

REPUBLIC OF RWANDA
Ministry of Infrastructure

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



Electricity Access Rollout Programme (EARP)

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**PROJECT BRIEF FOR THE CONSTRUCTION OF
TRANSMISSION AND DISTRIBUTION LINES FOR
GICUMBI AND GIKOMERO**

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LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
EMF	Electromagnetic Fields
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
IAPs	Interested and Affected Parties
IDA	International Development Association
LV	Low Voltage
MV	Medium Voltage
MININFRA	Ministry of Infrastructure
FORENWA	National Fund of the Environment in Rwanda
NDF	Nordic Development Fund
PPE	Personal Protective Equipment
PCBs	Polychlorinated biphenyls
PAPs	project Affected Parties
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	Energy, Water and Sanitation Authority

0. 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 Energy, 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 160'000+ 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 Ministry of infrastructure (MININFRA) on advice from the partners.

A number of development partners so far committed to support the program including World Bank IDA, World Bank GEF/ESMAP CEIF, African Development Bank, BADEA, OFID, Saudi Funds, Netherlands, Japan, and others.

It is in this regard that Rwandan Government through its cooperation with IDA applied for grant to undertake the construction of transmission and distribution lines in Gicumbi (19km of MV 15kV and 19 km of LV to have a total of 1140 new connection) and Gikomero (79 km MV 30 kV and 42km of LV to have a total of 3895 new connections) areas.

I. DESCRIPTION OF THE PROJECT

I.1. INTRODUCTION

This is a rural electrification project which is in the context of the effort of the Ministry of Infrastructure to meet the national Economic Development and Poverty Reduction Strategy (EDPRS) target to increase access to electricity on a national scale, and to supply reliable and affordable energy to Rwandan householders. This lack of electricity in some parts of rural areas caused concentration of economic activities in urban areas, causing a lot people to shift from nearby centres for green pasture.

The electricity access roll-out program aims at increasing connections, boost economic activities all over the country, direct and indirect creation of jobs and raise off-firm jobs. The ongoing EARP will enable energy sector stakeholders to connect at least 16% of the population or 350,000 customers to the grid by 2012. It is in this regard therefore that remote areas have been identified to benefit this grant.

Currently, the Rwandan transmission system is composed of 370 km 110 kV and 70 kV lines linking the southern substation Mururu II to Gikondo as well as the 70 kV line from Jabana to Rwinkavu. The transmission system has also eleven 110kV substations, and four 70kV substations that supply all Country.

According to the high energy demand the Rwandan generated electricity needs to be transmitted and distributed to the beneficiaries. It is in this line that there is a need of the construction of transmission and distribution lines in Gicumbi and Gikomero areas.

I.2. OBJECTIVES OF THE PROJECT

The purpose and objectives of this project are as follow:

- 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.

I.3. PROJECT ACTIVITIES

The project components shall consist of the construction of 19km of MV 15kV and 19 km of LV in Gicumbi to have a total of 1140 new connection and 79 km of MV 30 kV and 42km of LV to in Gikomero to have a total of 3895 new connections.

The Works will consist of:

- Construction and installation of MV and pole mounted transformer substation in along the transmission line in the subproject area
- Construction and installation of LV lines and poles along the distribution line in the subproject area
- Transportation of line building materials from Kigali to the Contractor's warehouse on site
- Storage and management of the materials in the warehouse
- Line and topographic surveys, profile calculations and calculation of structures and detailed plans for pole and cables
- Providing as built drawings of the lines.
- Arrangement of system shut-downs and outage notifications
- Testing and commissioning of works
- Inventory of damaged items in transit

I.4. CONSTRUCTION PROGRAMME

Lot 1

Proposed Construction Program

Month	1	2	3	4	5	6	7	8	9	10	11	12	13
Task													
Submit Detailed Program	█												
Line Profiling MV		█	█	█									
Line Profiling LV		█	█	█	█								
Order Materials					█	█							
Material Delivery						█	█	█	█				
Construction							█	█	█	█	█	█	█
Service Connections								█	█	█	█	█	█
Final Handover													█

Lot 2

Proposed Construction Program

Month	1	2	3	4	5	6	7	8	9	10	11	12	15	16	17	18
Task																
Submit Detailed Program	█															
Line Profiling MV		█	█	█												
Line Profiling LV		█	█	█	█											
Order Materials					█	█										
Material Delivery						█	█	█	█							
Construction							█	█	█	█	█	█	█	█	█	█
Service Connections								█	█	█	█	█	█	█	█	█
Final Handover																█

I.5. TECHNICAL DESCRIPTION

Description of Works

This Part of the document will give a detailed explanation of the works to be completed. The MV networks will mainly be constructed with 12m wood poles. Where anchoring of poles with a stay is not possible, or where the excavation for the stay will result in high expropriation cost, unsupported concrete poles will be used. The correct design strength for the pole must be calculated, and the correct foundation type must be used.

Allowance is made or some 14m wood and steel poles for special needs.

Conductors used include 35/6 and 70/12 and 120/20 mm² ACSR.

MV construction will be insulated on 30kV, although the Gikomero feeder (Lot 1) will be operated on 15kV.

Low Voltage lines will be constructed with ABC conductor on 9m wood poles.

The installation of service connections and split prepaid meters are included in the Contract. Prepaid meters will be supplied by EWSA.

The transformer sizing as well as LV and MV conductor sizing was done by means of a load forecast study and load flow analysis and is assumed to be accurate. The Contractor must report any instance where this information seems to be inaccurate due to actual consumers to be connected on the network.

The overall project plan is shown in figure 1 below.

For Lot 1, the total distance of MV line is 19km of MV line and 16km total of LV line.

For Lot 2, 76km MV and 107km LV ABC cable must be installed.

Line Profiling

The proposed line route is indicated in ArcGIS software. This route is an indication of the route to be surveyed by the Contractor. The positions of LV lines and transformers are given as accurate as possible and final surveying of this must be done by the Contractor. Conductor sizes were calculated in the preliminary design and the information is available from the ArcGIS database.

A number of poles with different strength specifications, as well as strain insulators are included in the BOQ. The Contractor must design the lines to fall within the specifications of this equipment as far as possible.

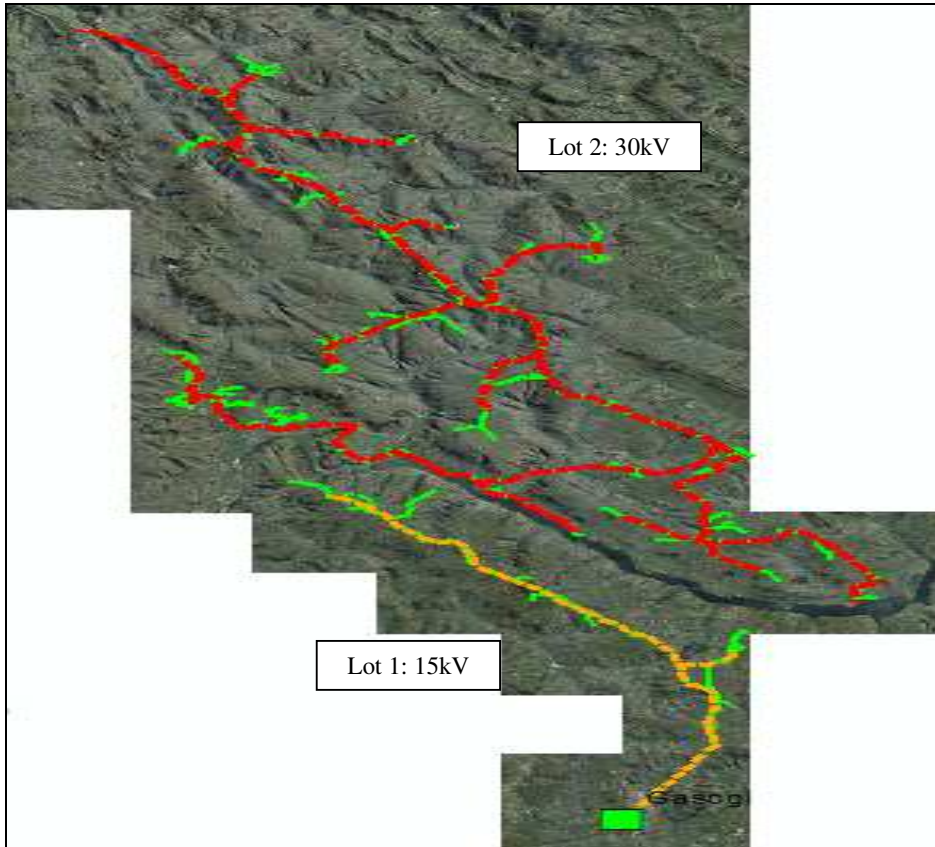


Figure 1: MV Line Route

General Technical Specifications

Scope

This section covers the general technical specifications for the electrical part of the works and consequently describes the supply, installation and commissioning of all the electrical equipment for the 30kV/15kV/400V networks in Rwanda. Where the specification refers to items not required for the project, the specific clauses shall be ignored.

Environmental Data

The project is located in an area of Rwanda with a climate characterized as sub-tropical to tropical.

The following summarised climate data will form the design data for the working conditions of the equipment:

Air Temperatures:

Maximum outdoor temperature +40°C

Minimum outdoor temperature	+ 5°C
Maximum daily average temperature	+30°C
Annual average temperature	+20°C

Rainfall

Annual average rainfall	1,500mm
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Solar Radiation

Maximum solar radiation	5,200 W/m ²
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Isokeronic Level

Average	70 days/year
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Altitude	> 1,500m
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Air Humidity:

Maximum at +35°C	95%
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Wind:

Maximum wind velocity	40 m/s
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Maximum Sustained Wind speed 29m/s

Safety Precautions

The contractor shall work strictly in accordance with the safety precautions of the Rwandan Government. The contractor shall take all the necessary precautions to ensure the safety of personnel when working on or near live electrical equipment. The Contractor shall notify the Engineer in advance of all switching or disconnecting of HV equipment.

The contractor shall hold monthly safety meetings and minutes of such meetings must be forwarded to the engineer.

Quality Assurance

The supplier shall provide current certification showing the manufacturer's compliance with ISO 9000 or equivalent national standard.

Packing and Shipping

Packing

All equipment, including accessories, shall be packed and securely clamped against movement in robust, wooden, non returnable packing cases to ensure safe transit from the manufacturer's works to the work sites.

All equipment be handled with due care. Specifically, poles shall not be bound together, they shall not be dragged along the ground and hand cant hooks, pole tongs and other pointed tools shall not be applied to the ground line section of treated poles. The packing shall provide suitable protection against all climatic conditions prevailing during transport and on site.

Equipment or material liable to deterioration by sea water, moisture, or ingress of foreign matter shall be totally sealed in strong polythene bags.

All accessories shall be carefully packed so that they are fully protected during transport and handling operations and in storage.

Internal surfaces of loose accessories shall be sealed off by means of gaskets and blanking off plates. Equipment and surfaces liable to deterioration due to condensation shall be protected by packs of silica gel or other approved desiccant.

The manufacturer or supplier may be consulted on the adequacy of warehousing arrangements and he or she shall be required to accept responsibility for the advice given, in so far as these arrangements may have a bearing on the behaviour of the equipment in subsequent service.

Poles shall be securely clamped against movement to ensure safe transit from the supplier's facilities to the site. All accessories (such as wood plugs) shall be carefully packed so that they are fully protected during transport and handling operations and while in storage.

Shipping or Inland Transportation

The contractor shall be responsible for the shipping of all plant and equipment supplied from abroad to the ports of entry and for the transport of all goods to site and for all the costs and expenses resulting from it, including customs clearance, offloading, warehousing and insurance.

All transport accessories, such as riding lugs, jacking pads, blanking off plates, etc. shall become the property of EWSA.

Each consignment shall be accompanied by a fully detailed shipping or inland transportation list in a sealed waterproof envelope. One copy of each information list shall be sent to EWSA prior to dispatching.

Hazardous Substances

The supplier shall submit safety data sheets for all substances used in the preservative treatment of the poles. These substances shall be classified in accordance with the European Union SI 426: European Communities (dangerous substances) (classification, packaging, labelling and notification) regulation, 1992, or any subsequent amendment.

The Contractor shall give an assurance that there are no other substances classified as hazardous with the poles supplied. The supplier shall accept responsibility for the disposal of such hazardous substances, should any be found.

The Contractor shall also be responsible for any injury resulting from the use of hazardous substances.

STANDARDS AND SPECIFICATIONS

LOW VOLTAGE AERIAL BUNDLE CABLES (600/1000V)

The present specification is applied to the isolated aerial bundled cables (twisted cables) for rated voltage U_0/U equal to 0.6/1 kV, with a cross-linked polyethylene (XLPE) insulating sheath and intended for overhead low voltage lines.

This specification fixes the characteristics of these isolated twisted cables and defines the tests to which they shall comply.

CABLE DESIGN

Conducting cores

The core of conductors has a circular stranded cross-section.

The wires of the support core neutral conductor are in aluminium-silicon-magnesium alloy.

Core of conductors other than neutral messenger is carried out in aluminium wires with purity at least equal to that corresponding to 1350 code in conformity with IEC 60889 standard.

The presence of weldings on the elementary wires of the stranded core is tolerated, but when one considers the whole of the wires of the support neutral, two consecutive weldings must be distant at least 50 m.

Insulating sheath

The insulating sheath is an extruded sheath in black colour reticulated polyethylene. It must be possible to withdraw it easily.

In the case of neutral messenger, a paper-type separator can be applied to the core.

For phase conductors, the presence of a separator is optional, but when there is one separator, it must be coloured in the mass and must be the same on all the twisted cable cores.

SPECIFICATIONS

Characteristics of the conducting cores

The aluminium wires used for manufacturing of phase conductor cores of abc cables without neutral messenger shall present before wiring, a tensile strength at least equal to 120 MPa.

The aluminium alloy wires used for conducting cores manufacturing of the support core neutral must present before wiring, the following characteristics:

Nominal diameter of wires: 3.15 mm for the 54,6 mm² for the neutral messenger

Linear expansion rate: $23 \cdot 10^{-6}$ per degree Celcius

Modulus of elasticity: 62.000 MPa

600/1000V GENERAL PURPOSE LV CABLES

The cable design offered for use at L.V. shall meet the following requirements.

Conductors

The conductors shall conform to IEC-228. Refer to Table 1 for conductor type and size.

Insulation

Cable insulation shall consist of polyvinyl chloride, **PVC**. Insulation thickness shall conform to IEC-502.

Armouring

Armouring shall be applied helically forming a layer of galvanised steel wire over an inner covering. Armour shall comply with the requirements of IEC 502, Clause 11.

Oversheath

All cables shall have a **black coloured P.V.C. oversheath**, which shall be embossed at regular intervals as per Clause 12.4 of this specification.

Core Identification

Individual cores shall be colour coded as per Table 1.

CABLE OVERSHEATH

The following requirements apply to 600/1000V cables.

The thickness of PVC oversheaths shall be in accordance with IEC 502.

PVC oversheaths shall be of a heat, moisture, and sunlight resistant material that is fire retardant and low acid emitting when subjected to the temperature limits of the underlying insulation. Solutions to which the oversheath is resistant shall include petrol, oil, acids and alkalis. The oversheath shall contain a termite, insect and rodent repellent of a permanent nature.

LV SERVICE DROP CABLES

This specification establishes the technical characteristics of single phase LV concentric power cables for overhead service drop with nominal voltage 0,6/1 kV. This cable is self supported type. Metal shall be **copper**.

The cable will be installed aerially between pole top and house meter.

CABLE DESIGN

Circular stranded hard drawn copper phase conductor, XLPE insulated with identified neutral and bare earth conductors arranged concentrically around it, polyethylene sheathed 600/1000v service connection cable. Nylon ripcord laid under sheath

Characteristic requirements

Phase cores constitution: Circular stranded hard drawn copper phase conductor, XLPE insulated

Neutral conductor: bare or isolated wires arranged concentrically around insulated phase conductor,

Communication pilot cores: a pair of isolated communication pilot cores to allow using the service drop cable with split prepayment meters. The pair of communication cores shall be isolated in proper colour of insulating matter, different from color of neutral wires insulation matter.

Outer sheath: Polyethylene sheathed 600/1000v house service drop cable with Nylon ripcord laid under sheath.

CONDUCTOR CHARACTERISTICS

Conductor characteristics shall be in conformity with the standard of reference.

The conductor will be delivered completely lubricated including the external layer with a neutral grease with respect to aluminium.

This grease must be in conformity with the requirements of standard NFEN 50.326; its dropping point ("point de goutte") must be at least equal to 105°C.

15KV DISTRIBUTION TRANSFORMERS

This specification establishes the technical characteristics of Three-phase 15KV/BT conventional overhead distribution transformers for distribution overhead network.

STANDARDS

The equipments shall comply with this specification and the following standards:

IEC 60076 : power transformer,

or

ANSI/IEEE C 57.12.90: Test code for liquid immersed distribution power and regulating transformer

ANSI/IEEE C 57.12.80: Power and Distribution transformer

ANSI/IEEE C 57.12.00: Liquid-immersed distribution Power and regulating transformer,

30KV DISTRIBUTION TRANSFORMERS

This specification establishes the technical characteristics of Three-phase 30KV/BT conventional overhead distribution transformers for distribution overhead network.

STANDARDS

The equipments shall comply with this specification and the following standards:

IEC 60076 : power transformer,

Or

ANSI/IEEE C 57.12.90: Test code for liquid immersed distribution power and regulating transformer

ANSI/IEEE C 57.12.80: Power and Distribution transformer

ANSI/IEEE C 57.12.00: Liquid-immersed distribution Power and regulating transformer.

TRANSFORMER LV DISTRIBUTION BOX

LV DB

LV equipment shall be housed in a Galvanized box with two hinged doors and lockable latch. The cost for padlocks shall be included in the LV DB price.

Mounting of the box shall be by means of fixing it to two (2) lengths of suitably sized Galvanized angle iron mounted between the poles below the transformer for the new pole mounted transformers.

The box shall have an insulated neutral busbar connected to the neutral bushing but insulated from the body to a basic insulation level of 1000V.

The box shall have a gland plate to accept 2 x 95mm² 4 core armoured copper cables from the transformer LV bushings.

A reliable earthing terminal, having a clamping screw or nut, for connection to an earth conductor suitable for the fault condition specified shall be provided. The diameter of the clamping screw/nut shall be M12 or greater and shall be connected to the HV earthing system.

Phase rotation will be indicated in the door of this box.

15KV SURGE ARRESTORS

This specification establishes the technical characteristics of arresters designed to protect equipment and used to limit overvoltages on the distribution overhead network.

STANDARDS

The arresters shall comply with this specification and the following standards :

IEC 60099-4 : Surge arresters - Part 4 : Metal-oxide surge arresters without gaps for a.c. systems.

Or

ANSI/IEEE C-62-11: Arresters for AC power circuits.

CHARACTERISTICS OF NETWORK

The arresters will be installed on the 3 wires overhead network with isolated neutral:

Nominal voltage of network : 15 KV.

Maximum voltage of network : 16.5 KV.

Frequency : 50 Hz

30KV SURGE ARRESTORS

This specification establishes the technical characteristics of arresters designed to protect equipment and used to limit overvoltages on the distribution overhead network.

STANDARDS

The arresters shall comply with this specification and the following standards :

IEC 60099-4 : Surge arresters - Part 4 : Metal-oxide surge arresters without gaps for A.C. systems.

Or

ANSI/IEEE C-62-11 : Arresters for AC power circuits.

30KV INSULATED FUSE CUTOUTS

This specification establishes the technical characteristics of MV fuse cutout for overhead distribution network operated on 15kV or 30kV, but insulated on **30KV**.

STANDARDS :

Cut outs shall comply with this specification and the following standards :

ANSI/IEEE C-62-11 : Arresters for AC power circuits.

ANSI C 37.41: IEEE Standard Design Test for High Voltage Fuses, Distribution Enclosed Single Pole Air Switches, Fuse and Accessories.

or

IEC 60282-2 : High Voltage Fuses.

IEC 61109 : Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria.

WOOD POLES

The present technical specification concerns the supply of wood poles intended for the construction of electrical distribution (Medium voltage and low voltage) overhead lines regardless of their rated voltage.

NORMATIVE REFERENCES

The following standards are applicable to the present specification

NFC 67-100 : wood pole for overhead lines-specifications.

EN 12490 : Durability of wood and wood-based products — Preservative-treated solid wood — Determination of the penetration and retention of creosote in treated wood

EN 12465 : Wood poles for overhead lines- Durability requirements

EN 12479: Wood poles for overhead lines-Sizes- Methods of measurement and permissible deviations

EN 12510 : Wood poles for overhead lines-Strength grading criteria

EN 50423-1 : Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV – Part 1 : General requirements – Common specifications

EN 12511: Wood poles for overhead lines- Determination of characteristic values

EN 60652 : Loading tests on overhead line structures

EN 12509 : Timber poles for overhead lines-Test methods- Determination of modulus of elasticity, bending-strength, density and moisture content

SABS 754 (latest version): Eucalyptus poles, cross-arms and spacers for power distribution and telephone systems

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

NB: Wood Poles proposed according to SAS Standard shall have at least the minimum pole characteristics required by NFC 67 100.

PRESERVATIVE TREATMENT

Wood specie and preservative treatment:

The adopted treatment process shall be compatible with the proposed wood specie, in accordance with NFC 67 100 standard or equivalent. The supplier shall indicate the proposed specie and adapted preservative treatment in its offer.

Freshly felled poles are accepted as well as dried poles. The preservative treatment process shall be adapted to each of both cases, in accordance with NFC 67 100 or equivalent.

For dry poles, drying minimum period of time shall be at least 6 months for the smallest poles.

CONCRETE POLES

The present technical specification concerns the supply of Prestressed Concrete poles (PCP) intended for the construction of electrical distribution (Medium voltage and low voltage) overhead lines regardless of their rated voltage.

NORMATIVE REFERENCES

The following standards are applicable to the present specification

EN 12843 : Precast concrete products Masts and poles

NFC 67 – 250: Prestressed Concrete poles

NFC 67 – 220: Supports for overhead lines- Concrete poles of Class D and E

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

STEEL POLES

This Technical Specification covers the technical characteristics of welded round conical steel poles (“tubular”) used in overhead distribution systems, regardless of their rated voltage.

STANDARDS:

The following standards are applicable for the present specification:

EN 10025: Hot rolled products of structural steel

EN 10149 : Hot-rolled flat products made of high yield strength for cold forming

EN 10079 : Definition of steel products

NFA 35 - 503 : Steel for galvanization by hot immersion.

ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.

ISO 14713: Protection against corrosion of iron and steel in structures - Zinc and aluminium coatings - Guidelines.

Any other international standards guaranteeing for this type of material a quality higher or equal to the standards above mentioned are also accepted.

SETTING OUT AND ERECTION

General

Wayleaves and right of access facilities, subject to the requirements of landowners and tenants will be provided by the Employer, but the Contractor will be responsible for the provision of access routes or tracks along the line routes to enable him to carry out the erection of the transmission line.

The Contractor will be provided with a set of plans showing the routes of the transmission lines and any setting out details which may be required. The terminal points at ends of each line will be indicated by the Engineer.

The Contractor shall set out the route of the line determining the alignment and the co-ordinates of all terminal and turning points. The work shall be undertaken by competent surveyors who are familiar with the requirements and working conditions.

The route shall be pegged on the centre-line by means of steel pins positioned every kilometre, or such smaller distance as may be required to provide intervisibility between intermediate points. Each turning point shall be pegged and referenced by providing four additional steel pins, giving a means of relocating should the turning point marker be displaced or removed. Each turning point position and reference system shall be recorded on a field distance. The fourth peg shall be placed in any convenient location and recorded. Where distinctive features are present these shall be recorded also. The steel pins shall be 16mm diameter and not less than 750mm long, and shall be driven into the ground to leave 50mm protruding.

At overhead line or telephone crossings where the line being surveyed crosses between two poles or structures, the conductor height shall be assumed to be an imaginary straight line connecting the uppermost attachment point on the two poles or structures and not the actual height of any conductors at the crossing point.

Field sketches of all power and communication line crossings shall be made at the time of setting out, show the general disposition of conductors, insulators and earth wire. The pole height to the upper attachment shall be measured accurately from the elevation datum.

Planting Depth

Poles excavations shall normally be as follows:

USE	LENGTH (m)	PLANTING DEPTH (mm)
LV	9	1500
MV	12	1700
MV	13	1800
MV	14	1900
MV	15	2000

Backfill and Compaction

Backfilling and compaction of the hole shall be done in layers of not more than 200mm. Each layer shall be compacted to the normal adjacent soil density or better. Manual or mechanical means of compaction may be used. Inspections of compaction density shall be done by the Engineer.

All excavated material must be returned in the foundation, and no material should be left over.

Pegging of Structure Positions

The Contractor shall be responsible to ascertain the correctness of structure positions on site according to the drawings and shall, where so required, re-measure and determine positions in conjunction with the Engineer. The co-ordinates for each pole shall be accurately measured and the type of structure, i.e. strain, intermediate, etc, shall be noted.

The as-pegged as well as the as-built information shall be submitted to the Engineer in both hardcopy and ArcGis software format.

Network poles must be available to every consumer stand after construction allowing an average of 4 consumer connections per pole. The network shall stop within 40m of each house in the zone under construction.

Site Preparation

The Contractor will be responsible for the pruning or complete removal of trees where necessary along the routes of overhead lines.

Where trees are to be removed, the Contractor shall completely uproot the relevant trees by means of a monkey winch or other approved methods, and stack them in a position approved by the Employer or Engineer. All holes caused by such uprooting shall be filled by him to leave the site clean and tidy, all to the satisfaction of the Engineer. Utmost care shall be taken when uprooting trees, as the Contractor will be responsible for all the claims due to any damage and/or injury caused by such uprooting of trees.

Where the branches of trees are to be pruned, such pruning shall be neatly carried out in an effective and workmanlike fashion to the satisfaction of the Engineer.

Unless specifically indicated otherwise herein or on the accompanying drawing, Tenderers shall allow in their tenders for:

The removal of trees, except shrubs, with trunks within 5m from the nearest conductor along the routes of all lines.

The pruning of all tree branches, along the routes of all lines, in such a way that no branch will project through a vertical plane parallel to and 3m from the nearest conductor, on the understanding that such branches of which the highest points are below 6m above ground level need not be pruned unless it is within 3m from any pole.

Protection of Natural Vegetation

The Contractor shall exercise proper care not to destroy damage or remove any natural trees and vegetation, except where he is instructed or given permission to do so in cases where it is unavoidable. No trucks or plants shall be allowed to run over areas not specifically set aside for this purpose.

The Contractor shall take care not to have field fires developing from his site. He shall be responsible for any losses and claims, which could arise from field fires starting due to his negligence. In the case of any field fires threatening the site, he shall give all assistance to protect the site against such fires from elsewhere. The Contractor shall at his own expense do all the protection as described and shall not be specially paid for any fencing or fire breaks, etc.

The following trees shall under no circumstances be uprooted or damaged in any way except with the consent of the Engineer:

Transvaal Ebony	<i>Diospyros mespiliformis</i>
Baobab	<i>Adansonia digitata</i>
Wild Fig	<i>Ficus Capensis</i>
Cape Ash	<i>Ekebergia Capensis</i>
Yellow woods	<i>Podocarpus</i>
Stinkwoods	<i>Ocotea Bullata</i>
Kiaat	<i>Pterocarpus Angolensis</i>
Tambotie	<i>Spirostachys Africana</i>
Cabbage Tree	<i>Cussonia's</i>

CONSTRUCTION

When the Contractor is about to commence work on any property he shall be responsible for ascertaining from the Engineer that the Wayleaves are in order and give the occupier of such property adequate notice of the commencement of the work.

If the Contractor wishes to make a camp on any property he shall first obtain written permission to do so from the occupier of such property. All staff shall be provided with badges indicating their employment by the Contractor and adequate supervision shall be employed to protect the interests of the occupier of the property.

When the Contractor is about to carry out erection of the conductors or installation of earth electrodes or counterpoise along or across public roads, telegraph or telephone lines, railways or across power lines he shall be responsible for giving the requisite notice to the appropriate authorities of the date and time at which he proposes to perform the work.

Where the local authorities and other public undertakings affected deem it necessary for the protection of the public and the assistance of traffic, to provide flagmen or watchmen or installation of warning lights, etc., the cost of such provision shall be borne by the Contractor.

The Contractor shall be held responsible for any injury to the Public and damage to livestock due, in the opinion of the Engineer, to failure to comply with the above requirements.

In the event of any dispute or questions of damage or for the adequacy of provisions made for permanent or temporary replacement or repair, the Contractor shall at once inform the Employer.

II. DESCRIPTION OF THE ENVIRONMENT

II.1. DESCRIPTION OF THE PHYSICAL ENVIRONMENT: METEOROLOGY, HYDROGRAPHY, GEOLOGY, RELIEF AND BIODIVERSITY

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 of impacts and influence the overall direction in the development of the project.

Project Location

The two projects are located in the Northern Province for Gicumbi lot and in Kigali City for Gikomero Lot. Further details are described below:

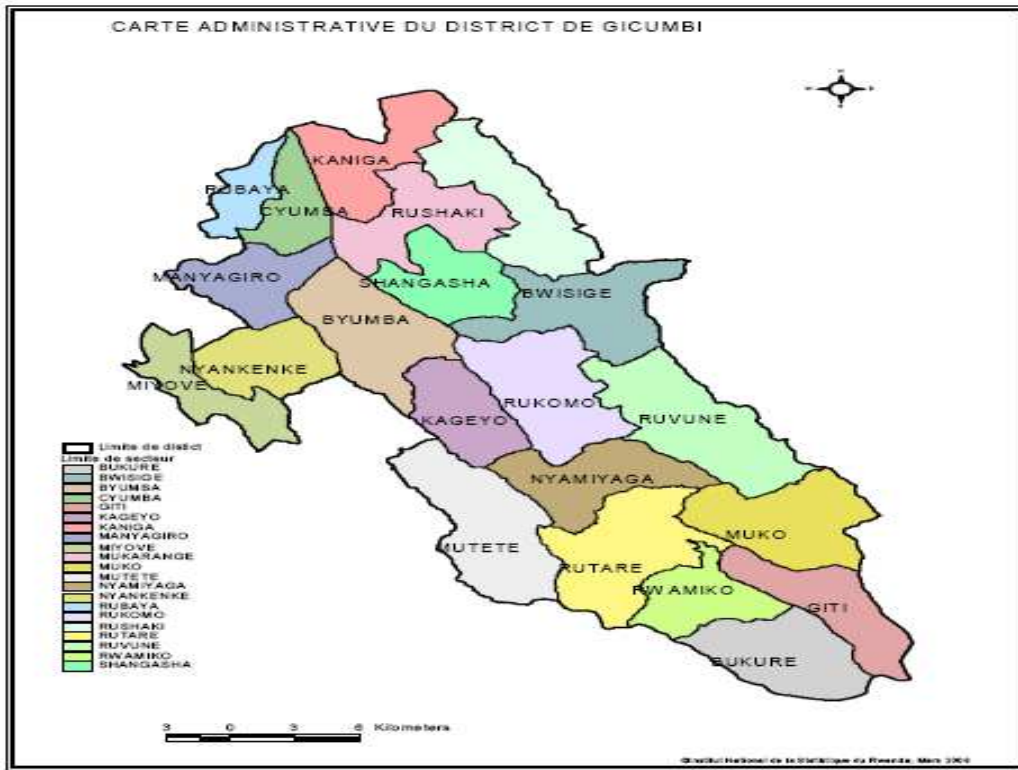
GICUMBI DISTRICT

Location and geographic data.

Gicumbi district is one of five (5) districts of the Northern Province. It is located in the East of this province. Gicumbi district includes large parts of the old districts of Rwamiko, Rebero, Rushaki, Bungwe, Kisaro and the City of Byumba. Its area is 829 km². The district includes 21 sectors, 109 cells and 630 villages. The district lays due-north of Kigali, straddling the major road from Kigali to Kampala. It is a hilly district.

The district includes the following limits:

- North: From West to East, the district of Gicumbi respectively bounded by the Burera district, Rwandan-Ugandan border and the district of Nyagatare.
- In the East: From North to South, the district of Gicumbi is limited by the districts of Nyagatare, Gatsibo and Rwamagana.
- In the South: from East to West, the district of Gicumbi has the border with Rwamagana and Gasabo districts
- To the West: from South to North, the district is limited by Gasabo, Rulindo and Burera districts.



Relief.

The relief of Gicumbi district is very rugged with steep slopes where the altitude culminates at 2500 meters. The valleys are deep and narrow. To the East, there are rather plains with altitudes ranging between 1 500 and 1 800 meters. To the South, Muhazi Lake has an altitude of 1500 meters and is the border between the two districts of Rwamagana and Gasabo

Hydrography.

The major rivers in the district are: Mwange, Mulindi; Muturirwa, Walufu and Bulimba. Gicumbi district has also a few water supplies scattered here and there and likely to provide hydro-electrical power. The flow of these rivers and supply systems varies seasonally. Despite this abundance of water sources, the district's population suffers from drinking water shortage, since most of these sources are in the lowlands (valleys) while the population prefers to live in the slopes and hilltops. Thus, conveyance of water by gravity is not possible and the installation of the pumps is expensive. Gicumbi district shares Lake Muhazi with other districts namely Gasabo, Gatsibo and Rwamagana.

The whole river system of the district of Gicumbi belongs to the Nile Basin. The density of the network is important in the West, the regime is torrential and rivers are often cut off from falls or rapids that can produce electrical energy. Several rivers and streams can have flooding during the rainy season and abruptly fall during the dry season, hence the difficulty to know exactly their flows.

Gicumbi district has one lake; Muhazi. It has a large marsh with plenty of water. Exploitation for agricultural purposes is prohibited so as not to deplete water of Burera and Ruhondo districts. Despite all this rich hydro potential, the district of Gicumbi lacks drinking water. People live in the tops of the hills yet the water sources are in the shallow valleys. Because of the very rugged terrain, the piped water by gravity is rare. Water supply by pumping is very expensive and difficult to maintain.

Agro-climatic zones.

According to the classification of agro bioclimatic Rwanda (Agricultural Agenda 2003, soil map), the district of Gicumbi belongs to three agro-climatic zones:

- In its north-south axis, from Kaniga sector to Rutare sector, the district is in the area of the highlands of Buberuka characterized by a very hectic terrain, a succession of steep hills separated by valleys, a high altitude varying from 1 800 to 2650 meters, rainfall varies from 1 200 to 1 564 mm, an average annual temperature of 15-16 ° C and land degraded by rain erosion.
- In the East South axis, from Bwisige sector to Bukura sector there is the zone of plateau in the Est, characterized by a relief of less tormented interfluves of Muhazi-Nyabugogo basin, an altitude ranging between 1 500 and 1 600 meters, an average annual rainfall of about 1000 mm and an average temperature of about 23 ° C.
- And finally, in its western part, covering a of big part of Mutete and Rutare sector is the area of the Central Plateau characterized by an interim relief, an altitude from 1 600 to 1 800 meters, an average annual rainfall of 1000 to 1 100 mm and an average temperature of about 20 ° C.

Climate.

The climate of the district of Gicumbi alternates between dry and rainy seasons with winds from the tropics and the monsoon from the Indian Ocean and Lake Victoria. The area of the eastern district enjoys a temperate climate with an equatorial average annual temperature of 20 ° C. In the region of high altitude, the annual average temperature average oscillates between 11 ° C and 15 ° C. Towards the altitudes of 2000 meters, the climate is cold and wet.

In general, rainfall is abundant but irregular, sometimes improvised during the dry season. There are often major landslides during the long rainy season. In the mountainous area in the western part of Gicumbi district, the rainfall exceeds 1200 mm per year whereas the average is 950 mm per year in the East

Soils.

Overall, the soils of the of Gicumbi district are kaoli soils which are dominated by shales, the mica and quartz. They are acidic (pH around 5) and have a high content of clay, well developed topsoil and an acceptable level of exchangeable bases.

- The group of kaolin dominates quartz and shales with a high content of clay;
- Soils derived from shales in fine silt with high water retention;

The ferric-soils rest on a lateritic layer of varying thickness from which agricultural value depends on the state of conservation of the humus layer which is often very low, their vocation is often forestry and pastoral;

- The ferric-soils and litho-soils on quartz rich in gravel and stones
- The very stony soils on quartz for the sole purpose of forestry;
- Organic soils of valleys with high agricultural potential but with very indispensable drainage,

In all kaoli-soils, the ferric-soils have the high potential fertility provided that anti-erosion measures required by the very rugged terrain, save their humus layer. In general, soil productivity of Gicumbi decreases year by year due to rainfall erosion caused by terrain and as a result of the overexploitation of land due to population pressure and lack of organic manure.

GASABO DISTRICT

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 Ngiryi) Gasabo (Bumbogo sectors, Gasabo, Gacaca I & II, Gikomero, Gishaka, Jurwe Karama, Kayanga, Nduba, Sha, Shango, and Rubungo Rutunga).

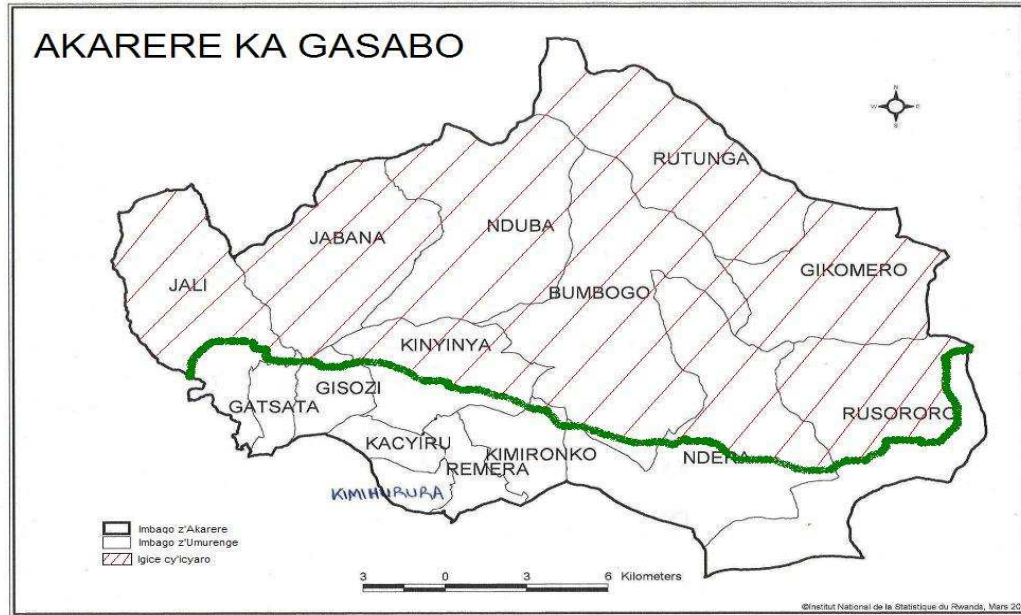
Gasabo is a district (akarere) in Kigali Province, Rwanda. Its capital is at Kacyiru, a village on the outskirts of the Kigali urban area. The district also includes large areas of the city itself, including Kacyiru, Remera, Nyarutarama and Kimihurura.

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 km ², 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.

The district of Kicukiro is situated to the South of Kigali city, the capital of Rwanda. The district is delimited to the,

- South by the district of Bugesera, Eastern Province
- West by the district of Nyarugenge, Kigali City
- North by the district of Gasabo, Kigali City
- East by the district of Rwamagana, Eastern Province



Source: DDP of Gasabo District (2010)

Relief

The terrain of Gasabo district is dominated by high altitude mountainse (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.

Flora and fauna

Natural vegetation is almost nonexistent 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 latiforialis*.

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).

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,).

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.

Demographics

Population of Gasabo District by sector

Number of sector	Population 2007	Area (Km2)	Density (Km²) 2007
Bumbogo	21289	60,0727	354
Gatsata	33515	6,0156	5571
Gikomero	16872	34,8095	485
Gisozi	18452	8,4834	2175
Jabana	27734	36,4359	761
Jali	26509	37,4999	707
Kacyiru	23648	5,8119	4069
Kimihurura	35741	4,8758	7330
Kimironko	44918	11,4356	3928
Kinyinya	39649	24,5943	1612
Ndera	23387	50,1650	466

Nduba	17983	46,7201	385
Remera	26925	7,0307	3830
Rusororo	30412	52,4736	580
Rutungu	23451	42,7826	548
Total	410485	429,2066	957

Source; District Development Plan Gasabo

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.

II.2. DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT

GICUMBI DISTRICT

Population of Gicumbi district

The total population in Gicumbi is 362 331 inhabitants with 172 144, or 47% are men and 190 187, or 53% are women. The density is 437 inhabitants per km².

Areas of human development.

Health

As elsewhere in Rwanda, the public health system is based on primary health care strategy. The geographical distribution of health facilities is satisfactory with an average of health center per sector.

In the community of Gicumbi district, we find a ratio of a doctor and 15.4 paramedics per 100 000 people against 1.8 doctors and paramedical 17.9 100 000 people at the national level, as elsewhere in Rwanda, much of the personnel (50.7%) are concentrated in the city and qualifications of the staff do not always match the needs of service. The formal private sector in health is still not widespread, except for some concentrated medical offices, especially in cities

The traditional medicine (Tradi-practitioners, traditional birth attendants, etc.) occupies a large part in the health region. But everything remains to be redefined because often many confuse them with the charlatans who watch as looking for their own profits.

Furthermore, as foreign aid has declined significantly recently in Rwanda from \$ 20 million between 1994 and 1999 to less than \$ 10 million in 1999-2000 (Vision 2020) and the Rwandan government in financing health, has increased from 2.2% of the national budget in 1997 to 4.1% in 2000, rates are still very low compared to WHO recommendations (12% of the national budget) while the rate Inflation stabilized at 2.1%. (MINECOFIN, Department of Statistics, July 2001.)

The first causes of morbidity are respectively malaria, the parasites, skin diseases, trauma, malnutrition and problems gynecological - obstetric. The abortions are prominent among the reasons for hospitalization for gynecological problem Gicumbi district. The rate of assisted

deliveries is only 38.6%. All health facilities have inadequate staffing in both quality and quantity. All health facilities have now integrated the system of mutual health organizations in their activities, but membership rates vary from one formation to another, ranging from 60 to 89.5%. The average rate was 74.5% in April 2007. (Gicumbi district report, 2007).

Habitat

The habitat is a serious problem for the district of Gicumbi. In general, it is dispersed and further complicates the difficult access of the population to basic social services (health care, drinking water, electricity, education,) and the development of communication. This mode of dispersed settlement has another drawback that is the excessive fragmentation of land and miniaturization of family farms, making these economically unviable. The population seems to understand all these constraints and remains open to the consolidation of a coherent policy will specifically be identified and serviced (sanitation, water and sanitation, education, electricity, roads, pharmacies, markets, etc). In the urban area of Byumba, the protocols of urbanization have not been met; the urban habitat is disorganized.

Water and sanitation

The hydraulic network of the district of Gicumbi is dense. The area has high altitude sources including the capture and conveyance by gravity can serve many families. There are also shallow sources that can be improved to feed the population. Overall the lack of access to clean water is still outstanding; the average access for the entire district is 1.582m away.

Economic Development Sector.

Agriculture

Agriculture in the district of Gicumbi occupies over 90% of the population. The agricultural production system is characterized by the family farm, and remains farming for substance. This agriculture is dominated by food crops (beans, maize, sorghum, small weight, potato, wheat, vegetables, passion fruit, sweet potatoes, cassava, banana, soybeans, etc..) and two industrial crops namely coffee and tea. Agricultural tools available are practically limited to the hoe and the machete.

Breeding

In general, the district of Gicumbi we notice the lack of modern livestock infrastructure. As for improved pastures, the only area that stands out is Manyagiro sector in which vulnerable

families received an improved cow an arithmetic mean of 60 acres of forage.

Two veterinary clinics and 42 races for the entire district which seems very inadequate to the development of this sub-sector. Concessions for intensification inputs are very rare, and when they exist, they are rather empty.

Beekeeping.

Beekeeping is partially exploited using traditional techniques. The hives are mostly of wood (i.e. traditional) and are not well designed in a way that sometimes the swarms of bees often die during periods of rain. The productivity is still low.

Afforestation

A commendable effort has been made but there is not enough because the forest area of the district represents 5%, while the objectives of MINAGRI / MINIRENA is 30%. Hence, 5% of the existing, private sector proportion is 76%, allowing one to hope definite improvement in the near future.

Infrastructure

Gicumbi district has a range of infrastructure in relatively good conditions which scattered throughout the district and administrative localities as detailed below:

- Existence of the urban center (City of Byumba)
- Existence of administrative infrastructures
- Existence of the national electric lines (via Ntaruka) and foreign (via Kabare)
- International asphalt road that joins Kigali and Gatuna
- Existence of the inter-district and inter sectoral roads
- Telephonic network existing (stationary and portable)
- Existence of the farming agglomerations (imidugudu)

Education

Gicumbi district the following education levels for formal: the nine year basic education, secondary education, professional education, university education and functional elimination of illiteracy.

The district of Gicumbi currently has 148 nursery schools, 90 nine year basic education schools including 3 that are privately owned, 27 secondary schools including 6 which are privately owned, 6 Youth Training centres commonly known as CFJ of which 1 only is publicly owned, 173 Centres for illiteracy elimination and 2 Institutes of higher learning: Polytechnic institute of Byumba (IPB) and Higher Institute of Health of Byumba.

Land and housing

The process of distributing land begins with preparing agglomerates because it was discovered that the essential infrastructure that can bring economic and social development must be brought to agglomerates so that people can get attracted to live there.

According to MINALOC program, people should live in well arranged villages, because of that Gicumbi district prepared at least one village in each sector so that it can be used as exemplary to others and this village should be having all the essential socio-economic infrastructure.

Gicumbi does not have a good town plan. The settlement, up to now, is still dispersed, the biggest number of the houses is not well constructed and they are dispersed on the slopes of the hills. It is a very small number of people that are living in agglomerates.

This dispersed kind of settlement does not allow many people to easily get access to essential socio-economic infrastructure. And it also does not favor agriculture because it is not easy to cultivate or graze on scattered pieces of land. It does not allow access to land for agriculture and the problem of the cultivable land is very crucial in this district.

In addition, dwelling houses are built in poor quality and nondurable materials. Most of these materials, in almost the whole district are made out of mud bricks with straw roofing.

Industry

The industrial sector is almost non-existent in Gicumbi district due to lack of essential infrastructure like electricity, water, and roads. However, a few processing units of agricultural products are in place with an aim of increasing the value of certain products like coffee that represent a considerable economic potential for the district.

The art and craft industry is usually practiced at the level of associations and individuals. The major artisanal activities are masonry, shoe making, carpentry, pottery, brick making, joinery, hair dressing, weaving, watch, radio and bicycle repairing.

The low capacity of organization and management of craftsmen, lack of raw materials, insufficient incomes, weak purchasing power, difficult in accessing foreign markets as well as not having quality products that can compete on the international market are some of many factors which contribute to the lethargy of the arts and crafts industry.

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 labour. 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.

Tourism

The tourism sector in the district can be a source of employment to a big number of people. It is not yet well developed in the district in spite of its potential to create jobs and generate income. Yet the tourist attractions are available in the district whereby we find high mountains that offer beautiful panoramic views of the volcanoes.

There are also several Hotels like Hotel Urumuli , restaurants and bars that can accommodate tourists. Although they are not many but plans are being put in place to build more and encourage investors to invest in this sector. There are also five centres of welcome at Rwesero, Karambo, Rukomo, pastoral Centre, and at the EER Diocese in Byumba.

Trade

Gicumbi district's trade is mostly practiced through shops, small bars, restaurants, and some other two small hotels. There are some markets amongst which some are well constructed

others still operating from places that are not roofed in such a way that traders have to endure the rain and the sun that bothers them a lot and spoils their merchandise.

There are even micro finance lending institutions and savings cooperatives that help people to access financial facilities.

The district indulges in trade with the other districts that it shares the borders with especially in agricultural products. The district built and rehabilitated some markets and this helped greatly in improving trade within the district. Trade in the district is improving as more people participate in it.

There is need, however, for well constructed markets so that traders can practice their trade better and trade would be generally improved in the district. The district is encouraging investors to invest in trade because there are profits especially in the agricultural sector.

GASABO DISTRICT

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.

BREEDING

Type of livestock practiced in the district are cows, goats, sheep, pigs, chickens, rabbits and guinea pigs. Farming practiced is extensive but a few farms where cows are raised exotic from Europe and South Africa. To improve profitability, artificial insemination of traditional cows is practiced. The cattle raised in barns represent 78% of all livestock present in Gasabo District.

The NGO "send and Cow" is active in the District of Gasabo by training farmers and distributing improved livestock mainly cattle and goats. Some challenges reported in this area are poor integration of agriculture and livestock, the continued threat of animal diseases and pandemics and the low value of livestock products.

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.

The oil lamp is the most widely used by households as light sources. Other energy sources such as biogas, peat, which can be initiated and operated centers of secondary school and prison is almost unknown in the District. Power generators are used by high-income households if there is current load shedding from EWSA.

WATER AND SANITATION

The main sources of water are public taps fitted. The major problems in this area are the remoteness of the population to water sources and the long lines because of low flow. The managed and unmanaged sources are insufficient.

The rural part of the District uses water pumps that are outdated and inadequate. In the areas of Rutunga and Gikomero, the engines are used, but the water needs of the population does not make them happy. As for sanitation, the main challenges encountered in this sector are related to lack of collective system of disposal and treatment of sewage and other domestic waste, as well as collection and drainage of rain.

EDUCATION

The literacy level is 65% for men and 59% in women. Currently, the District of Gasabo has 61 literacy centers visited by 1769 individuals. Illiteracy is more in rural areas than urban areas. The District has educational facilities located in the following table

TABLE : Number of schools by levels and status

Level/Status	Kinder garden		Primary		Secondary		Total	%
Public	2	3%	21	30%	5	19%	28	17%
Parastatal	4	6%	13	19%	1	4%	18	11%
Private	59	91%	36	51%	20	77%	115	71%
Total	65		70		26		161	

Source : PDD2010

- Public schools are respectively: 2 for kindergarten, 21 for primary, secondary for 5 i.e. 19% of all schools is 161.
- The subsidized schools are four kindergarten, 13 primary level and one at the secondary level 11% of all schools (161)
- Private schools are as follows: 59 at primary level, 36 at primary level and 20 high school 71% of all schools

The school population is estimated at 6211 children in pre-school, 62,355 primary and 10,107 secondary school students. Girls make up 51% in pre-school, 56% primary and 42% in high school. The level of qualification of teachers is still low because 87% of primary school teachers have at least one degree in the secondary education i.e. 920 out of 1057 have completed secondary education. The qualification rate of the secondary is about 79%.

The repetition rate in the district of GASABO is 43% overall with differences according to the rural (62%) and urban (35%). Add to this the poor condition of school facilities, overcrowded classrooms, the existence of a large number of indigent high school, the low transition from primary to secondary and high school to university, lack of educational facilities adapted for disabled and limited access to the Internet.

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.

Housing Type

Housing Type	Areas		Total
	Urban	Rural	
Imidugudu (New Villages)	7%	8%	7%
Old villages (insisiro)	2%		1%
Dispersed Households	28%	89%	48%
Formal Settlements	7%	1%	5%
Informal Settlement	56%	1%	38%
Total	100%	100%	100%

Source: EICV 2006

Health Care

Gasabo district has got 10 health centers, and there is a plan undergoing for the construction of Gatsata and Gikomero hospitals, there is also the district hospital. The district is doing all it can to make sure that the distance covered by the population in to access health facilities is reduced in such a way that each sector will be provided by its own health center.

Gasabo district has 10 health centers with a staff of 162 people and three hospitals. The indicator suggested by the MOH to a health center by sector does not always solve the problem of access to health care for everyone because these facilities are still inadequate in urban areas to deliver quality services. The major challenges in this area are the small size and limited staff capacity of all health facilities.

The main causes of morbidity, hospitalization and death are largely malaria, respiratory infections and gastrointestinal and HIV / AIDS. Pregnant women in the District of Gasabo respond favorably to the NPC at a satisfactory rate of 95% on average an 96% in urban areas

against 91% in rural areas. Immunization coverage of children against diphtheria, tetanus, pertussis, poliomyelitis, measles and tuberculosis reached 99%.

The use of contraceptive methods is only 12% in urban areas as against 8% in rural areas. Vulnerability to disability in all its forms affects 3410 people with 1752 or 51% male. Other challenges are to report the difficult geographical access to health care, access to difficult financial health, hygiene standards not applied, lack of management information system adequate sanitation (GESIS), high prevalence of infectious diseases, medical staff technical capacity limited.

Post and telecommunication

Gasabo District benefits from the communications infrastructure that developed in the development of the city of Kigali. To this end, the wired and wireless network serving the urban parts of the District and much of the rural area (in terms of network coverage not wired). This sector has a solid foundation for its development.

In addition, the district population of Gasabo captures more than 5 stations with Radio Rwanda and the national Television. Postal services are also close to urban and peri-urban.

Tourism

The tourism sector in the district can be a source of employment to a big number of people. It is not yet well developed in the district in spite of its potential to create jobs and generate income because of its location.

Culture

The culture in the district is expressed through traditional dancing, songs and other folk demonstrations. There are several dancing groups in almost all sectors, schools, and religious establishments that usually entertain guests in different occasions like during wedding parties or when there are important guests in the district.

To keep our culture, the population of Gasabo has been engaged in different activities like through some women associations who are engaged in making baskets, jewelry, weaving in

traditional ways. The district has also been taking good care of genocide memorial sites to maintain our culture of preserving the memory of our loved ones

Youth

Most young people who did not have access to post primary education find themselves in a state of idleness and unemployment. This exposes children to wander without occupation which creates the category of street children.

But young people have the support structures of the cell to the district level, but their response capabilities are inadequate. However, some youth associations and clubs against AIDS also exist but their level of organization is still weak.

Sport

The existing sports are football and the District has one team. Handball and athletics begin to grow timid. Rusororo sector has one team for basketball and handball. Other sports facilities belong to schools.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

III.1. 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, 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 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.

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.

C. Land Law

This organic law n° 08/2005 of 14/07/2005, determines the use and management of land in Rwanda. It also institutes the principles that are respected on land legal rights accepted on any land in the country as well as all other appendages whether natural or artificial.

Land is part of the public domain of all Rwandans; ancestors, present and future generations. With exceptions of the rights given to people, the state has supreme powers to manage all the national land, and this is done in public interest aimed at sustainable, economic development and social welfare, in accordance with procedures provided for by law. In that regard, it is the state that guarantees the right to own and use the land. The state also has rights to expropriation due to public interest, settlement and general land management through procedures provided by law and prior to appropriate compensation.

This organic law protects equally the rights over the land acquired from custom and the rights acquired from written law. With regard to law, owners of land acquired from custom are all persons who inherited the land from their parents, those who acquired it from competent authorities or those who acquired it through any other means recognized by national custom whether purchase, gift, exchange and sharing.

A land can be categorized urban and rural land (which is confined within boundaries of towns and municipalities established by law), individual land (composed of the land acquired through custom, written law which excludes public land or district, town, municipality and the City of Kigali land, the one acquired from competent authorities, purchased land, gift, exchange and sharing and state land (which makes up the public domain consists of all the land meant to be used by public or land reserved for organs of state services as well as national land reserved for environmental protection;

1° Land containing lakes and rivers as listed by an order of the Minister having water in his or her attributions;

2° Shores of lakes and rivers up to the length determined by an order of the Minister having environment in his or her attributions starting from the furthest line reached by water depending on successive floods. This is not concerned with exceptional floods;

3° Land occupied by springs and wells determined in accordance with an order of the Minister having water in his or her attributions;

4° National land reserved for environmental conservation composed of natural forests, national parks, reserved swamps, public gardens and tourist sites ;

5° State roads and their boundaries which were listed by the order of the Minister having infrastructure in his or her attributions;

6° Land and buildings the administration reserved for public activities or the land used by public administration organs).

Under this law, registration of land a person owns is obligatory. An employee called the Land Officer who directs the land bureau, shall keep land registers and issues certificates approving ownership of land.

Regarding land issues, he or she holds the power of the public notary and in regard to administration; he or she is supervised by administration of town, municipality or district in which the land he or she is responsible to register is located.

Without prejudice to laws related to human settlement, general land organization and use, the landowner shall enjoy full rights to exploit his or her land in accordance with the existing laws and regulations. However, the laws stipulates that the landowner has no right over minerals and any other wealth underground; they belong to the State but the landowner is allowed before others to enjoy rights of their exploitation upon his or her request and if he or she is capable.

Besides the rights that are enjoyed by the land owners, there some obligations that have to be full filled; unless it is considered to be necessary, the landlord shall not act against other people's rights.

In that regard he or she shall not:

- 1° refuse passage to his or her neighbors leading to their homes when there is not any other way;
- 2° blocking water that is naturally flowing through his or her land from other persons' land above his or hers;
- 3° refuse other people to draw water from a well found on his or her land unless he or she can prove that such a well has been dug or built by him or her.

The law envisages penalties in case of non compliance of the obligations of the land owners. There exist administrative penalties (requisition of degraded and the unexploited land, forceful confiscation of degraded and unexploited land, repossession of requisitioned land) and penal sanctions (payment of cash as fines).

III.2. 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 April 8th 2005.

Under the article 65 put, Rwanda Environment Management Authority (REMA) is the institution 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 67 clearly calls for the need to subject subprojects to mandatory Environmental Impact Assessment.

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

Article 67: Further specifies that every subproject 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 subprojects referred to in this Article shall be spelt out by the order of the Minister in charge of environment.

Article 68:

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

- A brief description of the subproject 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 subproject or, as the case may be, at the final evaluation stage of the subproject;
- A financial evaluation of measures recommended preventing, reducing or compensating for the negative effects of the subproject on the environment and measures for regular monitoring and control of relevant environmental indicators.

Article 69:

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 subproject 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 Subprojects 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 subproject that must be subjected to mandatory EIA has been put in place under article 30 of the Organic Law which 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.

III.3. 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 subprojects 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 subproject 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 that any subproject 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 subprojects classified under Impact Level III shall be subjected to a public hearing prior to the decision-making process.

III.4. INTERNATIONAL LEGISLATIONS RELEVANT TO THE SUBPROJECT

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 subproject 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 subprojects 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 subproject 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 subproject to one of three subproject categories, as defined below:

Category A: An EIA is normally required because the subproject may have diverse significant impacts (subprojects 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 subproject may have specific environmental impacts. Subprojects 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 subproject is unlikely to have significant environmental impacts. Subprojects 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 subprojects 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 subprojects 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 subprojects that will significantly damage non-replicable cultural property and assists only those subprojects 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 subprojects and that they receive culturally compatible social and economic benefits. Effectively the World Bank requires a subproject to develop a program for addressing issues based on the informed participation of the indigenous people themselves. Any subproject 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 subproject receives benefits from it and also covers those with usufruct or customary rights to land or other resources taken for the subproject. The Operational Policy is specifically inclusive, ensuring that all those affected both directly and indirectly by subproject developments are compensated as part of the subproject. 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 subproject benefits,
- Participate in planning and implementation of resettlement programs, and
- Be assisted in their efforts to improve their livelihoods or standard of livings or at least to restore them, in real terms, to pre-displacement levels or levels prevailing prior to the beginning of subproject 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 subprojects and programs supported by the Bank, including nongovernmental organizations, is essential for the effective implementation and sustainability of subprojects.

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

- 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

IV. PROJECT ALTERNATIVES

This chapter describe and examine the various alternatives available for the 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.

IV.1. 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 sitting criteria (which are related to economic and environmental values):

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

B. On-Grid Electrification

Provide on-grid electrification. This is the alternative that is proposed by this project. Through this all target beneficiaries 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 of existing electricity infrastructures, 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 if the new distribution and transmission lines are built. However the positive benefits will be forgone in terms of providing more access to electricity to the populace of the project area which would have in turn spurred and contributed to economic growth.

IV.2. COMPARISON OF ALTERNATIVES

The second alternative “providing improved on-grid electrification for the proposed beneficiaries” is the most feasible 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. 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.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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 a significant number of Rwandese through the project potential hazards that the project could pose to the public, pollution of water resources and atmospheric resources.

V.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.

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 new distribution lines to be 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 new 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 will be increased, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

Electricity access increase 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 associated with the use of firewood and others means of lighting 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. At this point, the number of women workers or those directly affected by the project who could be employed is unknown but EARP will advise that this group of persons be given priority.

Environmental Benefits

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

V.2. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES.

The table below presents the anticipated environmental impacts, corresponding mitigation measures related to the pre-construction, construction and operation of the distribution and transmission lines of the project. 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	EARP Subcomponent Type
Preconstruction		
Land acquisition for MV transformers, overhead line installation and loss of income due to acquisition of agricultural land and plantation forests.	Expropriation shall be made for the affected lands, tress or any other property in consistency with GoR and World Bank requirements.	Construction of Medium and low voltage overhead transmission lines and transformers.
Land acquisition mayll 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.	Construction of Medium and low voltage overhead transmission lines and transformers.
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	Construction of Medium and low voltage overhead transmission lines and transformers.
Safety risks due to presence of UXO	EWSA/EARP shall engage qualified organizations to remove UXOs prior to site works.	Construction of Medium and low voltage overhead transmission lines and transformers.
Lack of consultations with local authorities on route selection	During FS and detailed design, EWSA/EARP and MININFRA shall coordinate with local authorities regarding selection of suitable alignments for transmission and distribution lines to ensure minimal impacts to affected communities.	Construction of Medium and low voltage overhead transmission lines and transformers.
Construction		
Vegetation clearing for construction for the provision of buffer zones for medium voltage lines	EWSA/EARP shall coordinate with affected families and local authorities for compensation of trees lost following Government/ WB policies	Construction of Medium and low voltage overhead transmission lines

	<p>Contractors shall confine vegetation clearing within required area, unnecessary cutting of trees shall be prohibited</p> <p>As much as possible, contractors shall undertake vegetation clearing through manual methods. Use of herbicides shall be prohibited.</p> <p>Contractors shall replant disturbed sites</p>	and transformers.
Increased exploitation of forest products	Workers shall be prohibited from hunting and gathering other forest products	Construction of Medium and low voltage overhead transmission lines and transformers.
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.	<p>Run-off and drainage control shall be provided in construction areas to avoid siltation of nearby watercourses.</p> <p>Sediment laden construction water will be discharged into settling ponds prior to final discharge, if practical.</p> <p>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 project areas.</p>	Construction of Medium and low voltage overhead transmission lines and transformers.
Flooding of adjacent areas	Proper drainage shall be installed to avoid flooding of surrounding properties.	Construction of Medium and low voltage overhead transmission lines and transformers.
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.	Construction of Medium and low voltage overhead transmission lines and transformers.
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"> - Provision of cover on haul trucks transporting materials, gravel, excavated soil and other construction materials, access roads shall be regularly cleaned to keep these free from debris - Water spraying on exposed areas near residential and commercial areas to suppress 	Construction of Medium and low voltage overhead transmission lines and transformers.

	<p>dust emission,</p> <ul style="list-style-type: none"> - Proper maintenance of equipment and use of mufflers, as appropriate, to minimize noise, - Speed restrictions for trucks and vehicles shall be enforced to minimize dust and noise emission - 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 - Ensure all vehicles and equipment are properly maintained to meet emission standards and are covered by valid operating permits 	
<p>Disruption to traffic movements may occur due to construction- related activities.</p>	<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>	<p>Construction of Medium and low voltage overhead transmission lines and transformers.</p>
<p>Irrigation canals in adjacent agricultural land, dykes may be damaged during construction.</p>	<p>Any damage to irrigation channels shall be immediately repaired and damages shall be compensated, as appropriate.</p>	<p>Construction of Medium and low voltage overhead transmission lines and transformers.</p>
<p>Access roads used during transport of construction materials and equipment may be damaged.</p>	<p>Restoration of damaged roads shall be undertaken upon completion of construction.</p>	<p>Construction of Medium and low voltage overhead transmission lines and transformers.</p>
<p>Failure to restore temporary construction sites.</p>	<p>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.</p>	<p>Construction of Medium and low voltage overhead transmission lines and transformers.</p>
<p>Possible conflicts with and/or disruption to local community</p>	<p>If construction worker camps are required, select the locations in consultation with local authorities.</p>	<p>Construction of Medium and low voltage overhead transmission lines</p>

	Train workers on suitable interactions with local community including prevention of transmissible diseases.	and transformers.
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>	Construction of Medium and low voltage overhead transmission lines and transformers.
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>	Construction of Medium and low voltage overhead transmission lines and transformers.
Operation		
Safety hazards	Unauthorized persons shall not be allowed at the transformer.	Operation of Medium and low voltage overhead transmission lines and transformers.
Pollution due to use of herbicides	Use of herbicides to control vegetation height within the right of way shall be prohibited	Operation of Medium and low voltage overhead transmission lines and transformers.
Soil and water contamination due to leaks of hazardous substances	<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>	Operation of Medium and low voltage overhead transmission lines and transformers.

	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.	
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V.3. PROJECT DECOMMISSIONING

Decommissioning of the project will involve dismantling and removing all the structures of the 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.

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. EWSA 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.

REFERENCES

- RECO/EARP, 2009: Project Appraisal Document
- Rwanda Energy Policy 2004.
- Institute of the energy and the environment of the French speaking countries, 1999-2000: Environmental Assessment. Networks of E7 appraisal for the Global environment.
- MINITERE: Organic Law carrying management and protection of the environment, the law N° 4//2005 of April 8, 2005
- MINITERE: Organic Law carrying regime fundamental N°08/2005 of the 14/07 /2002
- REMA EIA Regulations and Guidelines 2006.
- EARP, 2010: Environmental and Social Management Framework
- EARP, 2010: Resettlement Policy Framework
- World Bank, 1999 Manual on environmental assessment. Policies, procedures and sectoral guidelines.
- World Bank (1994a). *Environmental Assessment Sourcebook, Volume I: Policies, Procedures and Cross-Sectoral Issues*, Environment Department, World Bank Technical Paper No. 139, Washington, D.C. (1994b). *Environmental Assessment Sourcebook, Volume II: Sectoral Guidelines*, Environment Department,
- World Bank Technical Paper No. 140, Washington, D.C. (1994c). *Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry projects*, Environment Department, World Bank Technical Paper No. 154, Washington, D.C.
- Environmental and Social Management Framework, EARP, 2009.