the rainy season ;
- Vast rural areas yet to be planned.

#### **ii) Artificial constraints**

There are also other constraints created by men:

- The presence of slums in some urban areas ;

- Construction of residential areas in villages with poor road mapping thus origin of the soil erosion;
- The increase in population growth due to high birth rates.
- Pollution caused by household and city dump;
- Clearing of trees at high scale;
- Building without planning;
- The paths are steep and impassable during the rainy seasons;
- The roads in the peril-urban areas are in bad condition.

In spite of the constraints noted above, northern zone of Rwanda has the following potentialities:

*The soil fertility:* at the periphery of urban areas, the soil is very fertile and the population live out of farming and export of product such as tea and coffee. The northern zone also due to its fertile soils is a home to delicious Irish potatoes and thus serving the neighbouring zones as well as the city of Kigali.

*Tourism:* The northern zone of Rwanda is located within the tourist sites of *Virunga* and it's a home to one third of world's mountain gorillas. This is the reason one can observe the high interest in the construction and developing the energy sector in this province.

*Transport by Road.* The Northern Province is economically strategic due to its geographic location especially at the boarder points hence transporting of goods and people from either side of the boarder becomes easier.

*Services:* The position of northern zone gives her to develop the tertiary sector in providing service to the northern area of Rwanda and the South of the Republic of Uganda, such as Hotels, banks, insurers and telecommunication.

*The investment sector:* Northern Province has a speciality because of its physical and Geographical presentation where the agricultural and touristic activities are favourable due to its helpful relief. The Province Investment promotion in Northern Province primarily focuses on prospective investors in different areas such as: **Agriculture and Agribusiness, Construction and Real Estate; Energy; Finance; ICT; Infrastructure; Mining; and Tourism.**

## Description of the Socio-economic Environment

### Agriculture

Major economic activities are small scale businesses and agriculture. The Northern Province is leading in the production of food in country, the region has been blessed by its fertile soils and its geographical location as it bordered by Uganda in the north, and this also boosts business across the border. There is a variety of farm products cultivated in the higher altitude north and in the lower altitude central, east and southern parts of the province.

It has fertile agricultural land, producing crops like rice, maize, Cassava, Bananas, beans and coffee. Lush pastures support the cows which produce milk for nation, as well as sheep and goats.

## **Infrastructure**

The industrial sector in Burera District is not very well developed. In the district there are only 12 coffee processing centers and two centers for seedling variety improvement. This is usually brought about by lack of socio-economic infrastructure like roads, water, electricity etc. Roads covering a distance of 33km were constructed and these are Kaziba-Akarere, Kirenge-Rushashi, Buranga-Murambo. There were also small roads that were repaired during the monthly community work exercise covering a distance of 59.4km. Four bridges of Cyacika, Mugunga-Vunga, Kamina, Kivuruga were constructed.

## **Business**

The District of Burera indulges in trade through shops, small bars, restaurants and some hotels. There are some markets of which some are well constructed and others still operate without any roofing and traders have to endure the risk of rain and sun throughout the day. There are also micro finance institutions, banks and credit and saving cooperatives. The district also trades with the neighboring districts especially in agricultural products. The district has built and upgraded some markets and this has facilitated the smooth running of trade within the district. There is a remarkable increase in trade with more people getting involved.

There is need to encourage foreign investors to invest in the district especially in the agricultural sector due to the soil fertility in the district and abundance of cheap labor. There is also need to encourage the population to use modern methods of technology in order to increase their productivity and hence improve their standards of living.

## **Health**

The district of Buera has established family planning committees in all the villages in the district and family planning services are being offered in six secondary family planning posts put in place by religious organizations. The number of women that have been participating have grown from 8.1% to 16%, however, men have also been participating in this endeavor with 70 men in 2007 but have tripled to 288 in 2008.

The District upgraded some health centers including Muhondo, Coko, Bushoka, and Rutake Health Centers. These health centers helped in providing testing and counseling services (VCT&PMTCT) to more than 15,600 people.

People are being sensitized to look after their hygiene especially drinking boiled water, using clean food utensils, and cleaning their homesteads. At the village level, there are people responsible for monitoring how all this is being implemented. People have been encouraged to subscribe to the mutual health insurance and there is a big improvement with an increase in the number registered members. Some organizations and corporate companies have been helping the vulnerable and the poor to be able to pay for this mutual health insurance.

## POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### Policies Relevant to the Project

#### A. 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 priority policy 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.

The 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.

Below are the priority policy actions:

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

## **B. 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 that 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.

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 4<sup>th</sup> 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 4<sup>th</sup> 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 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.

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.

## Organic law on Environmental 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 law gives right to every natural or legal person in Rwanda to live in a healthy and balanced environment. They also have the obligation to contribute individually or collectively to safeguard country's natural, historical and socio-cultural heritage.

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 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 environmental 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 clause 1 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.

## Environmental Clearance Procedures

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 expansion of distribution network in Kigali City that involves construction of substation and electrical lines 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.

## International Legislations Relevant to the Project

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.

### 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.

### **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.

### **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.

### **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 national 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.

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
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal adopted on 22 March 1989



- Bamako Convention on the Ban of the Import Into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, adopted 30 January 1991
- Convention on Biological Diversity, 5 June 1992
- Convention on the Protection of World Cultural and Natural Heritage ratified 1997.
- Convention on the Means of Prohibiting and Preventing the Elicit, Import, Export and Transfer of Ownership of Cultural property ratified 2003.
- Ramsar (wetlands) Convention

## PROJECT ALTERNATIVES

This chapter describe and examine the various alternatives available for the sub-project. Alternatives examined during the study included site and route alternatives, on-grid electrification, and finally a No Project alternative was also assessed to determine the impact of this No Project Scenario.

### Analysis of Alternatives

#### A. Alternative 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, alternative 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, other power lines, etc.).

#### B. On-Grid Electrification

Provide on-grid electrification. This is the alternative that is proposed by this sub-project. Through this all target sectors will be provided with electricity from the existing grid system. The project is expected to significantly reduce demand for firewood, as this is the primary source of heating and lighting in these communities. This alternative will contribute positively to improving the lives of the target communities through reduced exposure to smoke, improvement in living conditions, increased communication via use of mobiles and opportunities for seeking alternative livelihood options. Local government institutions will also benefit through reduced time and money spent on sourcing firewood from local communities, as well as increase in accessibility to information through various media sources, internet and improved communication.

#### C. No Project Alternative

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.

### Comparison of Alternatives

The second alternative “providing on-grid electrification for the proposed sectors” is the most feasible in light of the easy availability of hydropower in the country, the positive environmental benefits, and most importantly because this is what the local communities prefer. The third alternative of “no-build” is not feasible because electricity is included as a measure of development in a village and therefore is always given high priority in the list of developmental activities for any district Development plan. It is impossible for the government to overlook this demand especially since the country is a major generator of Hydropower energy. While there will be no environmental cost from this alternative, with increasing population it is expected that

the demand for fuel wood will increase each year, putting very heavy pressure on the already dwindling forest resource.

## ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The table below presents the anticipated environmental impacts, corresponding mitigation measures related to the pre-construction, construction and operation phases of subprojects. Mitigation measures for pre-construction and operation phases shall be implemented by EWSA/EARP while those for construction phase shall be implemented by contractors.

Impact Description	Mitigation Measures
<b>Preconstruction (Planning and Design)</b>	
Land acquisition for substation construction, overhead line installation and upgrading of urban/rural grid and loss of income due to acquisition of agricultural land and plantation forests.	Resettlement Plans (RP) detailing compensation schemes, grievance mechanisms, monitoring and evaluation plan, and institutional arrangements will be prepared and implemented consistent with GOV and ADB requirements.
Land acquisition will require relocation of some households.	Prior to any site works, EWSA and MININFRA shall undertake compensation and relocation in coordination with affected families and local authorities.
Disturbance to agricultural land uses through permanent and temporary land acquisition	Carry-out detailed design of ROW and towers in a way that minimizes disturbance to agricultural land. Utilize tower designs that minimize ROW width and land use impacts. Adjust power line span length to avoid specific tower pad impacts.  As far as practical, schedule construction works to take place after crop harvesting
Safety risks due to presence of UXO	EWSA/EARP shall engage qualified organizations to remove UXOs prior to site works.
<b>Construction</b>	
Vegetation clearing for construction of new conventional substations and provision of buffer zones for high voltage lines	EWSA/EARP shall coordinate with affected families and local authorities for compensation of trees lost following Government/AfDB policies  Contractors shall confine vegetation clearing within required area, unnecessary cutting of trees shall be prohibited  As much as possible, contractors shall undertake vegetation clearing through manual methods. Use of herbicides shall be prohibited.  Contractors shall replant disturbed sites
Direct discharge of construction run-off may cause siltation of watercourses. Improper storage and disposal of excavation spoils, wastes and other construction materials could adversely affect water quality and flow regime.	Run-off and drainage control shall be provided in construction areas to avoid siltation of nearby watercourses.  Sediment laden construction water will be discharged into settling ponds prior to final discharge, if practical.  Earth, stones and solid wastes will be properly stockpiled and disposed of so that these do not block canals, rivers and creeks in the vicinity of the subproject sites.
Flooding of adjacent areas	Proper drainage shall be installed to avoid flooding of surrounding properties.
Improper storage and handling of fuel, lubricant and other hazardous substances could contaminate soil and water.	Fuel and other hazardous substances shall be stored in roofed, concrete-lined and bunded areas.
Oil leaks during replacement of old transformers.	Prior to replacement, old transformers shall be carefully checked to ensure that there are no oil leaks.  In case oil leaks occur, abatement and clean up measures shall be immediately implemented by the contractor to avoid contamination of soil and water resources.

	Handling, storage, transport and disposal of old transformers shall be undertaken following national and local regulations. Required permits shall be secured by the contractor.
Elevated noise and dust emission levels may be experienced by nearby households and other sensitive receptors.	<p>The following measures will be implemented to minimize impacts to local communities during construction:</p> <ul style="list-style-type: none"> <li>- Provision of cover on haul trucks transporting filling materials, gravel, excavated soil and other construction materials, access roads shall be regularly cleaned to keep these free from debris</li> <li>- Water spraying on exposed areas near residential and commercial areas to suppress dust emission,</li> <li>- Proper maintenance of equipment and use of mufflers, as appropriate, to minimize noise,</li> <li>- Speed restrictions for trucks and vehicles shall be enforced to minimize dust and noise emission</li> <li>- Scheduling of noise generating activities during daytime, as much as possible, to avoid disturbance to nearby communities; if evening construction is necessary, affected households and groups should be notified beforehand</li> <li>- Ensure all vehicles and equipment are properly maintained to meet emission standards and are covered by valid operating permits</li> </ul>
Disruption to traffic movements may occur due to construction- related activities.	<p>Proper coordination with local authorities regarding traffic flow supervision and diversion shall be made.</p> <p>Road closures and corresponding schedules as well as posting of traffic advisory signs to minimize traffic build-up shall be implemented in coordination with local authorities.</p> <p>Design travel routes for construction vehicles to avoid areas of congestion</p>
Irrigation canals in adjacent agricultural land, dykes may be damaged during construction.	Any damage to irrigation channels shall be immediately repaired and damages shall be compensated, as appropriate.
Access roads used during transport of construction materials and equipment may be damaged.	Restoration of damaged roads shall be undertaken upon completion of construction.
Failure to restore temporary construction sites.	All temporary construction sites will be cleared of debris and structures, ground shall be leveled (as necessary), revegetated (as necessary) and restored before turning over to communes and households.
Possible conflicts with and/or disruption to local community	<p>If construction worker camps are required, select the locations in consultation with local authorities.</p> <p>Train workers on suitable interactions with local community including prevention of transmissible diseases.</p>
Health risks due to unhygienic conditions at workers' camps.	<p>Basic medical care shall be provided at camp sites.</p> <p>Workers shall be provided with potable water supply and hygienic sanitation facilities.</p> <p>Proper storage as well as regular collection and proper disposal of solid wastes shall be implemented.</p> <p>Health and safety orientation shall be conducted for construction workers.</p>
Safety hazards during construction	<p>Workers will be oriented on safe practices and shall be provided with appropriate personnel protective gear (e.g., safety shoes, hard hats, safety goggles).</p> <p>There will be provision for adequate protection to the general public, such as safety barriers and warning signs in construction areas.</p> <p>Appropriate lighting shall be installed in construction areas when works occur after dark</p>
<b>Operation and Maintenance</b>	
Flooding of adjacent areas	Drainage facilities within and around the substation site shall be properly designed and constructed to avoid flooding of surrounding properties during operation phase.
Safety hazards	<p>An emergency response plan, adequate fire-fighting facilities and proper training of employees on fire prevention and control shall be provided.</p> <p>Unauthorized persons shall not be allowed within plant premises and adequate warning signs shall be provided.</p>
Impacts to water quality due to sewage	Toilets with septic tanks at office facilities shall be provided.

<p>generation</p> <p>Soil and water contamination due to leaks of hazardous substances</p>	<p>PCB-containing equipment shall not be used.</p> <p>Power companies shall secure hazardous substance management permit prior the operation.</p> <p>Leaks shall be repaired immediately and waste oil shall be stored and disposed of consistent with applicable laws and regulations.</p> <p>There shall be provisions for concrete-lined transformer bays as well as drainage and oil-water separator to handle spills, leaks and oily water run-off that could emanate from the transformers.</p>
<p>Gas leaks during operation could pose hazards to the environment and plant personnel</p>	<p>Substation equipment containing SF6 is gas-tight. The plant will be equipped with continuous gas monitoring apparatus such that any leakage would be discovered at an early stage and shall be repaired immediately.</p> <p>In case of leaks, inhalation of SF6 is non- toxic but may cause asphyxiation when oxygen level in the air is low. Provision of adequate ventilation throughout the plant premises will prevent this condition.</p> <p>A manual on safety procedures during operation and maintenance of the GIS facilities shall be developed and corresponding training of plant personnel shall be carried out prior to operation.</p>

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

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