ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED RONGAI - KILGORIS HIGH VOLTAGE TRANSMISSION LINE PROJECT

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CERTIFICATE OF DECLARATION AND DOCUMENT AUTHENTICATION

This document has been prepared in accordance with Environmental (Impact Assessment and Audit) Regulations, 2003 of the Kenya Gazette supplement No. 56 of 13th June 2003, Legal Notice No. 101.

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Date: ----------

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Date: ----------

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NAME: DR. (ENG.) JOSEPH SIROR

DESIGNATION: GENERAL MANAGER, TECHNICAL SERVICES

Signature----------

Date----------

Do hereby certify that this report was prepared based on the information provided by various stakeholders as well as that collected from other primary and secondary sources and on the best understanding and interpretation of the facts by the Environmental Social & Impact Assessors. It is issued without any préjudice.

EXECUTIVE SUMMARY

Introduction

According to the Ministry of Energy, the existing power transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, Coast, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.

To address these constraints, the Kenya Electricity Transmission Company (KETRACO) has identified the need for a number of new transmission line projects. Among these projects is the 400kV Rongai – Kilgoris transmission line project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Nakuru, Bomet, and Narok Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages in the project areas.

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction, operations and decommissioning stages.

This Environmental and Social Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts while enhancing positive impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

Study Objectives

The principal objective of this assessment was to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

Study Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA Cap 387 as well as the Environmental Management and Coordination (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as decommissioning. In addition, baseline information was obtained through physical investigation

of the site and the surrounding areas, desktop studies, public consultations with members of the community in the project areas, survey, photography, and discussions with key people in KETRACO (the proponent).

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholders including the project proponent, community members, County administration, opinion leaders and National and County Government departmental heads. The consultations were based on the proposed project, site planning and the project implementation plan;
- Physical inspections of the proposed project area which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

Conclusion

An Environmental and Social Management Plan (ESMP) outline has been developed to ensure sustainability of the site activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, and mitigation action plans. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality against the pre-project bio-physical and socio-economic baseline. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the proposed project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed project will bring positive effects in the project area including improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed locations route, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that all identified potential negative impacts can be mitigated and that no community objection was received, the project may be allowed to proceed.

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LIST OF ABBREVIATIONS

ACC	Assistant County Commissioner
AFD	Agence Francaise de Development
AfDB	African Development Bank
AGO	Automotive Gas Oil
AST	Above Ground Storage Tank
CB	Circuit Breaker
CT	Current Transformer
CVT	Constant Voltage Transformer
CO_2	Carbon Dioxide
CO	Carbon Monoxide
DCC	Deputy County Commissioner
DOHSS	Directorate of Occupational Health and Safety Services
EA	Environmental Audit
EIA	Environmental and Impact Assessment
EIS	Environmental Impact Statement
EMCA	Environmental Management and Coordination Act
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ERC	Energy Regulatory Commission
GDC	Geothermal Development Company
GHGs	Green House Gases
GoK	Government of Kenya
HFO	Heavy Fuel Oil
IEC	International Electro-technical Commission
IPP	Independent Power Producer
KenGen	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KP	Kenya Power
Kshs.	Kenya Shillings
kV	Kilo Volt
KWH	Kilo Watt Hour
KWS	Kenya Wildlife Service

LCPDP	Least Cost Power Development Plan
LILO	Line In Line Out
L.R	Land Registration
mg/kg	Milli grams per kilogram
MoE	Ministry of Energy
MW	Mega Watts
MVA	Mega Volt Amperes
NEMA	National Environment Management Authority
NOX	Oxides of Nitrogen
OSHA	Occupation Safety and Health Act
PM	Particulate Matter
PPE	Personal Protective Equipment
REA	Rural Electrification Authority
SF_6	Sulphur Hexafloride
SHE	Safety Health and Environment
SOX	Oxides of Sulphur
STD	Sexually Transmitted Diseases
WRA	Water Resources Authority

CHAPTER 1: INTRODUCTION

1.1: PROJECT BACKGROUND

Vision 2030 is Kenya's development blueprint covering the period 2008 to 2030. The objective of Vision 2030 is to help transform Kenya into a, "middle-income country providing a high quality of life to all of its citizens by the year 2030". The Vision outlines the Government of Kenya's economic growth objectives.

Vision 2030 recognizes the energy sector as one of the infrastructure enablers of the economic, social and political pillars underlying the Vision. The sessional paper No. 4 of 2004 on Energy recognizes that affordable, quality and cost effective energy services is an important prerequisite for attainment of accelerated social and economic growth and development. In view of these considerations, energy sector development is a key policy concern for Kenya's development.

To guide the energy sector development, the Ministry of Energy in 2011 developed the Least Cost Power Development Plan (LCPDP). In pursuit of the provisions of section 5 (g) of the Energy Act No. 12 of 2006 that mandates the Energy Regulatory Commission to prepare Indicative National Energy Plans. The Commission in conjunction with key stakeholders in the energy sector including; officers from the Ministry of Energy (MoE); Kenya Electricity Generating Company (KenGen); Kenya Power (KP); Kenya Electricity Transmission Company (KETRACO); Geothermal Development Company (GDC); Rural Electrification Authority (REA); The Ministry of State for Planning, National Development; Kenya Vision 2030 Board, Kenya Investment Authority (KenInvest); Kenya Private Sector Alliance (KEPSA); and the Kenya National Bureau of Statistics (KNBS); updates the LCPDP every second year. This report focuses on developments in the electric power sub-sector and takes a long-term view of the sector, given a set of assumptions.

According to ERC annual report 2014/2015, The demand for electric power continued to rise significantly over the last five years driven by a combination of normal growth, increased connections in urban and rural areas as well as the country's envisaged transformation into a newly industrialized country as articulated in Vision 2030. However, the power market remained unbalanced with this demand not fully met by supply. This is mostly due to system constraints and weather challenges. The peak demand rose from 1468MW in 2013/14 to 1512MW in 2014/15. The supply of electricity showed a 6.8% increase from 8,839GWh in 2013/14 to 9280GWh in 2014/15. The recorded total consumption also demonstrated a significant increase, recording a total of 7655GWh compared to 7244GWh in 2013/2014.

The number of customers connected to the national grid increased by 30.5% from 2,767,983 in 2013/14 to 3,611,904 in 2014/15. The customer base had increased by 18.7% between 2012/13 and 2013/14. This increase in number of customers was as a result of the “last mile connectivity” by Kenya Power where life line customers were being connected at KES 1,160.00 and continued enhanced connectivity by the Rural Electrification Authority to schools and other public amenities. The sales of the commercial and industrial customer category increased marginally, from 3,819GWh in the year 2013/2014 to 4,030GWh in 2014/2015.

As at June 2015, Kenya had an installed electricity generation capacity of 2,299MW comprising of hydro (821MW), thermal (827MW), geothermal (598MW), wind (25.5MW), co-generation (26MW), and solar (0.57MW).

Table 1.1: Installed Capacity and Effective Power Generation

	Installed MW	**Effective MW**
Hydro	820.7	800
Geothermal	588.0	579.9
Thermal (MSD)	720.0	701.5
Temporary Thermal (HSD)	30.0	30.0
Thermal (GT)	60.0	54.0
Wind	25.5	25.5
Cogeneration	26.0	21.5
Interconnected systems	2,270	2,210
Off grid thermal	26.8	23.1
Off grid wind	0.66	0.61
Off grid solar	0.55	0.212
Imports	000	000
Total capacity	**2,299**	**2,234**

Source; Kenya Power 2014/2015

The existing transmission network lengths stands at 1,434km of 220kV and 2,513km of 132kV while the distribution network stands at 1,212km of 66kV, 20,778km of 33kV and 30,860km of 11kV lines respectively. Sub-station capacity expanded from 3,181MVA in 2013/14 to 3,612MVA in 2014/15.

Table 1.2; Transmission Circuit Network (kms)

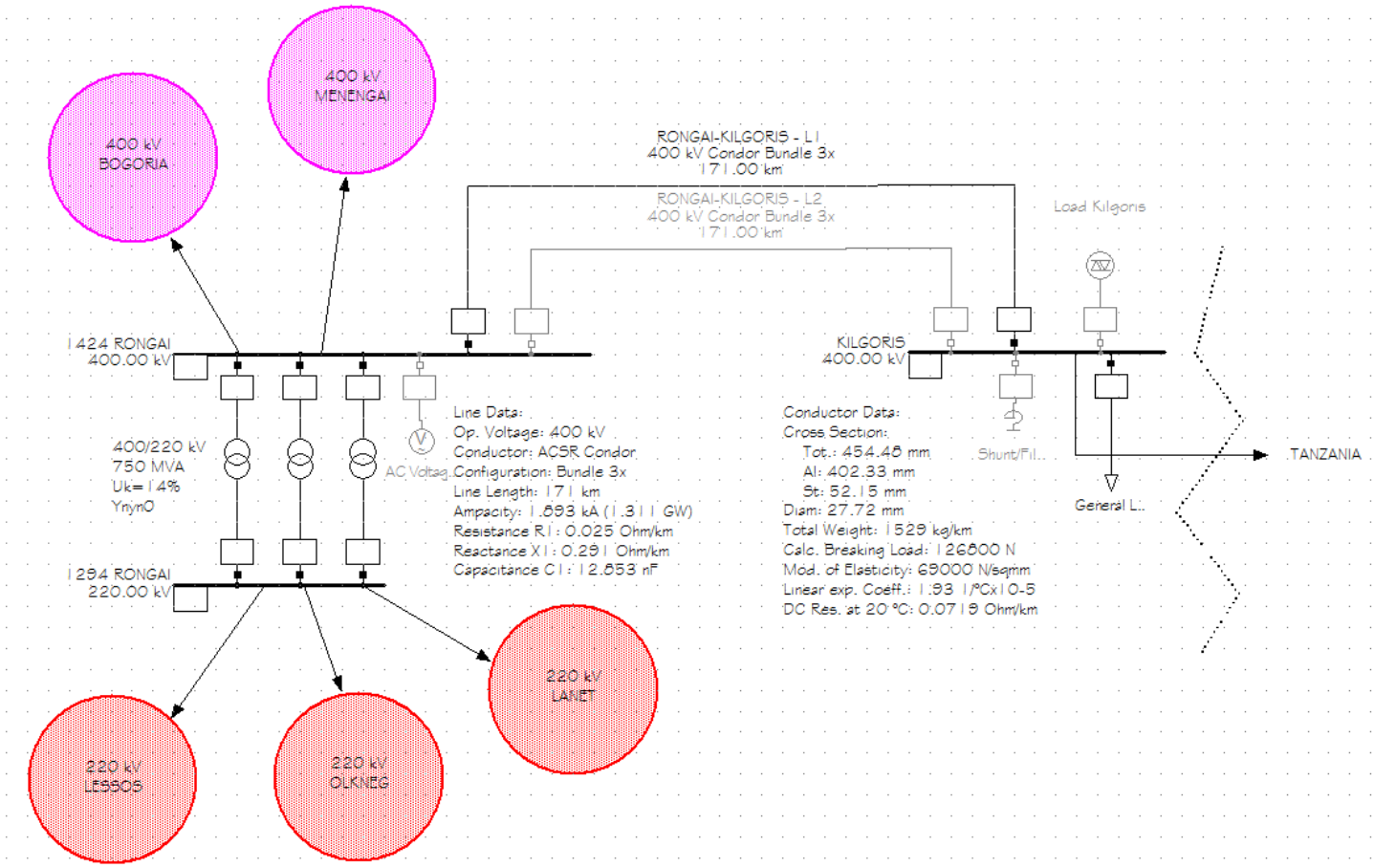
Voltage (KV)	2014/2015
220	1,527
132	2,527
66	1,212
33	21,370
11	32,823
415/240 or 433/250	23,502
TOTAL	**82,961**

Source; ERC

The existing transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, Coast, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.

To address these constraints, the Kenya Electricity Transmission Company (KETRACO) has identified the need for a number of new transmission projects. Among these projects is the 400kV Rongai – Kilgoris Transmission Line Project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Nakuru, Bomet, and Narok Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages in the project area.

Rongai – Kilgoris Transmission Line



Single Line Diagram for Rongai – Kilgoris Project

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction, operation and decommissioning stages.

This Environmental and Social Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

1.2: STUDY OBJECTIVES

The principal objective of this assessment was to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation, and decommissioning phases).

The specific objectives of this ESIA were to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental and Social Impact Assessment Report compliant to the EMCA, Cap 387 and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.3: TERMS OF REFERENCE (TOR) FOR THE ESIA PROCESS

The following are the TOR for the ESIA process

- Description of the baseline environment (physical, biological, social and cultural)
- Detailed description of the proposed project
- Review Legislative and regulatory framework that relate to the project
- Identify potential environmental impacts that could result from the project
- Carry out public consultation on positive and negative impacts of the project
- Propose mitigation measures against identified environmental and social impacts of the project
- Development of an Environmental Management Plan to mitigate negative impacts
- Development of an Environmental Monitoring Plan
- Prepare an Environmental and Social Impact Assessment Report

1.4: SCOPE OF THE STUDY

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the immediate environment as may be affected or may affect the proposed project. Any potential impacts (localized or delocalized) are also evaluated as guided by EMCA, Cap 387 and the Environmental (impact assessment and Audit) Regulations, 2003. This report includes an assessment of impacts of the construction, operations and decommissioning of the proposed project, site, and its environs with reference to the following:

- A review of the policy, legal and administrative framework

- Description of the proposed project.
- Baseline information (bio-physical and socio-economic)
- Assessment of the potential environmental impacts of the proposed project on the biophysical, social-economic, religious and cultural aspect
- Recommendation of cost effective measures to be used to mitigate against the anticipated negative impacts
- Proposition of alternatives
- Problems (non-conformity) identification and recommendation of measures to improve the existing management system;
- Preparation of an Environmental and Social Impact Assessment Report compliant to the EMCA, Cap 387 and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.5: ESIA APPROACH AND METHODOLOGY

The approach to this exercise was structured such as to cover the requirements under the EMCA Cap 387 as well as the Environmental (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, desktop studies, survey, photography, public consultations with members of the community in the project areas, and discussions with key informants (local administration and heads of departments)

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholder including the project proponent, community members, County administration, opinion leaders and National and County Government departmental heads. The consultations were based on the proposed project, site planning, project benefits, anticipated impacts, and the project implementation plan;
- Physical inspections of the proposed project area (site assessment) which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

Below is an outline of the basic ESIA steps that were followed during this assessment:

Step 1: Screening

Screening of the project was undertaken to evaluate the need of conducting an ESIA and the level of study. Transmission lines are listed under schedule 2 of EMCA Cap 387 among projects requiring ESIA before commencement. In addition, other considerations taken into account during the screening process included advice by local NEMA office, the physical site location, zoning, nature of the immediate neighbourhood, sensitivity of the areas surrounding the site and socio-economic activities in the area, among others.

Step 2: Desk Study

Documentation review was a continuous exercise that involved a study of available documents on the project including the feasibility study, project set-up plans and architect's statement, land ownership documentation, environmental legislation and regulations, County development plans, location maps, etc.

Step 3: Site Assessment

Site assessment was conducted between 5th and 21st February, 2018 to establish:

- The general environment and its sensitive receptors found within the environs of the project site.
- Flora, fauna and avifauna found on the site;
- The site landscape
- Surface water bodies within the neighbourhood of the site and;
- Land ownership, usage and conflicts

Step 4: Public Consultation

Detailed stakeholders' consultations for this study were undertaken from 5th to 21st February, 2018. These consultations were conducted in the form of:

- Key Informant Interviews and questionnaires
- Open-ended questionnaires and
- Public Barazas,

Step 5: Reporting

The ESIA Study Report was written in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003.

CHAPTER 2: PROJECT DESCRIPTION

2.1: PROJECT DESCRIPTION

The project will essentially involve the construction of a 400kV transmission line from Rongai in Nakuru County, through Bomet County, and terminate in Kilgoris town Narok County.

Detailed scope of work for the project is as follows:

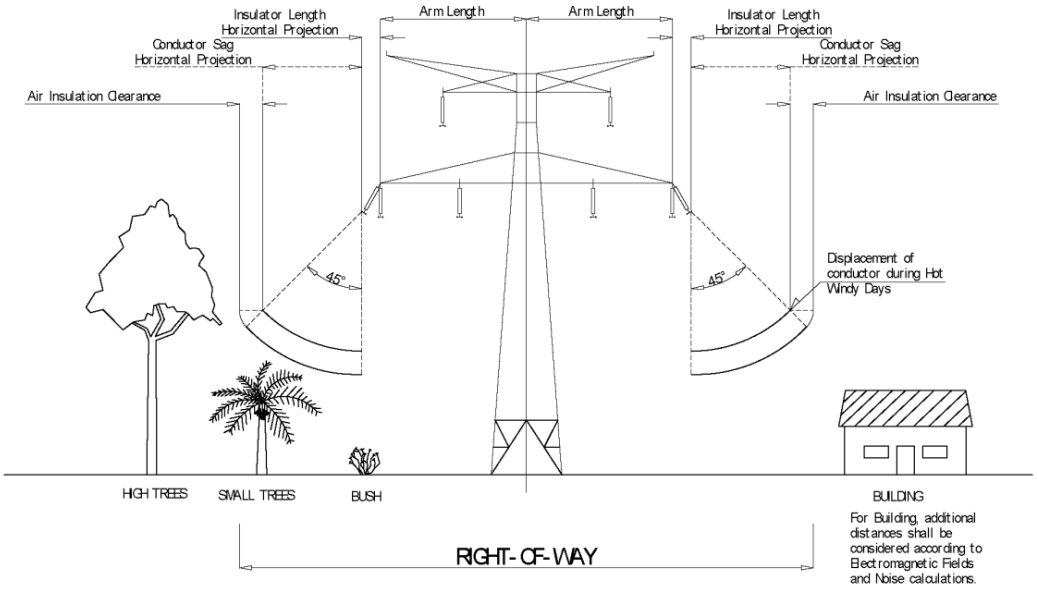
1. Transmission Line

   Rongai - Kilgoris 400kV Overhead Power Line (155km)

2. Substations
   a) Bay Extension at 400kV Rongai Substation
   b) Bay Extension at 400kV Kilgoris Substation

2.2: TRANSMISSION LINE DESIGN

2.2.1; Right-of-Way Requirements



A way-leave corridor is a particular width from the centre of the high voltage transmission power line that should be maintained clear so that the safety of lives of people and property is ensured. It is furthermore

important to note that the corridor under the high voltage transmission power lines provides for the safety of lives and allows access to routine maintenance work. The width of this corridor is dependent on the reference voltage and should be maintained clear, to ensure safety in the event that a power line conductor snaps. The proposed width for this line being a 400kV line, is 60m

2.2.2; Air Space Protection

Where it is likely that the power line is hazardous to aviation and avi-fauna safety because of its height and location, spherical markers will be used to identify overhead wires. The Kenya Civil Aviation Authority (KCAA) regulations, establish standards for determining obstructions in navigable airspace. Issues such as size and height of tower/pylons, right-of-way needs, maintenance access, and impacts to the approach zone, clear zone, or safety zone has to be evaluated and approved by KCAA to utilize property near airports and airstrips.

2.2.3; Conductor Clearances

Conductor Vertical Clearances

The following are the minimum vertical clearances to be ensured from the line conductors at maximum sag (inclusive of 0.3m included in sag calculations to accommodate conductor creep) to ground level or objects and crossings as described.

Above terrain in general, including minor roads/tracks	8.0
Above main (paved) roads	10.0
Above secondary (unpaved) roads	8.0
Above railways	8.5
Above steep or swampy ground, inaccessible to vehicles < 3.0m, and above water at max. flood level, except navigable rivers	7.0

Design Factors of Safety

The following design factors are for steel lattice towers and are true for 400 kV lines

Conductors, earthwire and optical fibre earthwire at final maximum working tension based on ultimate nominal breaking load.	3.00
Conductors, earthwire and optical fibre earthwire at still air everyday temperature final tension based on ultimate nominal breaking load	5.00
Tension clamps and mid-span joints based on conductors, earthwire and optical fibre earthwire ultimate nominal breaking load.	0.95
Insulators and Fittings (based on failing load) ▪ under normal working conditions	

▪ under broken string conditions	3.00 3.00
Steel Lattice Towers ▪ Steel towers under normal working conditions ▪ Steel towers under broken wire conditions ▪ Steel towers under maintenance conditions ▪ Cascade Collapse for suspension towers	 2.00 1.50 2.00 1.00
Foundations ▪ Foundations under normal working conditions ▪ Foundations under broken wire conditions ▪ Foundations under maintenance conditions ▪ Factor against overturning/uprooting	 2.50 1.75 2.00 1.20

2.2.4; Tower Layout

Transmission line tower; courtesy of KETRACO staff

Possible Tower Configurations

With regard to line design, there are four (4) different variants, which are technical feasible:

Conventional overhead line (Steel lattice towers with individual foundations)

- Advantages: cost effective design (regarding investment cost); ease of construction (no heavy equipment required).
- Disadvantages: space requirements (easement / permanent land take), visual impact (in urban areas).

Compact overhead line (Self-supported steel lattice towers with monoblock foundations for suspension towers.)

- Advantages: economic design, ease of construction,
- Disadvantages: slightly higher cost for (heavier) suspension towers, access to crane is required.

Tubular steel pylons / Pre-stressed concrete poles.

- Advantages: reduced easement / land take (because of smaller base), visual impact.
- Disadvantages: considerably higher cost than for steel lattice towers, requirements concerning access (temporary land take / destruction) and construction (heavy equipment/ noise).

2.2.5; Tower Type Family Recommendation

Taking into account the cost and space available the best option is to use tower structures of the self-supporting lattice-type galvanized steel frame with square bases, individual concrete foundations per leg, body and leg extensions, cross arms for phase and earth conductors.

Corrosion protection shall be of hot dip galvanization (minimum 610 g/m²).

The towers shall be fitted with anti-climbing devices at 3m from the ground, step-bolts on two diagonally opposite legs starting above the anti-climbing to the top, name plate and phase plates following the specifications of the Client.

Taking into account the possible theft of tower members, the towers shall be fitted with anti-theft bolts from ground level to the anti-climbing device level.

Tower dimensions

Regardless of dimensions such as footprint, member slope, cross-arms attachment to body width, which is the results of the static calculation and experience of the designer, a tower is defined by other typical dimensions listed below:

- phase to phase distance
- phase to earthwire distance in regards of the location of the earthwire to ensure an optimum against lightning strikes
- attachment height to ground of the suspension and tension string
- phase to structure clearance (which has to be followed by the strings as well as the jumpers of the tension towers)

Tower Height

The minimum tower height H is calculated and equals the sum of the following:

- h1 - Minimum permissible ground clearance
- h2 - Maximum sag (at highest conductor temperature)
- h3 - Vertical spacing between conductors

- h4 - Vertical clearance between ground wire and top conductor

H = h1 + h2 + h3 + h4

2.2.6; Definition of Spans

Each type of tower is characterized by a set of spans called "Typical spans" whose values are involved not only in the calculation of distances between phases, distance to ground, height above ground, but also in the calculation of forces acting on the structures (weight, wind load, etc.).

Those typical spans are:

The basic span is the most economical horizontal distance between two consecutive towers. It is the basis for determining the height of attachment above the ground conductor of the lowest points. It therefore affects mostly the normal height of the tower.

The maximum span is the maximum horizontal distance that can separate two towers. It is the basis for determining the characteristic dimensions of the tower cross-arms and mainly distances between conductor and earthwire

The wind span is mainly used to determine the horizontal force acting on the tower structure. For anchoring supports, wind range is the distance over which the wind is expected to act perpendicularly to the cable. It is equal to the arithmetic mean of adjacent spans of a support.

The weight span is the horizontal distance between the points where the tangent to the parabola is the horizontal distance between the points where the tangents to the curve of the two adjacent spans are horizontal.

2.2.7; Selection of Conductors

The phase conductors used by KETRACO are all of ACSR type, namely with Code Names LYNX, CONDOR and HAWK. Within the project we will try to us as far as possible the same conductor types:

Voltage Level	Phase Conductor Type ACSR
132 kV	1 x LYNX
400 kV	3 x CONDOR

2.2.8; Selection of Shield Wires

Conventional Earth Wire – Type ACS

The earth wire fulfils two functions:

- Shielding the phase conductors from direct lightning strikes
- Reliable high capacity communication channel by using OPGW (Optical Ground Wire).

Because earth wires are usually required to have less sag than the phase conductors, they are normally either ACS or steel construction.

Standard earth conductors used in most of the lines are aluminium-clad steel conductors. They are standardised according to IEC 61089, EN 50182, Table F21 or ASTM B416. The standard earth wire is type ACS at KETRACO.

2.2.9; OPGW Shield Wire

Fibre optic cable links are today the foundation of communications systems, since they have the advantage of large capacity, high speed, and long distance transmission. At the same time they are not influenced by electromagnetic fields and do not show any cross-talk, which is very important for installations on high voltage (HV) lines.

The most common method for this is to install an **OP**tical **G**round **W**ire (**OPGW**), which contains optical fibres, as a substitution of an existing ground wire.

The main characteristics of an OPGW are:

- the mechanical strength, which is mainly determined by the amount of steel;
- the short time current capacity, which is mainly determined by the amount of aluminium (alloy); and
- the number of optical fibers.

The fibres OPGW shall follow the following specifications and recommendations:

Optical fibre:	CCITT (recently ITU-T) recommendation, IEEE 1138, Annexure A for short circuit tests
IEC 60794	Optical Fibre Cables
IEC 61395	Creep test for stranded conductors
EN 187 000	Optical Fibre Cables (Generic specification)
EN 187 100	Optical Telecommunication Cables (Sectional specification)
EN 187 200	Sectional Specification: Optical Cables to be used along Electrical Power

	Lines (OCEPL)
EN 187 201	Family specification OPGW
EN 187 204	Family specification OPPC
EN 188 000	Optical Fibres (Generic specification)
IEC 60104	Aluminium-magnesium-silicon Alloy Wire for Overhead Line Conductors
IEC 60304	Fibres and binders colours
IEC 60865-1	Short-circuit Currents - Calculation of Effects.
IEC 60889	Hard Drawn Aluminium Wire for Overhead Line Conductors
IEC 60949	Calculation of Thermally Permissible Short-circuit Currents, taking into Account Non-adiabatic Heating Effects.
IEC 61089	Round Wire Concentric Lay Overhead Electrical Stranded Conductors.
IEC 61232	Aluminium-clad Steel Wires for Electrical Purposes
IEC 61597	Overhead Electrical Conductors – Calculation Methods for Stranded Bare Conductors
ITU G.652	Characteristics of a Single-mode Optical fibre

2.2.10; Foundation Design

The foundations shall be of pad and chimney concrete reinforced type. Piles may be employed in bad and buoyant terrain (lake and river crossing). The foundations capacity shall be determined in regards of a soil investigation.

The safety factors shall be as per “Design Factors of Safety”:

- 2.50 in regards of the yield strength of the steel for normal load cases
- 1.25 in regards of the yield strength for exceptional load cases

For the purposes of classification, foundation type selection, the basically soils to be found in the project area have been divided into the groups as per following table.

Soil Type	**Soil Conditions**
S1	Rock such as granite (with different levels of different minerals included), lightly weathered
S2	Very good soil such as hard clay, dense sand, very weathered rock
S3	Good/Normal soil such as medium-dense or loose soils, such as firm clay

	and medium sands
S4	Poor soft soil / backfill material
S5	Very poor soil such as waterlogged soils, swamps, soils below water table for a significant period of the year

2.2.11; Tower Footing Resistance

Lightning strikes to towers lead to an increase of the tower's potential, which is essentially determined by the tower footing resistance. If this potential exceeds the electric strength of the insulators, backward flashovers occur across the insulators, which, especially when they occur in the direct vicinity of the switchgear, can cause high over-voltage and over-voltage with high rates of change. Here, linking the last towers to the switch gear earthing system as a remedial measure is a suitable method of significantly reducing the tower footing resistance and of preventing backward flashovers across the insulators of these towers. For economic reasons however, this measure is generally restricted to portal and first tower seen from the substation.

Earthing of tower structure shall be made as required by soil conditions and the value of earth resistance at each tower location. One or more ground rods per tower shall be installed depending on the requirements. The design is dependent of the soil resistivity to be performed during the survey by the Contractor.

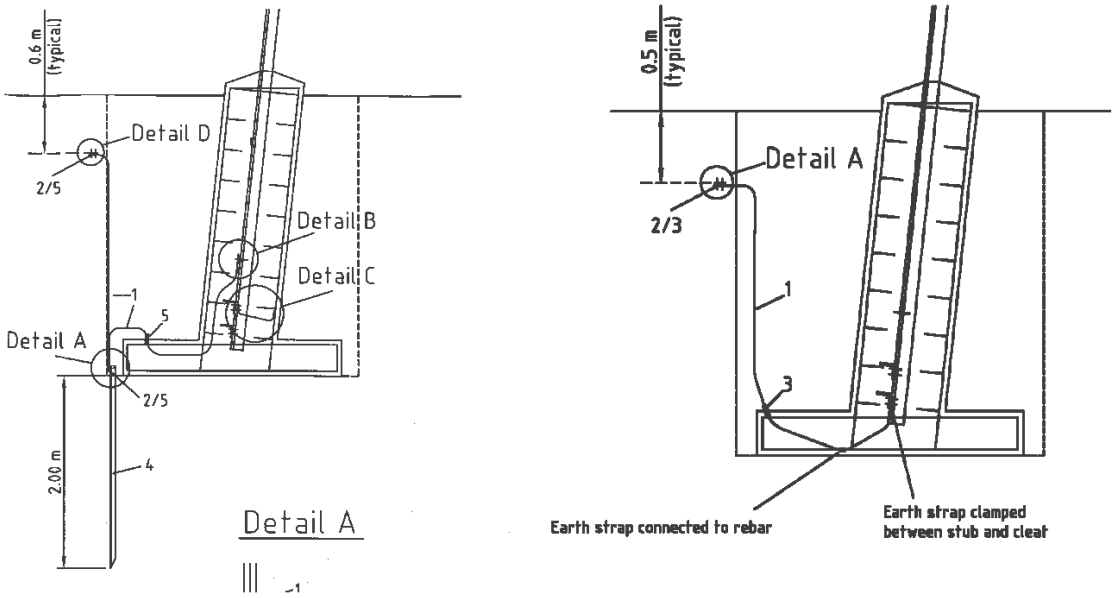
KETRACO's values for the nominal footing resistance of steel lattice towers are:

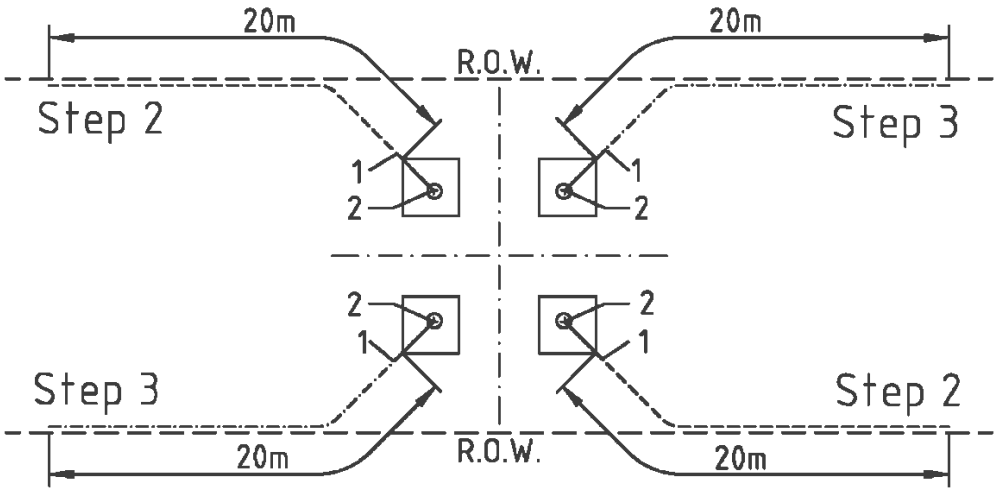
Voltage (kV)	**Footing Resistance Ω**
132	10
225	10
275	10
400	10

It is propose the use of ground rods of a 35 x 35 x 4 mm diameter cruciform and 3.0 metre long steel rods. Ground rods shall be hot-dip galvanised. The ground rods shall be buried or driven at the base of the tower leg foundation. In order to avoid vandalism of the earthing material it is propose to connect the foundation steel and tower leg to the earth conductors beneath the soil surface; this is a proven practice at ESKOM South Africa.

Where the measured tower footing resistance is greater than the required value, earth improvements shall be made by additional ground rods or earthing counterpoise cable connected to each tower leg. Earthing cables (counterpoise) shall be of galvanised steel wire with 11.5mm diameter.

The terminal towers shall be connected to the substation earthing grid.





2.2.12; Other Accessories

The following equipment must be included:

- Tower number plates, phase plates, warning plates;

- Anti-climbing devices;
- Spacers for bundled conductors;
- Anti-theft protection bolts.

2.3: SUBSTATION DESIGN

2.3.1; Introduction

Suswa substation; courtesy of KETRACO staff

The design of the substations will consider:

- the most economical means of achieving the full development requirements;
- the stage-by-stage developments of the substations. In some cases, this may involve preferred build of full diameters, co-ordinating the full diameter built with the demand forecast and generation expansion plan;
- any reactive compensation requirements;
- the future inclusion of distribution level substations;
- the co-ordination of overhead line entries, avoiding circuit cross-overs where possible;
- the required insulation withstand level of external insulation for substations to be constructed at altitudes greater than 1000 m above sea level.

The proposed substation layouts shall take into account the results of the system analysis, technical and economic aspects as well as standards of KETRACO in regard to equipment and operation.

The new substations shall be designed as conventional outdoor air insulated 400kV and with a substation control building housing 33kV switchboard, control and protection, communication and auxiliary equipment.

The substations configuration will be of the single busbar, double busbar system or breaker and a half. For single busbar substations space for future upgrade to double busbar shall be foreseen.

Space for additional bays shall be considered as well.

The layout shall consider the incoming overhead lines, easy access to the equipment and extension possibilities. The control building shall be located in a way to have clear view on the outdoor equipment and the access to the area. The whole substation area shall be fenced.

The standard layout used and recommended by KETRACO is:

Voltage	**Type**	
400 kV	Air insulated outdoor	Breaker and a half
220 kV	Air insulated outdoor	Breaker and a half
132 kV	Air insulated outdoor	Single Busbar, single breaker Double Busbar, single breaker
33 kV	Indoor	Single bus

For the 400kV voltage level, it is recommended to use Double Busbar systems or Breaker and a Half systems (standard at KETRACO).

2.3.2; Space Requirements

KETRACO'S guidelines in minimum substation land sizes are as follows.

Voltage	**Type**	**Space [acres]**	**Space [m²]**
132 kV	Air insulated outdoor	5	20.234
220 kV	Air insulated outdoor	10	40.468
400 kV	Air insulated outdoor	50	202.340

Common Requirements for Substations

2.3.3; Power Transformers

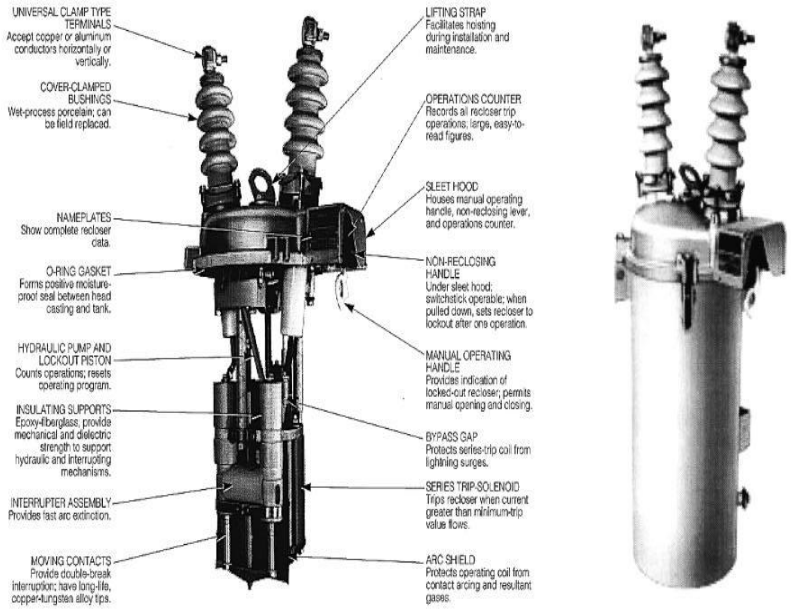
Power transformer; courtesy of KETRACO staff

The transformers shall be of the conservator type, fitted with external coolers and an on-load tap and shall comply with IEC 60076.

Note that the average maximum ambient temperature in any one day is 30 ºC. The maximum temperature rise shall therefore not exceed 55 K of the top oil and 60 K of the winding above the maximum ambient temperature of 40 ºC.

For temperature correction due to attitude reference is made to IEC 60076 which limits the temperature rise further when tested at the operation altitude.

2.3.4; Circuit Breakers



Typical Single-Phase Hydraulically Controlled Oil Circuit Breaker. Courtesy of Cooper Power Systems

The circuit breakers shall comply with IEC 60056.

The circuit breakers shall be of single-pressure, sulphur hexafluoride (SF_6) type with self-contained power-operated spring-charged operating mechanism.

- three-pole outdoor type, for the 132kV transformer breakers;
- single phase tripping and reclosing for all line breakers ≥ 132kV.

Each pole of the breaker shall have a mechanical position indicator. The device shall be labelled "ON" and "OFF" and these shall be clearly visible.

The circuit breakers shall be suitable for, single-pole high-speed auto reclosing. The rated operating duty shall be as follows:

- 0-t-CO-t'-CO t - 0.3 sec t' - 3 min
- CO.-.t2-CO t2-15 sec

Three Pole type breakers may have one operating mechanism common to all three poles while single pole type breakers shall have independent operating mechanism per pole.

The control voltage for closing and opening commands and for the operating mechanism motor(s) shall be:

- 110Vdc + 10% - 20%, unearthed, from battery

A "Local/Remote" selector switch and a set of open/close push buttons shall be provided on the control cabinet of the circuit breaker to permit its operation through local or remote push buttons. In the case of a complete failure of the operating mechanism all switches shall be operable manually by means of a lever or crank or another feature.

The circuit breaker shall be supplied with steel supporting structure.

2.3.5; Isolators and Earth Switches

The isolators and accessories shall conform in general to IEC 62271-102

Isolators shall be motorized outdoor off-load type. The operating mechanism for the isolating switches shall be provided for local and remote electrical operation. The earthing switches shall be only manually operated. The auxiliary voltage for the operation of the closing and opening devices shall be 110Vdc, + 10% - 20. Operating motors shall be provided for 240/415Vac 50 Hz or 110Vdc operation.

A "Local/Remote" selector switch and a set of open/close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote push buttons. In the case of a complete failure of the operating mechanism all switches shall be operable manually by means of a lever or crank or another feature. Isolators shall have mechanical interlocking to the associated earth switches.

All disconnecting and earthing devices within the substation shall be interlocked in a manner that ensures that they always operate safely. The system employed shall satisfy two distinct categories:

Operational interlocking. Interlocking associated with normal system operation and switching and intended to ensure that unsafe switching actions are prevented. Such interlocking shall be achieved by electrical means in a manner that permits the equipment to perform any safe operation. Contacts used for interlocking shall be directly driven auxiliary contacts of the main device.

Maintenance interlocking. Interlocking associated with a series of switching operations whose purpose is to render the equipment or sections of the substation safe for access and maintenance by personnel. Such interlocking shall be achieved by mechanical key type interlocks.

2.3.6; Surge Arresters

The lightning arresters shall be of the metal oxide gapless type, complying with IEC 60099-4. Arresters shall be of hermetically sealed units, self-supporting construction, suitable for mounting on tubular.

The surge arresters shall be of heavy-duty station class 3 and gapless type without any series or shunt gaps.

The surge arresters shall be capable of discharging over-voltages occurring during switching of unloaded transformers, reactors and long lines.

132 and 400kV class arresters shall be capable for discharging energy equivalent to class 3 of IEC on two successive operations. Surge counters shall be supplied for each single phase arrester.

2.3.7; Tariff Metering

The meters shall conform fully to IEC 60687 for class 0.2s Energy Meters and any other relevant specifications. The class and accuracy of the meters shall be coordinated with the CT and VT tariff metering cores.

The meters shall be programmable and relevant software and connection cable to laptop shall be provided. Meters complying with IEC 61334-4-4-1(DLMS Standard protocol) shall be required. The meters shall have memory and be capable of storage of at least 12 months load profile and other data e.g. freezed Monthly readings.

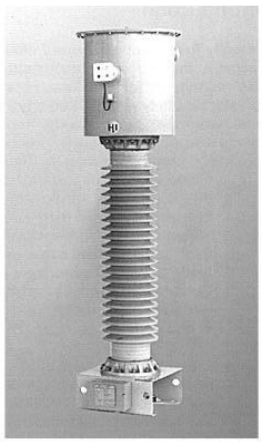
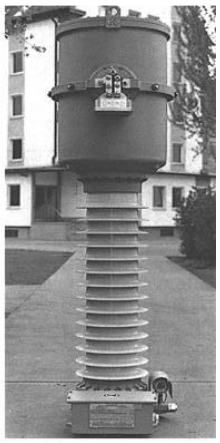
The meters shall be capable of bi-directional metering so as to record faithfully, both export and import quantities. The accuracy shall be as per IEC 60687 in both directions.

2.3.8; Measuring Transformers

The output of the measuring transformers for measuring and protection purposes shall be determined according to the technical requirements, but shall not be less than 125% of the overall computed (design) burden of the connected apparatus and conductors. However, the transformer shall not be loaded less than 60% of rated burden.

- Power frequency test voltage on secondary windings, 1 min. 2,5 kV
- Overvoltage inter-turn test, 1 min. 3.5 kV

Current Transformers

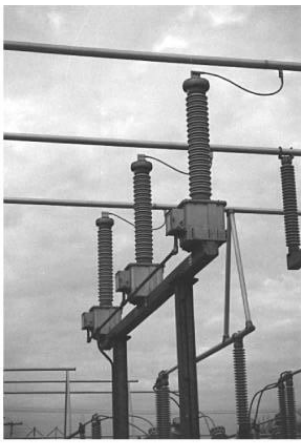
High-Voltage Current Transformers. Courtesy of Haefely Trench, Scarborough, Ontario, Canada

The characteristics of the current transformers shall comply with the provisions stipulated in IEC 61869 (replacing IEC 60044).

The current transformers shall be designed to carry continuously a current of 120% of the primary rated current. Rated output shall be chosen from preferred standard values in such a manner that secondary burden is between 25% and 100% of the rated burden.

Voltage Transformers





Capacitor Voltage Transformers With and Without Wave Trap. Courtesy of Haefely Trench, Scarborough, Ontario, Canada.

The characteristics of the voltage transformers shall comply with the provisions stipulated in IEC 60044 and IEC 61869 (and IEC 60358 for capacitive voltage transformers).

2.3.9; Earthing

The substation earthing system shall be designed principally according to IEEE 80 – 2000 and IEEE 2012 Guide to Safety in AC Substation Grounding.

The earthing system shall consist of the earth electrode system in the ground under the switchyard, and of the earthing conductors, over-ground, around fences and in the buildings.

2.3: TRANSMISSION LINE ROUTE

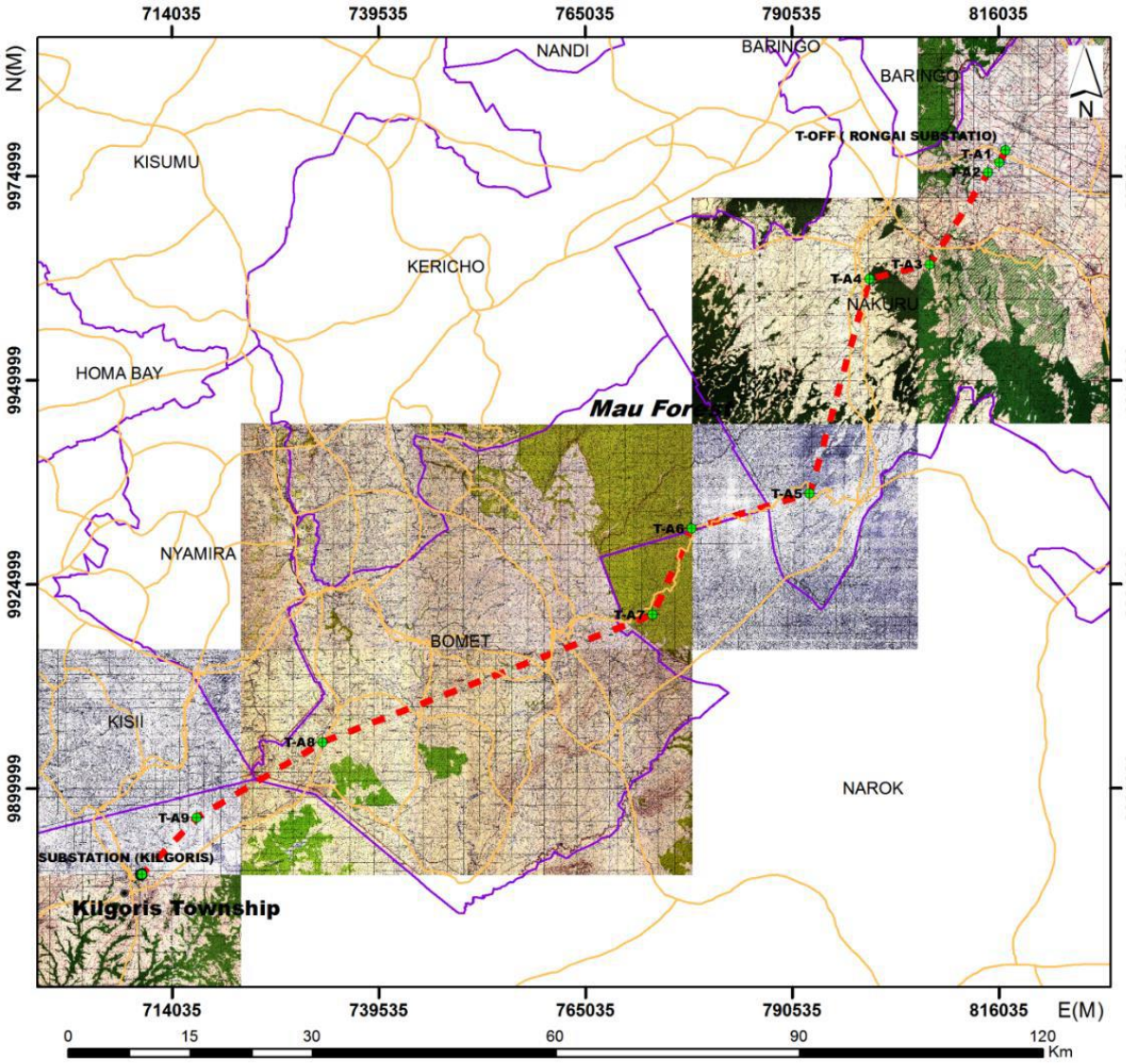
The route of traverse of the transmission line is roughly defined by coordinates as follows;-

RONGAI – KILGORIS TRANSMISSION LINE COORDINATES

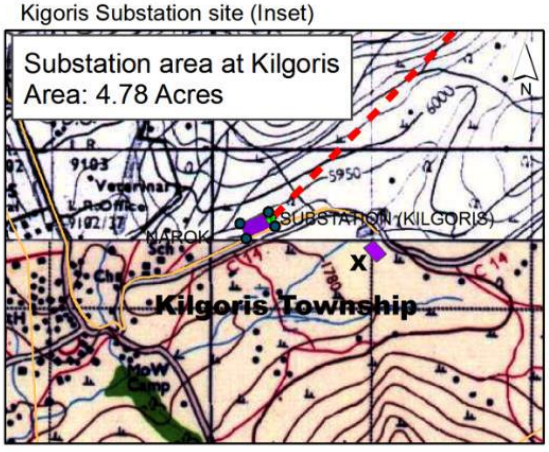
Transmission Line Angle Point	Easting	Northing
T-OFF (Rongai Substation)	839,986.51	9,978,281.37
T-A1	816,925.57	9,978,213.43
T-A2	816,177.55	9,976,716.44
T-A3	814,788.88	9,975,542.55
T-A4	807,604.03	9,964,226.53
T-A5	800,121.53	9,962,454.29
T-A6	792,760.69	9,936,155.86
T-A7	778,190.45	9,931,832,.99
T-A8	773,347,84	9,921,304.06
T-A9	732,628.83	9,905,693.49
T-A10	717,111.54	9,896,453.71
Substation (Kilgoris)	710,358.87	9,889,529.59

2.4: DESCRIPTION OF THE TRANSMISSION LINE ROUTE

Detailed description of the transmission line route is in appendix I.



Kigoris Substation site (Inset)



Proposed Transmission Line T/Angles

T_A	E	N
T-OFF(Rongai Town)	839,986.51	9,978,281.37
T-A1	816,925.57	9,978,213.43
T-A2	816,177.55	9,976,716.44
T-A3	814,788.88	9,975,542.55
T-A4	807,604.03	9,964,226.53
T-A5	800,121.53	9,962,454.29
T-A6	792,760.69	9,936,155.86
T-A7	778,190.45	9,931,832.99
T-A8	773,347.84	9,921,304.06
T-A9	732,628.83	9,905,693.49
T-A10	717,111.54	9,896,453.71
SUBSTATION (KILGORIS)	710,358.87	9,889,529.59

Legend

Turning_Angles | NewSite_substation_kilgoris | ProposedOHTL | Kenya_Counties

NB: X- site as was proposed by consultant

The TL will start at the proposed Rongai Substation which will be located at Gogar Farm (0^0 08' 38.4"S and 35^0 50' 17.5"E), in Rongai, Nakuru County, a distance of about 400metres from the Nakuru- Eldoret Highway. The proposed substation will lie on a piece of land (20 acres) which has a flat terrain and almost bare with short grass and surrounded by acacia vegetation and some tall planted trees. The proposed substation land also has an existing gatekeeper's shed at the gate of the farm and a pit latrine along the fence of the farm as existing structures. There exists a Kenya Power substation a few metres from the proposed substation just within Gorgar Farm. Of great significance is the existence of the Jinja- Nairobi transmission line. The road leading to the proposed substation site is a dusty murram road which is under construction with a 33kv power line running along it.

Proposed site of Rongai substation

From the proposed Rongai substation, the Rongai- Kilgoris TL will take a south westerly direction heading towards the Nakuru- Eldoret Highway at (0^0 12' 05.8"S and 35^0 50' 40.6") before crossing the said highway at Salgaa Town and not very far from the Deloren River bridge. Salgaa Town is a densely populated town famous as a stopping point for heavy commercial vehicles destined to the neighbouring countries. The presence of heavy commercial vehicles parked along the highway is highly noticeable.

The terrain here is generally flat, with acacia vegetation, sunny, dry and dusty. Structures here are mainly permanent stone buildings but are mostly shops. However, the TL will pass through a section with limited structures and the few that will be affected are those that are constructed using mud and timber.

From Salgaa, the TL runs parallel to the Rongai -Elburgon Road. The road is a dirt murram road. The line goes to Boror Village and then Lelechwet Village. It crossing another rural access road heading towards Lelechwet Primary School at (0^0 13' 12.8"S and 35^0 49' 43.1"E).

This section consists of a flat terrain with loam soils, dry and dusty. There are tall acacia trees which are the dominant tree species and some cactus. The population is evenly distributed and the residents keep livestock and farming as evidenced by small and large wheat farms. There are presence of few rock outcrops, bushland and shrubs.

Some of the households which are majorly semi-permanent have been connected to electricity power through a 33kV line running within the village. Many villagers however complained to the ESIA team of not being connected to electricity power by Kenya Power.

The TL continues in a parallel direction with the murram road passing Burma and Matuiku Village; a place which is slightly hilly and has large uncultivated wheat farms. Residents also plant sorghum and millet for subsistence purposes since the soil is fertile supporting this type of crop farming.

From Matuiku, the TL heads towards Elburgon Town, passing through Kibisu, Tegat and Kirwara villages, as it deviates further and further from the Rongai- Elburgon Road.

Between Matuiku and Elburgon, the environment consists of tall eucalyptus trees which are used to mark property boundaries. The soils are fertile loamy ones that support maize farming (evidence of harvested maize stalks). Temperatures become cooler due to the hilly landscape with many tree types that act as windbreakers. Homesteads here are mainly semi-permanent housing units.

As one approaches Elburgon Town, one can not fail to notice a change in the population density. Farms become smaller as subdivision of farms increase giving way to the expansive Elburgon urban center. According to the residents, the town relies on timber processing. Three perennial rivers emanating from the Mau Forest Complex are evident. The Rivers are, Mau, Muro and Shawa. The TL avoids the highly populated sections of the town to pass it in the western side where there are more farmslands and bushes.

Elburgon Town

The TL then pass Kapsita Village, an area that is hilly with very steep slopes, large farms and relatively high tree canopy. The landmark here is a long and tall railway line bridge that is scary to pass atop and with a tributary of Mau river passing under.

From Kapsita, the TL takes a southerly direction crossing the Elburgon – Molo Road between Elburgon town and Randi Village and then runs towards Muchorwe Trading Centre passing through small villages of Turi and Chandera while running parallel the Turi - Muchorwe murram Road.

The environment here is cool with a heavy tree canopy. The terrain is gentle sloping but steep slopes are evident in some sections. Soils are fertile loam that support agriculture, livestock and tree plantations. Sheep rearing is common as temperatures are cooler and the section falls under the highland areas.

Just before Muchorwe, the TL cuts through the Bararget Forest. The forest though degraded is part of the larger Mau Forest Complex. The section like any other part of Mau Forest is highly sensitive and calls for conservation. The ESIA team were therefore of the strong opinion that, the line, in this section be shifted from the forested areas into the farmlands.

Muchorwe Trading Centre is a densely populated area with plenty of business activities which are carried out on either open air or housed in semi-permanent buildings/ structures. The TL avoids the populated areas of the center, passing in the southern area of the urban center before taking an angle point to run parallel to the Molo – Olenguruone Road.

After Muchorwe, the TL enters Nyota farm (0^0 21' 40.6"S and 35^0 41' 24.5"E) and then Naivas. This is an extensive farm which according to residents interviewed is owned by Niaivas Chain of supermarkets. The land at the time of the assessment was bare but was being prepared for cultivation. It has two seasonal streams. From here the transmission line pass Seguton and later Kibarani villages.Landmarks here are a farm with huge greenhouses, a small dam, a steep ravine and a beautiful spring.

This area has gentle sloping terrain which is very windy, with wheat and maize farming being dominant. Livestock keeping (sheep and cows) is also practiced. The dominant tree species is pine which can be seen at the peripheries of the farm. The population is low and mainly live in semi-permanent timber constructed houses.

The TL then cross River Kimalany before reaching Kimalany centre and later Kaplelach village. In this section, the TL shifts to the eastern side of the Molo - Olenguruone Road as it heads towards Keringet and passing through Siwot village.

Keringet town (the home of Keringet Brand of mineral water) is a small densely populated town that acts as the administrative town of Kuresoi Constituency. It houses sub county offices belonging to various ministries including water, livestock, agriculture, youth affairs and sports, public health and sanitation and the Kuresoi Social Hall in addition to the office of the Deputy County Commissioner and Assistant County Commissioner (Kuresoi South). The ESIA team was lucky to meet one of the local seasoned leaders Hon. William Leitich (Popular during the Moi Era) who informed the team that, he was in deed the person who sold KETRACO the 20 acre, Rongai Substation Land.

The TL will pass at Kapsogus Village (0^0 25' 37.0"S and 35^0 40' 31.9"E), crossing River Kipsonei, an area with fertile loam soils which support wheat, maize and potatoes farming, and livestock keeping practices. The terrain consists of steep slopes and the temperatures are cool due to the many tree plantations. Kapsogus is also windy. In this village the structures are semi permanent and mostly constructed using timber. This town is served by a 33kV line.

Keringet Town

From here, the TL starts to deviates from the Molo - Olenguruone Road as it heads towards Olenguruone on the eastern side of the road maintaining a south western direction cutting through small centres like Sanchagwan, Tendwet, Pombo, Metikei, Ambusket, Chikamba (Kecheyiat), Irongo, and Chepnyalilo.

These areas are sparsely populated with large farms and tall trees (increased canopy cover). The terrain is mostly hilly but has sections that is relatively low gradient. Tea farming start to become evident but also other types of farming including diary are practiced.

The TL avoids the populated areas of Oleguruone town to pass in the north-western side of it at a place called Wamkong. Here is an interesting spring and a small stream (Kormatet Stream) emanating from the spring that residents claim used to produce enough water for the village but no longer do since one of them made it his own and now farms on it. Tea plantations and tall cypress trees are the main features in this area.

At this area (0^0 34’ 33.7”S and 35^0 37’ 47.8”E), the TL makes an almost right angle as it changes course to a more westerly direction heading towards Kiptagich Trading Centre before proceeding to Mau Forest.

Here the ESIA team recommends that, as an alternative rather than the TL make, a right angle, it should proceed on a straight line, in a southerly direction to meet the Mau Forest Complex at a village called Sogoo. Here, the Mau Forest Complex is only about 4km wide and provides an opportunity for the line to pass the complex with the least amount of disturbance.

From Wamkong, the TL heads to Kiptagich, taking a slight deviation from the main tarmac road but maintains an almost parallel path to the road. The characteristics of the area include large tea and tree plantations, fertile loam soils, steep slopes, sparse population and cool temperatures.

Tea farms at Kiptagich

As the TL exits Kiptagich, it runs a few hundreds of metres from the road, and eventually crosses the road at Chepkiswet Shopping Centre at (0^0 31' 55.5"S and 35^0 34' 50.0"E) near Chepkiswet Primary School. However, it is worth noting that this public utility will not be affected by the TL since it is not on the wayleave of the TL. The TL will only affect a few small semi-permanent wooden house. Other than the Kiptagich Tea Factory, this centre is the last one before the TL enters the Mau Forest.

From here, the TL enters the Mau Forest Complex. The transmission line, within the Mau Forest, covers a distance of about 23km, aligning itself as much as possible to the Olenguruone – Bomet tarmac Road.

The Mau Forest Complex is the largest closed-canopy montane ecosystem in Eastern Africa. It encompasses seven forest blocks within the Mau Narok, Maasai Mau, Eastern Mau, Western Mau, Southern Mau, South

West Mau and Transmara regions. The area is thus the largest water tower in the region covering over 400,000 hectares and being the main catchment area.

However, in the past, the Mau Forest Complex has undergone significant land use changes due to increased human population demanding land for settlement and subsistence agriculture. The encroachment has led to drastic and considerable land fragmentation, deforestation of the headwater catchments and destruction of wetlands previously existing within the fertile upstream parts due to communities searching for farming land and grazing land. Today, the effects of the anthropogenic activities are slowly taking toll as is evident from the diminishing river discharges during periods of low flows, and deterioration of river water qualities through pollution from point and non-point sources.

The Mau Complex is drained mainly by 12 rivers including Rivers Njoro, Molo, Nderit, Makalia, Naishi, Kerio, Mara, Ewaso Nyiro, Sondu, Nyando, Yala and Nzoia feeding lake Natron in Tanzania, lake Nakuru, Lake Baringo, Lake Victoria and lake Turkana. The community around the area who are mostly pastoralist and farmers depend on these rivers for their living. These rivers also support agriculture, hydro power, urban water supply, tourism and wildlife habitat throughout much of Kenya. The Eastern Mau Forest is the headwaters for Njoro River which empties its water into Lake Nakuru - one of Kenya's prime tourist attractions. The forest is also home to rare indigenous trees such as cedar, African olive, *bamboo, dombeya* and shrubs. It also has exotic trees such as cypress, pine, grevillea robusta and eucalyptus which are regularly planted by the Kenya Forest Services mainly for commercial purposes.

The animals found in the forest are the elephants, buffalo, Bongos and hyenas among other wildlife species.

Entrance into the Mau Forest Complex

The TL exits the Mau Forest Complex at Masese village which hosts the KFS Nyongoress Office. The village is within Mugango location.

Boundary of the Mau Forest Complex. On the background isthe Nyayo Tea Zone

The terrain here is hilly, soils are fertile loam that support various types of agriculture including tea and maize farming, livestock rearing and tree plantations. The population here is relatively dense and most households are semi-permanent wooden structures.

From here, the TL passes close to Tenwek Town (0^0 44' 54.4"S and 35^0 21' 33.1"E) before proceeding on to KETRACO Bomet 132kV Substation.

Landmarks here, are a tea factory, the Tenwek Mission Hospital, the Tenwek Dam and HydroPower Plant, and River Cheplulo (a tributary to Mara River).

The TL maintains a south westerly direction as it proceeds further south then crossing the Bomet- Tenwek- Silibwet Road, passing on the northern part of Bomet Town, about 3 kilometres from the town center and near the Itembe Shopping Centre. For a small distance, the TL runs parallel to the Kaplong- Narok- Maai Mahau Road before crossing it in between Kapkwen and Sachagwan villages (0^0 46' 35.1"S and 35^0 17' 12.3"E). Sachagwan village hosts the KETRACO's Bomet 132kV Substation which is about 300 metres from the TL.

KETRACO's Bomet 132kV Substation

From Sachagwan, the TL passes Solyot Village (0^0 47' 30.0"S and 35^0 14' 50.5"E) near Solyot Primary School, an area with gentle slopes, relatively heavy tree canopy, fertile loam soils that support subsistence farming (maize, beans and bananas) and livestock keeping (sheep and cattle). The area is sparsely populated with relatively small farm sizes.

The TL then pass through, Ndamichonik Village. This is an area of flat terrain, sparsely populated, black cotton soil, hot temperatures with tall planted trees but less canopy cover. Generally, subsistence farming is practiced in this village. Saramek River is the dependable water source for the residents. A 33kv line also serves this village. The TL will cross this village at Saramek- Makimeny tarmac road (0^0 48' 49.0"S and 35^0 11' 25.5"E), which has very minimal traffic.

The TL then deviates from the Saramek- Makimeny Road, as it crosses Kiboson and Sasita/ Sigorian Villages. This area is characterised by flat terrain, black cotton soil, high temperatures, sparsely populated with homesteads comprising of semi-permanent houses, sheds and latrines. Maize farming is common in most homesteads.

Further west, the TL will pass near Oldebesi Shopping Centre (0^0 49' 59.8"S and 35^0 08' 22.6"E), crossing a murram road under maintenance in a zone that is flat, with little canopy cover, black cotton soil, sparsely populated, relatively small farm sizes.

Ndanai Town is a major urban centre that the TL traverses. It avoids the populated sections of the town (about 1 kilometre from the town center) as it proceeds to Kilgoris Town. It will cross the Ndanai - Gorgor Road at (0^0 51' 29.1"S and 35^0 04' 50.8"E), a tarmac road with minimal traffic. This area is gently sloping and slightly rocky with loam soils. Subsistence farming is the major practice done in small farms. Canopy cover is minimal but generally green. The temperatures are high in Ndanai similar to those in the small villages on the route of the TL before Ndanai.

The TL enters Narok County after passing through Ndanai in a generally hilly area, with increased tree cover and undergrowth being mainly grass. Some bush lands are also present within this region. Being a hilly area, the region is sparsely populated. The TL runs in an almost parallel direction to the murram road from Ndanai-Gorgor junction, about 2-3 kilometres away, which is generally rocky, forcing motorised transport to travel at reduced speeds. It will also cross Romosha River near Shartuka Village. From Shartuka Village, vegetation becomes scarce and the area becomes somewhat dusty. Other villages that the TL will traverse nearby include Abossi, Takitech and Njipiship.

The TL will terminate at Kilgoris, where the proposed KETRACO Kilgoris Substation will be located (0^0 59' 51.3"S and 35^0 53' 20.5"E). This is about a kilometre from Kilgoris Town. The proposed site of the substation has some planted eucalyptus trees in some section, a small shed and an 11kV post within. It lies on a fairly gently sloping land with loam soils. The proposed site is surrounded by maize farms, some bushes and sisal

plants. The access road to the site is a rocky murram road just off the Ndanai- Kilgoris Road which is under construction.

Proposed Kilgoris Substation Land

2.5: PROJECT JUSTIFICATION

Currently electricity is accessible to less than 20% of the total population and approximately 5% of rural population. The government's goal is to accelerate access rate to 40% of rural population by 2040.To achieve this, the government has prepared the Energy Scale up program covering the period 2008 to 2017.This would be approached from among others, improvement and expansions of the system networks. This project will contribute in the expansion of the transmission network.

2.6: PROJECT BUDGET

The estimated cost of the project is approximately US Dollars thirty four million, six hundred and fifteen thousand, one hundred and sixteen (US$ 34,615,116)

2.7: TARGET GROUP FOR THE ESIA REPORT

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction, operation, and decommissioning of the proposed project. The report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social

impacts and suggested mitigation measures at various stages of project activities. The information will be useful in planning, implementation, management and maintenance of the transmission line project.

In this regard, the report is useful to the following stakeholders:

- Funding agencies and donors;
- Relevant government ministries and agencies for policy implementation;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the project;
- Contractors to be engaged in the project;
- People to be involved in the management and operation of the project.

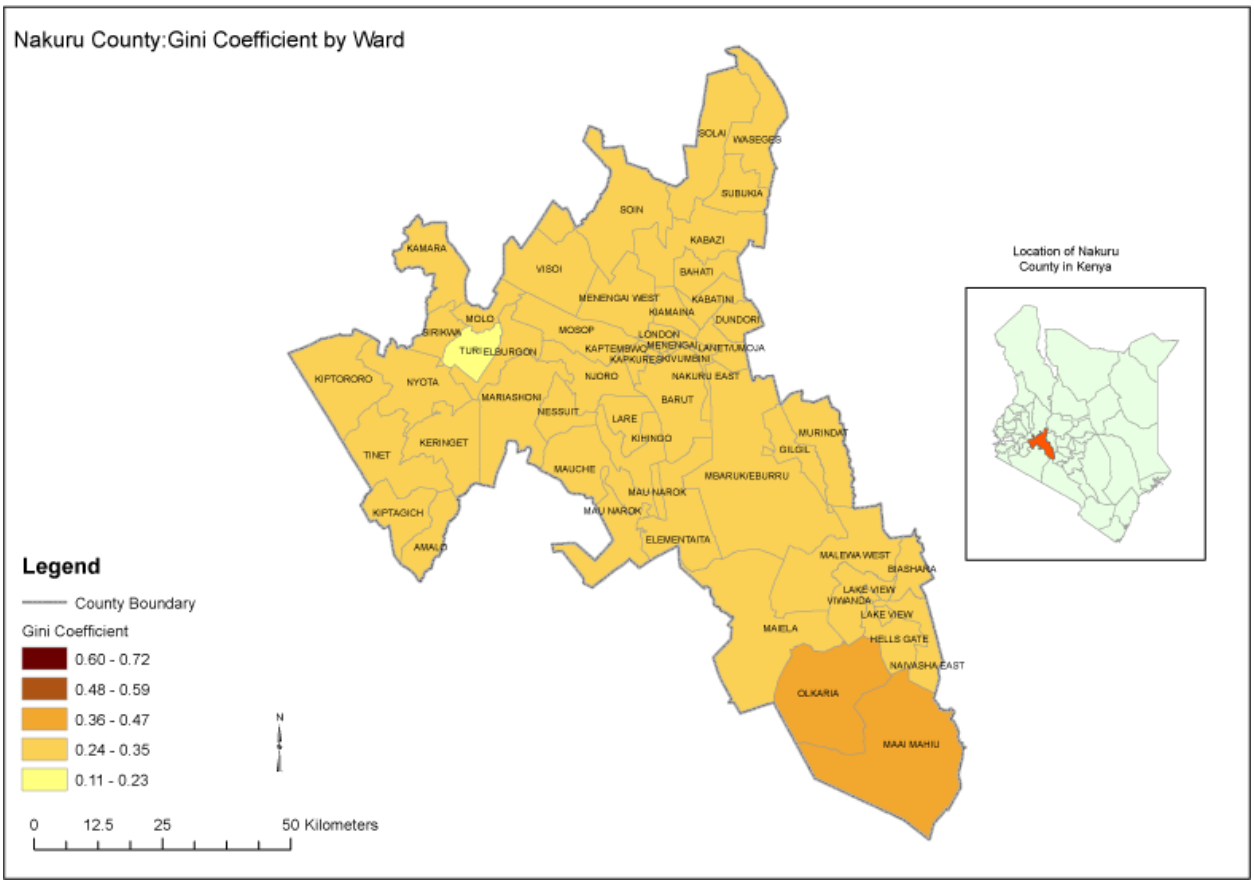
CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA

3.1: BACKGROUND

Nakurui County

Nakuru County is one of the 47 counties of the Republic of Kenya provided in the Constitution of Kenya 2010. The county lies within the Great Rift Valley and borders eight other counties namely; Kericho and Bomet to the west, Baringo and Laikipia to the north, Nyandarua to the east, Narok to the south-west and Kajiado and Kiambu to the south.

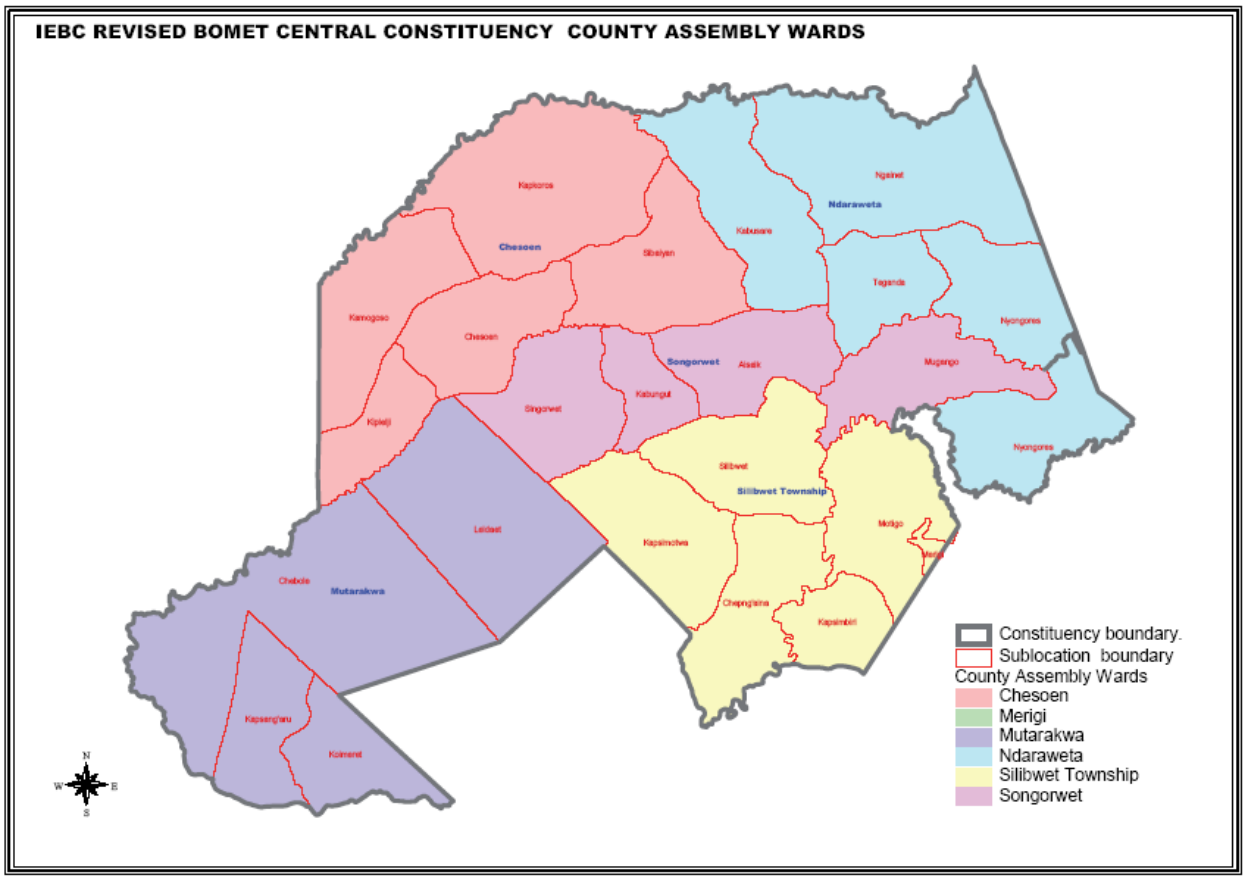
The county covers an area of 7,495.1 Km² and is located between Longitude 35 º 28` and 35º 36` East and Latitude 0 º 13 and 1º 10` south. The county headquarter is Nakuru Municipality which was previously the headquarters of Rift Valley Province provided for in the old constitution until 4th August 2010.



Nakuru County Map Courtesy of Inequalities-sidint website

Bomet County

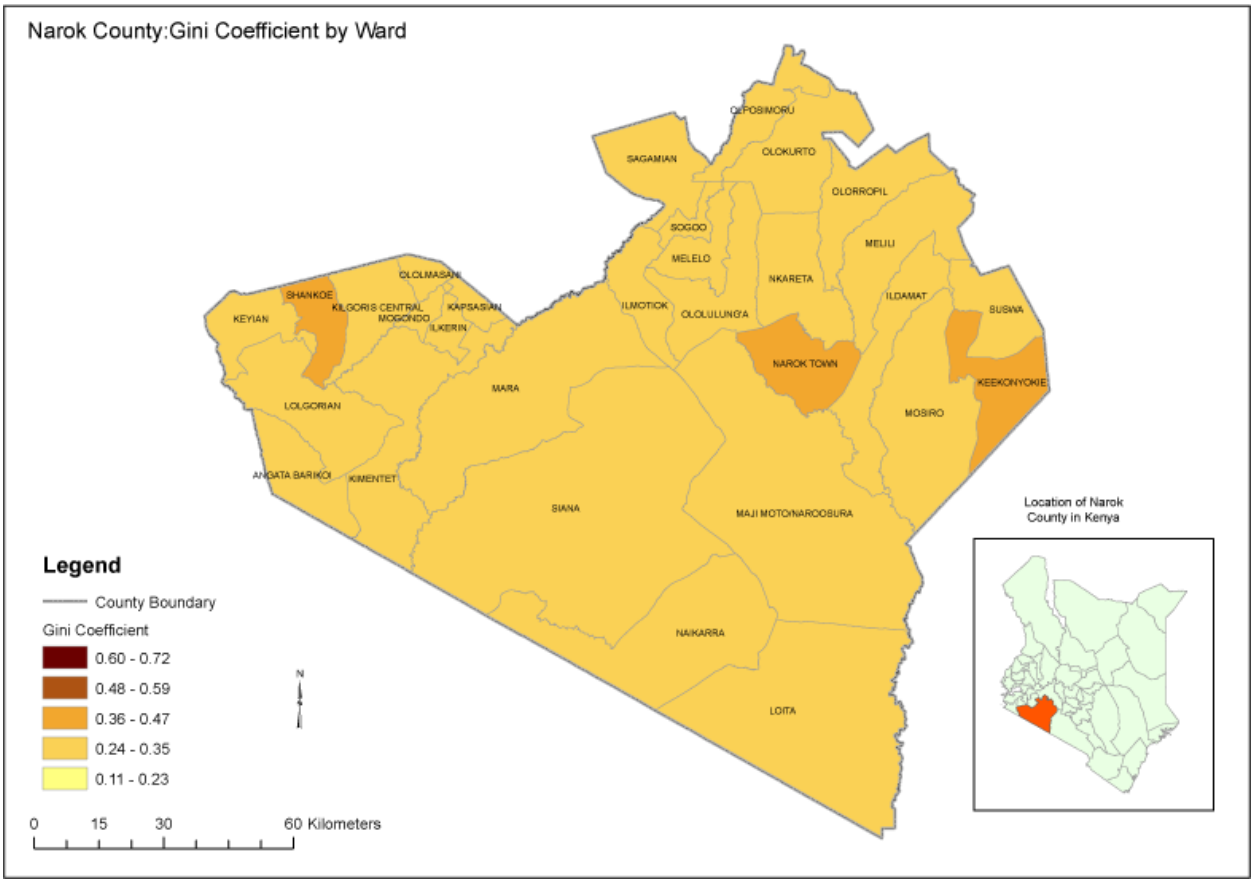
Bomet County lies between latitudes 0º 29' and 1º 03' south and between longitudes 35º 05' and 35º 35' east. It is bordered by four counties, namely: Kericho to the north, Nyamira to the west, Narok to the south and Nakuru to the north-east. The County covers an area of 2037.4 Km^2.



Bomet County Map courtesy of Softkenya website

Narok County

The County Government of Narok lies between latitudes 0° 50´ and 1° 50´ South and longitude 35º 28´ and 36º 25´ East. It borders the Republic of Tanzania to the South, Kisii, Migori, Nyamira and Bomet counties to the West, Nakuru County to the North and Kajiado County to the East. The county headquarters is at Narok Town. The county covers an area of 17,933.1 Km^2 representing 3.1 per cent of the total area in Kenya and therefore the eleventh largest in the country.



Narok County Map Courtesy of Inequalities-sidint website

3.2: PHYSIOGRAPHIC AND NATURAL CONDITIONS

3.2.1; Physical and Topographic Features

Nakuru County

The main topographic features in Nakuru County are the Mau Escarpment covering the Western part of the county, the Rift Valley floor, Ol Doinyo Eburru Volcano, Akira plains, Menengai Crater, elaborate drainage and relief system and the various inland lakes on the floor of the Rift Valley where nearly all the permanent rivers and streams in the county drain into. These rivers include river Njoro, Makalia which drain into Lake Nakuru, Malewa which drains into Lake Naivasha and Molo River which drains into Lake Baringo among others. The topographic features are an interesting niche for research as well great tourist attraction sites. The most predominant is the Hells gate gorges in Naivasha which are an important tourist sites. The land topography in Naivasha and Gilgil Sub-Counties is characterised by mountain ranges and savannah vegetation cover that support various species of wildlife.

The soil pattern in the county presents a complex distribution with three main classifications that have been influenced by climatic conditions, volcanic activities and underlying rock type. These main soil classifications include:

Latosolic soils; are the well-drained red volcanic soils (common in upper Subukia valley) and imperfectly drained loam with dark brown subsoil covers (common in Njoro, Nakuru Central Elementaita and Maai Mahiu in Naivasha areas) with fertility ranging from moderate to high. The main crops supported by these soils are wheat, Maize, pyrethrum, sunflower, finger millet potatoes, pigeon peas, vegetables and beans and peas.

Planosolic Soils; these comprises of poorly drained dark brown clay soils with highly developed textured top soils as well as well drained humic lawns with dark brown sub soils. These soils are classified as fertile. Areas covered under these soils range from Olenguruoni in Kuresoi, Molo, Rongai and parts of Njoro. The main agriculture activities in these areas include sheep rearing, dairy farming, wheat, barley, potatoes, pyrethrum and vegetables farming.

Alluvial and Lacustrine Deposits; these are shallow soils resulting from volcanic ash sediments as well as other sources. They occupy the Rift Valley bed in Lake Nakuru, Lake Naivasha, Lake Elementaita, Solai and the Menengai Crater as well as the adjacent areas to these features. Their fertility ranges from low to moderate. Livestock keeping is the most notable social economic activity in these regions.

Bomet County

A large part of the County is characterized by undulating topography that gives way to flatter terrain in the south. The overall slope of the land is towards the south, except the north eastern part which rises eastwards towards the 3,000 m high Mau Ridges. The land slopes gently from Kericho plateau to about 1,800 m in the lower area where the land is generally flat with a few scattered hills in Chepalungu and Sigor plain.

The County has several rivers: Kipsonoi river flows through Sotik to Lake Victoria, Chemosit flows through Kimulot in Konoin Sub-County, Nyongores flows from the Mau Forest southwards through Tenwek area, Amalo which originates in the Transmara Forest (Kimunchul) flows along south western boundary of the County, and Tebenik/Kiptiget Rivers which flow along the northern boundaries of the County. Dams are found in the drier zones of Chepalungu, parts of Sotik sub-county and Longisa in Bomet East sub-county.

Bomet County is made up of volcanic as well as igneous and metamorphic rocks. In addition to tertiary lava (phonolites) and intermediate igneous rocks, there are basement systems (granite), volcanic ash mixtures and

other pyroclastic rocks. Also present are quaternary volcanoes to the south west parts and faults along the Mau escarpment bordering Narok County.

The higher altitudes in the north eastern parts of the County are particularly suitable for tea and dairy farming. The middle part of the County which lies 2,300 m above sea level is suitable for tea, maize, pyrethrum and coffee. In the southern parts of the County such as Sigor and parts of Longisa, the main economic activity is livestock production while milk production is a major economic activity in Sotik sub-County. Areas between 1,800 m and 2,300 m above sea level are mostly suitable for maize, pyrethrum, vegetables and beef production.

Narok County

The county lies in the Great Rift Valley, home to a number of major rivers, arid and rugged landscapes, and volcanic landforms with areas of prominent geothermal activities. The highland areas of Mau escarpments, rising to an attitude of 3,100m above sea level provides fertile ground for farming. Production of wheat and barley has made the county acquire the tag; the bread basket of the country. Mau Complex is also the source of major rivers like Mara and Ewaso Nyiro with Mara River being the single major river that passes through Maasai Mara Game Reserve ultimately draining into Lake Victoria.

The famous Maasai Mara Game Reserve, one of the most popular tourism destinations in Kenya, is in the lowlands area of the county featuring the breathtaking view of the annual wildebeest migration, which has attracted researchers, wildlife documentarists and film-makers. Maasai Mara Game Reserve has been the location of numerous wildlife documentaries and movies, among them being the popular BBC documentary series: Big Cat Diary and Sydney Pollack‘s Academy Award winning movie out of Africa. In addition, Geothermal Development Company has embarked on geological research in Suswa with a view of extracting and tapping 300 MW potential of geothermal energy.

3.2.2; Ecological Condition

Nakuru County

The county has a robust ecological system that the residents depend on for agriculture, tourism, water and many other benefits. The Mau Escarpment with an average altitude of 2,400m above sea level is very important as most of the forests are located on it. It is also the source of Njoro River that drains into Lake Nakuru which is inhabited with flamingos, making it one of the premium tourists attraction site in Kenya.

The forests in Nakuru County viz-a-vis, Menengai Crater, Mbogoini, Solai, Mau, Bahati, Subukia, Eburru and Dundori) are a major source of timber and firewood as well as providing employment to high number of the

county population. The same forests generate income for the government in form of revenue from saw millers. The forest and the high altitude also influence climate condition in the county resulting to wet conditions suitable for agro-based economic activities. The climatic conditions are also favourable for micro-organisms that catalyses the decomposition of organic matter thereby enriching the soil that support agricultural activities especially dairy and crop farming enabling the county to be almost food sufficient. Mau forest is also home to the indigenous Ogiek community.

Underground hot springs in OlKaria are an important source of geothermal power that serves not only the county but also provides power supply to the national grid. Further explorations are underway at Menengai Crater and Ol Doinyo Eburru with a view to generating more electricity.

The foregoing demonstrates the need to protect the county's ecological systems upon which life depends. The resources, if exploited in an optimal and sustainable manner, will propel the county to attaining the Millennium Development Goals and Vision 2030.

Bomet County

The County borders a long stretch of Mau forest which is an indigenous forest and home to different species of animals and plants. However, due to human encroachment, animal life is threatened and certain species of wild animals, birds, insects and plants are extinct. Public sensitization on environmental conservation and the need for people to co-exist with other organisms is necessary if this trend is to be reversed. In addition, economic empowerment of the residents is needed to ensure they are able to meet their basic needs and thus promote environmental conservation.

Narok County

The county has a robust ecological system that residents depend on for agriculture, tourism, water and many other benefits. The county ecological conditions are influenced by the soil type, altitude, vegetation, rainfall pattern and human activities.

The dominant vegetation in the county includes forest land in the Mau area and grasslands and shrubs in the lowland areas of Suswa, in Narok North, Osupuko and Loita divisions in Narok South as well as the Mara sections in Transmara. These areas are suitable for livestock rearing and irrigation. A major threat to the vegetation cover is the destruction caused by human activities including grazing, charcoal burning, extraction of wood fuel and cutting down of trees without replacement resulting in adverse ecological effects.

The main drainage system includes Mara, Mogor, and Narok Enkare rivers that traverse the county from Mau region through to Kenya-border and into Tanzania. However, due to continuous deforestation over a couple of years, the volume of water in the rivers has been decreasing. To address this challenge, the county has introduced programs to construct water reservoirs, water pans, dams, shallow wells and, boreholes especially in the lowlands and denser settlements of urban and market centres of Narok town, Kilgoris, Lolgorian, E/Enkare and Ololulung'a to continue providing water for domestic and livestock use.

Maasai Mara Game reserve is a habitat for wildlife making the reserve a major tourist destination. The reserve is home a variety of wildlife including Wildebeests, Gazelles, Zebras, Warthogs, Hyenas, Giraffes, Elephants, Lions, Leopards and Elands. With their increasing numbers and human encroachment to the reserve, cases of human wild life conflict have been on the increase.

3.2.3; Climatic Conditions

Nakuru County

The climate of Nakuru County is strongly influenced by the altitude and physical features. There are three broad climatic zones (II, III and IV). Zone II covers areas with an altitude between 1980 and 2700 m above the sea level and receives minimum rainfall of 1000mm per annum. This zone covers Upper Subukia, Rongai and Mau Escarpment. Zone III receives rainfall of between 950 and 1500 mm per annum and covers areas with an altitude of between 900-1800m above sea level. This zone covers most parts of the county and is the most significant for agricultural cultivation. Zone IV occupies more or less the same elevation (900-1800m) as Zone III. However, it has lower rainfall of about 500-1000mm per annum. This zone dominates Solai and Naivasha.

The county has a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May. Temperatures in the county ranges from a high of 29.3^{o}C between the months of December, January, February, and part of early March to low temperatures of up to 12^{o}C during the month of June and July. Molo and Kuresoi Sub-Counties are relatively cold while Naivasha, Gilgil and parts of Rongai Sub-County experience extreme hot weather. However with the deforestation experienced in the county's forest blocks and influence from climate change, variant rainfall patterns and higher temperatures may be experienced.

Bomet County

Rainfall in the County is highest in the lower highland zone with a recorded annual rainfall of between 1000 mm and 1400 mm. The upper midland zone which lies west of the rift valley experiences uniform rainfall while in the upper midland zone on the southern part of the County, rainfall is low.

Rainfall is evenly distributed except for the short dry season in January and February. The wettest months are April and May. Overall, there is little break between short and long rains in the whole County. In the extreme south, rains start in November and continue intermittently until June. June to November is the dry season. In the extreme north, rains start towards the end of March and continue intermittently up to the end of December. The temperature levels range from 160 C to 240 C with the coldest months between February and April, while the hot seasons fall between December and January.

There are abundant water sources and even distribution of rain almost throughout the year. This explains why agriculture and livestock production are main economic activities of the County.

Narok County

The climate of Narok County is strongly influenced by the altitude and physical features. The county has five agro-climatic zones namely; humid, sub-humid, semi-humid to arid and semi-arid. Two-thirds of the district is classified as semi arid (Narok DEAP 2009- 2013). Temperatures range from 20^0C (January- March) to 10^0C (June- September) with an average of 18^0C.

Rainfalls amounts are influenced by the passage of inter tropical convergence zones giving rise to bi-modal rainfall pattern. Long rains are experienced between the months of February and June while the short rains are experienced between August and November. Rainfall ranges from 2,500 mm in wet season to 500 mm during the dry season.

The March to June season receives high intensity rainfalls that support growth of vegetation which is food for wild animals. This climatic characteristic has been influencing the migration of wildebeest into Kenya from Serengeti in June in search of vegetative food and return migration to Serengeti in November after the vegetation diminishes. The seasons are also important to farmers in planning for planting and harvesting.

3.2.4; Population Size and Composition

Nakuru County

The total population of Nakuru County stood at 1,756,950 in 2012, comprising of 881,674 males and 875,276 Females as per the projections of Kenya National Population and Housing Census of 2009. The population is projected to increase to 1,925,296, comprising of 966,154 males and 959,142 Female in 2015 and to 2,046,395 in 2017 comprising of 1,026,924 males and 1,019,471 females. This remarkable growth in the population implies that the county will have to invest in more social amenities and physical infrastructure to match the needs of the high populations.

The county population growth rate is estimated at 3.05 percent as per 2009 National Population and Housing Census. The high population growth rate has created a predominantly youthful population with about 51.87 percent of the population being less than 20 years of age and about 71.63 percent of the population less than 30 years of age. The implication of a large youthful population is that it will exert pressure on the existing resources. The county should promote facilities and services to meet the economic and social needs of the youth. In this regard the county government needs to initiate deliberate programmes aimed at youth empowerment for instance Small and Medium Enterprise Parks as well as training youths in technical and professional programmes. The observable decline in population of higher age group indicates a lower life expectancy. Developing a strong and affordable healthcare system and other socio-economic factors that improve the quality of life like environment will partly enhance living standards as envisaged in the Kenya Vision 2030.

Nakuru County is cosmopolitan comprising of a populace of diverse ethnicity and nationality which include Kikuyu, Kalenjins, Luos, Kamba, Luhya, and Kisii among others. The settlement patterns are influenced by availability of natural resources, soil fertility and rainfall, pasture, infrastructure, economic opportunities, proximity to urban set-ups and security. Although a large population is in the rural areas, the urban centres have the highest population density due to rural-urban migration as a result of well-developed infrastructures, employment opportunities, and security. The rural population is estimated to be 62 per cent, with the remaining 38 per cent living in towns.

Bomet County

The population of Bomet County was estimated at 723,813 in 2009 Population and Housing Census. The population was estimated to be 782,531 in 2012 and projected to reach 846,012 in 2015 and 891,168 by 2017 at an estimated population growth rate of 2.7 per cent.

The rapid population growth exerts pressure on the existing infrastructure and provision of services in the County, including pre-primary schools (ECD), primary, secondary and tertiary institutions. It requires greater investments in basic social services and hence exerts pressure on the economy thus limiting prospects of savings and production in a setting where a large population lives below poverty line. A large proportion of labour force are not in gainful employment. The population projections by sex and age cohorts for the period 2009–2017 for Bomet County are as shown in Table 4 below.

The population density of the County was 384 per square kilometres in 2012 and is expected to grow to 415/Km^2 and 437/Km^2 in 2015 and 2017, respectively.

Narok County

According to the 2009 Kenya Population and Housing Census (KPHC), the population of Narok was 850,920 persons of whom 429,026 were male while 421,894 were female. This population increased to 979,770 in 2012 and projected to 1,128,132 in 2015- 568,794 male and 559,338 female. The county is expected to reach 1,239,320 by 2017.

The county's inter-censal growth rate is 4.7 which is higher than the national inter-censal growth rate of 3.0. This rapid population growth is likely to strain the socio-economic resources and basic social services given that by 2017; the population will have increased by a significant 259,550 persons from 979,770 in 2012 to 1,239,320 in 2017.

As regards gender parity, the county population is almost evenly distributed between males and females with a ratio of 1.02 to 1.

3.2.5; Energy Access

Nakuru County

The 2009 Population and Housing Census indicate that 139,430 in Nakuru County households were using electricity for lighting, which translate to 34 per cent of the households. However, 85.7 per cent of these connections are in the urban areas. It is also worth to note that lantern and tin lamp are a common source of lighting in the rural areas accounting for 36.1 per cent and 25.3 per cent of the rural households respectively.

Nakuru County occupies a strategic geographical location at the flour of the Rift Valley which has seismic activities and therefore promotes the production of geothermal power at Olkaria, Menengai Crater and Ol Doinyo Eburru geothermal projects. Exploiting the full potentials of geothermal energy shall hugely improve the realisation of affordable energy and reduce over-reliance on hydro-power which is susceptible to climate change.

Bomet County

The main source of energy in the County is electricity and wood fuel. Approximately 91 per cent of households in the County use wood fuel compared to 64.6 per cent at the national level. Electricity coverage in the County is over 60 per cent with all the townships such as Sotik, Bomet, Mogogosiek, Sigor and Longisa having been connected to the national grid. Other sources of energy include kerosene, solar energy and lately there is a marked increase in use of biogas especially in Bomet Sub-County.

Increased supply of electricity to different parts of the County will make many people able to access it. Electrification within the urban centres is bound to encourage growth in investment and trade especially in the small and medium enterprises.

Narok County

Electricity connectivity in the county is very minimal. In 2009, only six per cent with 9,903 households had been connected to the electricity grid. Firewood was the main source of cooking fuel used by 83 per cent of the county households. The use of solar energy in lighting was at 1.4 per cent comprising of 2,301 households. Wind energy utilization has not been exploited in the county.

3.2.6; Forestry and Agro Forestry

Nakuru County

The forests in the county are classified into gazetted, non- gazetted and individual forestlands. There are two gazetted forests namely Mau Forest and Dondori Forests and six non-gazetted forests. The gazetted forests in the county cover 679.643 square kilometres. The individual forest land is estimated to be less than one per cent. There is great need to promote afforestation and re-forestation in the Mau Escarpment to improve tree cover and conserve the environment.

Bomet County

Bomet County has two forests, one gazetted and the other un-gazetted, with the gazetted forest covering an area of approximately 481.1 Km². There are two types of forests in Bomet, that is indigenous and plantation forests. The major forests include Mau forest, Chepalungu forest and private forests.

Narok County

The county has an estimated 724Km^2 of gazetted forest, 930Km^2 of non-gazetted forest and 480 Km^2 of county council trust forest. The total area under forest cover represents 11.9 per cent of the total county surface area. In addition, Maasai Mara game reserve covers approximately 1,510Km^2. Of this area 1,000km^2 is in Narok South sub-county while 510km^2 of game reserve is in Transmara West sub-county and is famously referred to as Mara triangle. The vegetative cover of these forests is mainly natural trees in the highland areas and shrubs and grasslands in the lowlands.

The forests are found in Olokurto division in Narok North Sub-county which covers part of Mau forest and Enoosupukia forest in Mau division. In Narok South, there is a forest in Mulot division (Mau) and in Loita division (Loita forest). The highland zones of Transmara West sub-county with forest are Ole Nkapune, Haile and Olomismis forest. The defunct Transmara County Council owned Emperua forest.

3.2.7; Major Contributors to environmental degradation in the county

Nakuru County

Environmental degradation in Nakuru County is mainly as a result of inappropriate farming methods, effects of climate change, poor solid waste and liquid waste disposal, soil erosion, inadequate sanitary facilities, massive felling of trees for firewood, timber and clearing land for agricultural use. In addition, poor physical planning in urban areas, quarrying activities, pollution and toxic from agro-chemicals contributes to environmental degradation.

Bomet County

The major contributors of environmental degradation in the County are quarrying activities carried out in Bomet Town as well as Koiwa and Kyogong areas of Konoin and Chepalungu Sub-Counties respectively. People have also encroached on gazetted forests for grazing and illegal logging. Due to these illegal activities, some forests like Chepalungu are near extinction and this is causing threat to the human and animal lives as water catchment areas are destroyed and subsequent loss of bio diversity. Lack of sewerage systems and proper waste management in most urban centres in Bomet County has led to pollution of the environment and increase in waterborne diseases have been witnessed across the County.

Narok County

Environmental degradation in the county is mainly as a result of unsuitable farming methods, effects of climate change, poor solid waste management, soil erosion, inadequate sanitary facilities, massive cutting down of trees for firewood, timber and clearing land for agricultural use, poor physical planning in urban areas, quarrying activities, pollution and toxic from agro-chemicals and alien and invasive species.

3.2.8; Tourism

Nakuru County

There are three national parks within Nakuru County namely, Mt. Longonot National Park, Hells Gate National Park and Lake Nakuru National Park. Others tourist attraction sites include Menengai Crater, Subukia Shrines, Lord Egerton Castle, Lake Naivasha, Lake Elementaita, Hyrax Hill Prehistoric Site, Ol Doinyo Eburru volcano, Mau Forest among others. In addition there are private wildlife conservancies which include; Marura, Oserian and Kedong in Naivasha Sub-County and Kigio and Soysambu in Gilgil Sub-County.

Bomet County

Although there are no major tourist attraction activities in the County, there exists a potential for tourism. Part of Bomet County is within the expansive Mau forest which is home to different tree species, wildlife and birds

which can easily be exploited for tourism. There are also caves in Konoin Sub-County and waterfalls along Itare and Chepkulo rivers in Konoin and Bomet Central sub-counties respectively.

Narok County

The County has several tourist attraction sites. Among them is the world‘s famous Maasai Mara game reserve featuring the breathtaking view of the annual wildebeests migration where over 1.5 million white bearded wildebeest and 250,000 zebra cross the crocodile infested Mara River. The animals cross into Maasai Mara game reserve from Serengeti National Park in July and depart in November. In November 2006, a jury of experts polled by ABC Television - a leading American broadcaster, affirmed the annual migration as one of the —New Seven Wonders of the World.

3.2.9; Wildlife

Nakuru County

The main wild animals available at the various parks within Nakuru County include; White Rhino, Black Rhino, Giraffe, Hippo, Buffalo, Zebra, Eland, Water Buck, Impala, Thomson Gazelle, Bush back, Grant Gazelle, Dikdik, Bohor Reedbuck, Mountain Reedbuck, Warthog, Baboon, Velvet Monkey, Colombus Monkey, Hyrax, Klip Springer, Lion, Leopard, Cheetah, Hyena, Jackal, Diuker, Great White Pelican, Pink Backed Pelican, Great Cormorant and Long tailed cormorant. Lake Nakuru has two major species of flamingos, about 422,341 lesser flamingos and 78 greater flamingos.

Bomet County

A section of Mau forest is within Bomet County and is home to rare animal species like bongo, giant forest hogs, cooper tailed monkeys, black and white Columbus monkeys, elephants, leopards, buffalos and abundant birdlife. It is the only National reserve in the County and has all the potential to be a leading tourist attraction and lead destination for the County.

Narok County

There are about 95 species of mammals, amphibians and reptiles and over 420 birds species recorded on the reserve. The main wild animals in the park are the big five (buffalo, elephant, leopard, lion, and rhino). Other game include wildebeests, hippopotamus, cheetah, impala, topi, coke‘s hartebeest, giraffe, roan antelope, zebras, spotted hyenas, waterbucks, thompson‘s and grants gazelles. The main birdlife include the vulture, marabou stork, secretary bird, hornbill, crowned crane, ostrich, long-crested eagle, and pygmy falcon. Nowhere in Africa is wildlife more abundant than in Maasai Mara Game Reserve.

3.2.10; Water Resources

Nakuru County

Nakuru County is endowed with natural water resources including four major lakes, Nakuru, Naivasha, Solai and Elementaita. In addition, there are rivers, shallow wells, springs, dams, pans and boreholes spread all over the county especially in drier parts of Naivasha, Gilgil, Molo, Njoro and Rongai. The boreholes have boosted water supply in the county. Some of the major rivers include, Malewa, Njoro, Molo and Igwamiti. The county is also endowed with springs found in Subukia, Nakuru North, Molo and Kuresoi areas. Rain water is another major source of water in the county with about 80 per cent of households harvesting rain-water.

Bomet County

The main rivers within the County include Nyongores, Kipsonoi, Itare, Kiptiget, Chemosit Amalo, Mara and Sisei. These are permanent rivers although the latter is fast diminishing due to intensified cultivation along its banks and catchment area. Degradation and plenty of blue gum along the river banks have also played a major role in fast diminishing of those rivers. Wetland are numerous, but they are unprotected.

Roof water harvesting is also practiced by the households that have corrugated iron roofs. Most public and private institutions have tapped rain water for their own use in areas where there are no nearby water supplies and springs. Generally, the County is well endowed with water sources that can be tapped for the development. Water quality depends on sources. Water from roof catchment, springs and streams are better in quality than that from ponds and small dams. However, there is declining water quality resulting from water pollution and extensive cultivation along the river banks and water catchment areas.

Narok County

The county has permanent and seasonal rivers which originate from major highlands. Rivers and streams are the major sources of water for domestic use. Dams and water pans are on the other hand used for livestock drinking. In the lowlands, such as Suswa and Osupuko, which are semi-arid, there is scarcity of water. Major rivers are Mara and Ewaso Nyiro. Ewaso Nyiro drains into Lake Natron while Mara River which passes through Maasai Mara Game Reserve drains into Lake Victoria. There are also some shallow wells, protected springs, dams, water pans, boreholes, and un-protected springs which serves as water sources for the communities.

3.3: BASELINE BIOPHYSICAL

Appendix II gives detailed flora, fauna and hydrology report for the Rongai - Kilgoris Transmission Line

Flora

Rongai – Matuiku.

Agroclimatic zone: IV Semi-humid to semi arid.

This is in Nakuru county where most of the activities are farming of both large and small scale farming including livestock farming of mostly cattle and sheep. Also there are tourism activities especially at lake Nakuru and Elementaita where tourist visit for bird viewing.

The main agricultural crops are maize, beans, wheat and potatoes as you approach Matuiku. The terrain is flat but well drained in most of the parts of Nakuru County. Few seasonal rivers are drying up due to over exploitation especially during the dry seasons. The tree species found in the area are mostly exotic such as eucalyptus sp, *cupressus lucitanica, grevellia, pinus*, and some few indigenous species such as *acacia sp* and *ficus sur Tarconanthus camphoratus*, Euphorbia candelabra and *Acacia drepanolobium* which community use for fuelwood, construction and animal shade. Type of grass are *Digitaria abyssinica*, Boma Rhode ,savanna and few parts with *pennisetum clandestinum* (kikuyu grass) mixed with mixed bush land.

Acacia trees at Rongai

Rocky parts of Matuiku

Agricultural land along the TL at Matuiku.

Matuiku – Elburgon.

Agroclimatic zone: I Humid.

This was initially part of Mau Forest within Maasai Mau forest areae covering Njoro, Elburgon, Mau Narok and Elburgon. This importantly is the source of rivers like Njoro, Muro and Kanyariri rivers among the others which feeds importance lakes e.g Lake Nakuru which is one of the important tourist site and home of many birds like the flamingoes. High demand of settlement and farmland due to population increase has led to human encroaching of the forest in search of land space.

The place was occupied by the Ogiek who were hunters and gatherers and lived in the forest but other tribe invaded the place introducing other life style like farming and gracing hence clearing the forest to allow cultivation for their day to day leaving changing the Natural status of land use to what we can now call introduction of artificial environment by introduction of exotic tree species.

The ethnic groups found here are Kalenjin and Maasai who are pastoralist/farmers and Kikuyu who are farmers.

The population density is pronounced and the land is small with farming and grazing practiced. The main crops are maize, beans, vegetables and potatoes. Topography is gentle slope with small rivers which local use for their domestic use and small scale irrigation farming. Trees are mostly exotic such as *cupresus lucitanica*,

eucalyptus sp, grevellia and indigenous like *ficus sur*. Acacia sp, *dombeya, olea Africana and juniperus procera*.

The soil is loam which is good for farming and grazing. The soil being soft and loose, erosion and dust might be experienced during project implementation and so control measures should be applied.

Elburgon- Muchorwe.

Agroclimatic zone: I Humid.

The area is adjacent to Elburgon forest which is apart of the Mau Forest Complex. The population is dense with subsistence farming of maize, beans, potatoes, cabbage and grazing being the main activities of the local communities.

The forest is degraded due to locals demand for fuel wood and building materials for the residence and the Elburgon town which has grown in population due to business activities especially farm produce and factories like Timsales which is a major producer of wood products in Kenya.

Fire wood harvesting for domestic use.

Much of the tree species in the Mau Forest in Elburgon is exotics especially cypress owned by the Timsale Factories who are the major agents of replanting the trees for replacement of what has been harvested for their row materials for production of plywood and product.

Forest plantation for commercial use

The soil type is dominated by loam soil with marram and rocks in some areas.

There are many small streams which dries up during the dry season of January to March but the area remain relatively wet.

The area is densely populated with small scale farming of maize, beans, potatoes, cabage, carrot and grazing. The terrain is gentle slopes with small rivers. Tree species are cupressus lucitanica, grevellia, pinus, and some few indigenous species such as *acacia sp, dombeya torrida, hagenia abyssinica, juniperus.* The type of grass is penesetum (Kikuyu grass).

Muchorwe.- Olengruone .

Agroclimatic zone: I Humid.

Subsistence farming and tea as cash crop are the livelihood occupation for the community within the area which was initially occupied by the white settlers within central rift valley that was known for high value agriculture. The topography is steep slope which is prone to soil erosion especially when not well managed.

Tree species found along the operation area are *cupressus lucitanica, pinus patula*, eucalyptus sp which are exotic and *juniperus procera*, *dombeya torinda, olea Africana, prunus Africana* which are indigenus among others.

Several streams of rivers form major rivers like the River Sondu which drains into Lake Victoria and does in fact produce hydroelectric power originates from this area which is cold almost throughout the year making the place one of the most agricultural productive region.

Loam soil dominate the region.

Steep slopes at Olenguruone

Olengruone – Bomet.

Agroclimatic zone: I Humid.

The line crosses to Bomet County through the Mau Forest Complex. The transmission line will enter the Forest Complex at Kiptangich and exit at Masese covering a distance of about 23km. At Kiptengich, where the forest boarders the settlement area, there is 2 kms bamboo buffer (inside the forest) which is known for the soil moisture preserver and water purification plant.

The Mau Forest Complex is the largest closed-canopy montane ecosystem in Eastern Africa. It encompasses seven forest blocks within the Mau Narok, Maasai Mau, Eastern Mau, Western Mau, Southern Mau, South West Mau and Transmara regions. The area is thus the largest water tower in the region covering over 400,000 hectares and being the main catchment area.

However, in the past, the Mau Forest Complex has undergone significant land use changes due to increased human population demanding land for settlement and subsistence agriculture. The encroachment has led to drastic and considerable land fragmentation, deforestation of the headwater catchments and destruction of wetlands previously existing within the fertile upstream parts due to communities searching for farming land and grazing land. Today, the effects of the anthropogenic activities are slowly taking toll as is evident from the diminishing river discharges during periods of low flows, and deterioration of river water qualities through pollution from point and non-point sources.

The Mau Complex is drained mainly by 12 rivers including Rivers Njoro, Molo, Nderit, Makalia, Naishi, Kerio, Mara, Ewaso Nyiro, Sondu, Nyando, Yala and Nzoia feeding lake Natron in Tanzania, Lake Nakuru, Lake Baringo, Lake Victoria and Lake Turkana. The community around the area who are mostly pastoralist and farmers depend on these rivers for their living. These rivers also support agriculture, hydro power, urban water supply, tourism and wildlife habitat throughout much of Kenya. The Eastern Mau Forest is the headwaters for Njoro River which empties its water into Lake Nakuru - one of Kenya's prime tourist attractions. The forest is also home to rare indigenous trees such as cedar, African olive, *bamboo, dombeya* and shrubs. It also has exotic trees such as cypress, pine, grevillea robusta and eucalyptus which are regularly planted by the Kenya Forest Services mainly for commercial purposes.

The complex also contains a good number of medicinal plants. In the last three decades, physical evidence has revealed that the rivers in the complex have had significant decline in discharges, coupled by dwindling

water quality. Other studies have also highlighted the changing hydrological response of the area are as a result of the land use/land cover changes.

Apart from being the largest closed-canopy montane in Eastern Africa, the catchment basin has two important biodiversity zones namely the forests shrouding the catchment's upper reaches and Lake Nakuru national park. Interposed between these two zones are human habitations with less biodiversity value, but which are dependent either directly or indirectly on ecological services provided by high biodiversity zones. Lake Nakuru is the home to various flamingoes. Currently the number of flamingoes in the lake has been declining with some migrating to other saline lakes due to urbanization and industrialization within the nearby Nakuru and Bomet towns.

Also part of Mau is the home of Ogiek communities who are hunters aand gatherers depending wholly on the forest for their livelihood and habitation. This would provide good foliage for them to provide honey which the community sell to other tribes.

Typical tree species in Mau Forest include Pouteria adolfi-friedericii, Strombosia scheffleri and Polyscias kikuyuensis. Olea capensis, Prunus africana, Albizia gummifera and Podocarpus latifolius are also found there.

The animals found in the forest include the elephants, buffalo, hyenas, Bongos etc.

Mau Forest.

Tea plantation in olenguruone.

Masese – Bomet

From Masese to bomet, the terrain is steep with farming of tea as the main cash crop and maize as subsistence farming. The soil is loam soil with some small rocky area. Soil erosion is experienced due to the steep terrain which might increase during the construction of the transmission line due to excavation.

The community benefits from the rivers from the Mau forest for their domestic use and other essential needs e.g. electricity for institution like Tenwek hospital that produce it's own from the same river.

Small scale faming in Masese Bomet.

Bomet – Ndanai.

Agroclimatic zone: III Semi-humid.

The area is occupied by Pastolists and farmers. The soil is black cotton, clay loam and loam soil. Rocky areas are present. The terrain is flat with steep slope around Kilgoris and small parches of swamps are present which the local community use for either fodder or source of domestic water.

There is moderate tree planting mainly of exotic species like eucalyptus, cypress and grevelia and indigenous trees like *acacia, dombeya* and *juniperus.*

Ndanai-Kilgoris.

Agroclimatic zone: III Semi-humid.

The area is occupied by Pastolists and farmers. The soil is black cotton, clay loam and loam soil. The area is dominated with gentle slopes with more pronounce soil erosion. Rocky areas are present. There is moderate tree planting mainly of exotic species like eucalyptus, cypress and grevelia and indigenous trees like *acacia, dombeya*, and *acacia sp*.

Birds:

The majority of this habitat is regarded as suitable for terrestrial bird species for foraging, roosting and as passage for migrating birds. It must be emphasized that birds will, by virtue of their mobility, utilize almost any areas in the landscape from time to time. Unique species found in the woodland include vulturine guinea fowl, Ostrich, wheaters, pipits, larks etc. The disturbance associated with clearing of woodland for the transmission line servitude will potentially impact on such species.

The project area has many species of birdlife consisting of Hartlaub's Turaco (Tauraco hartlaubi), Hunter's Cisticola (Cisticola hunteri) and Jackson's Francolin (Francolinus jacksoni)

Hydrology of the area

The following rivers and streams were identified during the assessment.

Rongai – Elburgon

1. Ndeloren River
2. Mau River
3. Muro River
4. Shawa river

Elburgon – Muchorwe

1. Muro River
2. Mau Ndogo River

Muchorwe – Olenguruone

1. Nyota Stream
2. Kimalany stream
3. Kipsonei stream
4. Two (2) more seasonal rivers that were nameless

Olenguruone – Bomet

1. Kormatet stream

2. River Cheplulo (a tributary to Mara River)

Bomet - Kilgoris

1. River Saramek
2. Romosha River

3.4: PHYSICAL CULTURAL RESOURCES (PCR) – ARCHEOLOGICAL AND CULTURAL HERITAGE

Physical cultural resources, are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or underwater. Their cultural interest may be at the local, provincial, or national level, or within the international community. Examples of PCR include;

Human-made

- Religious buildings such as temples, mosques, churches
- Exemplary indigenous or vernacular architecture
- Buildings, or the remains of buildings, of architectural or historic interest
- Historic or architecturally important townscapes
- Historic roads, bridges, walls, dams, fortifications, water works
- Archaeological sites (unknown or known, excavated or unexcavated)
- Commemorative monuments
- Historic sunken ships

Natural

- Holy waters and holy wells
- Sacred waterfalls
- Sacred groves and individual sacred trees
- Historic trees
- Sacred mountains and volcanoes
- Caves currently or previously used for human habitation or social activity
- Paleontological sites (ie., deposits of early human, animal or fossilized remains)
- Natural landscapes of outstanding aesthetic quality

Combined Human-made and Natural

- Sites used for religious or social functions such as weddings, funerals, or other traditional community activities
- Places of pilgrimage
- Burial grounds
- Family graves in the homestead
- Historic gardens
- Cultural landscapes
- Natural stones bearing historic inscriptions
- Historic battlegrounds
- Combined human and natural landscapes of aesthetic quality
- Cave paintings

Movable

- Historic or rare books and manuscripts
- Paintings, drawings, icons, jewellery
- Religious artefacts
- Historic costumes and fabrics
- Memorabilia relating to the lives of prominent individuals or to events such as historic battles
- Statues, statuettes and carvings
- Modern or ancient religious artefacts
- Pieces broken off from monuments or historic buildings
- Unregistered archaeological artefacts
- Antiquities such as coins and seals
- Historic engravings, prints and lithographs
- Natural history collections such as shells, flora, minerals

Result of assessment and way-forward

During the assessment, none of the above PCRs was found. However, chance finds cannot be disqualified. During excavations for the tower bases, workers may come across Archaeological finds.

Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.

3.5: SAFETY OF AIRCRAFTS

The Kenya Civil Aviation Authority (KCAA) regulations, establish standards for determining obstructions in navigable airspace. Issues such as size and height of tower/poles, right-of-way needs, maintenance access, and impacts to the approach zone, clear zone, or safety zone has to be evaluated and approved by KCAA to utilize property near airports and airstrips.

Section 56 of Civil Aviation Act (Restriction of building in declared areas) observes that, the Cabinet Secretary may, where he considers it to be necessary in the interests of the safety of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any building or structure above a height specified in the order. A “declared area” in this case means any area adjacent to or in the vicinity of an aerodrome which the Cabinet Secretary may by notice in the Gazette declare to be a declared area.

Section 57 (Control of structures, etc., on or near aerodromes), observes that, the KCAA Director General may consider provisions for civil aviation safety and security or efficiency of air navigation ought to be made;

- whether by lighting or otherwise for giving aircraft warning of the presence of any building, structure, tree or natural growth or formation on or in the vicinity of an aerodrome; or
- by the removal or reduction in height of any such obstruction or surface,

Result of assessment and way-forward

The consultant identified the following airstrips within reach of the transmission line;

1. Rongai Airstrip
2. Ngogar Airstrip
3. St. Andrews Turi Airstrip
4. Emom Airstrip (Olenguruone)
5. Bomet Airstrip
6. Kilgoris Airstrip

To ensure the safety of aircrafts within these sections, KETRACO will be required to acquire a KCAA license for this transmission line. This may involve overflying the transmission line.

Where it is likely that the power line is hazardous to aviation safety because of its height or location, spherical markers will be used to identify overhead power lines or KETRACO will consider reducing the size of its towers in such sections.

CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1: INTRODUCTION

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished or is in the process of development. The NEAP process introduced environmental assessments in the country culminating into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999.

An EIA is a legal requirement in Kenya for all development projects under the Second Schedule of the Environmental Management and Coordination Act (EMCA), Cap 387. EMCA Cap 387 and its operational regulations govern EIA studies.

EMCA Cap 387 created the National Environment Management Authority (NEMA), which has the statutory mandate to supervise and co-ordinate all environmental activities. Policies and legislation highlighting the legal and administrative requirements pertinent to this study are presented below.

4.2: THE CONSTITUTION OF KENYA

The Kenyan Constitution states that every person has the right to a clean and healthy environment, which includes the right –

a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69 and
b) to have obligations relating to the environment fulfilled under Article 70.

Article 69 observes that;

(1) The State shall—

a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;

d) Encourage public participation in the management, protection and conservation of the environment;
e) Protect genetic resources and biological diversity;
f) Establish systems of environmental and social impact assessment, environmental audit and monitoring of the environment;
g) Eliminate processes and activities that are likely to endanger the environment; and
h) Utilize the environment and natural resources for the benefit of the people of Kenya.

(2) Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

4.3: POLICY FRAMEWORK

National Environmental Policy

Kenya Government's environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of human environment
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- Conservation and management of the natural resources of Kenya including air, water, land, flora and fauna
- Promotion of environmental conservation through the sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- Meeting national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

The Draft National Land Use Policy, 2016

The overall goal of the national land use policy is to provide legal, administrative, institutional and technological framework for optimal utilization and productivity of land related resources in a sustainable and desirable manner at national, county and community levels. The policy is premised on the philosophy of economic productivity, social responsibility, environmental sustainability and cultural conservation. Key principles informing it include efficiency, access to land use information, equity, elimination of discrimination and public benefit sharing.

The Policy is a statement of intent that sets out long term goals on land use management. It addresses issues relating directly to the use of land, its resources and perceptions. It also incorporates all activities that are likely to have an impact on the use of land and its resources.

The Policy is important in addressing issues of optimal utilization of land and land related resources by providing principles and guidelines for:-

- Proper management of land resources to promote public good and general welfare;
- Land use planning to enhance sustainable development;
- Anchoring land development initiatives;
- Mitigating problems associated with poor land use;
- Promoting environmental conservation and preservation; and
- Preparation and review of a national spatial plan and integration of various levels of land use planning.
- Land and land related conflicts
- Categorization of land uses in the country

The Draft National Energy and Petroleum Policy, 2015

The overall objective of the energy and petroleum policy is to ensure affordable, competitive, sustainable and reliable supply of energy to meet national and county development needs at least cost, while protecting and conserving the environment.

The policy address issues relating to;

- Petroleum and Coal,
- Renewable Energy, including electricity generation from geothermal and hydro resources,
- Electricity,
- Energy Efficiency and Conservation,
- Land, Environment, Health and Safety,
- Devolution and Provision of Energy Services, and
- Energy Financing, Pricing and Socio-Economic Issues;

4.4: LEGAL FRAMEWORK

Application of national statutes and regulations on environmental conservation suggest that the Proponent has a legal duty and social responsibility to ensure that the proposed development be implemented without compromising the status of the environment, natural resources, public health and safety. This position enhances the importance of this environmental and social impact assessment for the proposed site to provide a benchmark for its sustainable operation.

Kenya has approximately 77 statutes that relate to environmental concerns. Environmental management activities were previously implemented through a variety of instruments such as policy statements and sectoral laws as well as through permits and licenses. Most of these statutes are sector-specific, covering issues such as public health, soil erosion, protected areas, endangered species, water rights and water quality, air quality, noise and vibration, cultural, historical, scientific and archaeological sites, land use, resettlement, etc.

Some of the key national laws that govern the management of environmental resources in the country are hereby discussed however it is worth noting that wherever any of the laws contradict each other, the EMCA, Cap 387 prevails.

4.4.1 The Environmental Management and Co-ordination (Amendment) Act, Cap 387,

Provides for the establishment of appropriate legal and institutional framework for the management of the environment and related matters. Part II of the EMCA, Cap 387, states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue an EIA license as appropriate. The approval process time frame for Project Reports is 21 days and for full EIA Study is 45 days.

This Project falls within Schedule 2 of EMCA Cap 387 and therefore requires an EIA. The Proponent has commissioned the environmental and social impact assessment study in compliance with the Act. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA, prior to being issued an EIA license.

4.4.2 The Environmental (Impact Assessment and Audit) Regulations, 2003

The regulations observe that; No proponent shall implement a project -

a) likely to have a negative environmental impact; or
b) for which an environmental impact assessment is required under the Act or these Regulations;

Unless an environmental Impact Assessment has been concluded and approved in accordance with the Regulations.

This Study is aimed at ensuring compliance of these regulations. The study has collected information on project design, the relevant baseline data, conducted an elaborate public consultation process and created an

Environmental and Social Management Plan(ESMP) and a monitoring plan (ESMoP) that if implemented will ensure conservation and protection of environment and improved livelihoods.

4.4.3 Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009.

The regulations observe that, except as otherwise provided in the Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

The Proponent shall observe policy and regulatory requirements and implement the measures proposed in this documenting as an effort to comply with the provisions of the Regulations.

4.4.4 Environmental Management and Coordination, (Water Quality) Regulations 2006

The Regulations observe that, every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act. It further observes that, no person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

It goes on to state that, no person shall:

a) discharge, any effluent from sewage treatment works, industry or other point sources into the aquatic environment without a valid effluent discharge license issued in accordance with the provisions of the Act.

b) abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an Environmental Impact Assessment license issued in accordance with the provisions of the Act; or

c) cultivate or undertake any development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the Authority from time to time.

The Proponent will observe the requirements of these regulations especially during the construction phase.

4.4.5 Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

The regulation observes that;

1. No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.
2. Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.
3. Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility.
4. Any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority.
5. Any person who owns or controls a facility or premises which generates waste shall minimize the waste generated by adopting the cleaner production principles.

The Proponent shall observe the guidelines as set out in the environmental management plan laid out in this report as well as the recommendation provided for mitigation /minimization /avoidance of adverse impacts arising from the Project activities.

4.4.6 Environmental Management and Co-ordination (Air Quality) Regulations, 2009.

The objective of these Regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The regulations observe that;

1. No person shall-
    a) act in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution; or

b) emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the First Schedule.

c) No person shall cause emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.

2. No person shall cause emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.
3. No person shall cause the Ambient Air Quality levels specified in the First Schedule of these Regulations to be exceeded.
4. (1) No person shall cause or allow particulate emissions into the atmosphere from any facility listed under the Fourth Schedule to these Regulations in excess of those limits stipulated under the Third Schedule.
5. Any person, being an owner of premises, who causes or allows the generation, from any source, of any odour which unreasonably interferes, or is likely to unreasonably interfere, with any other person's lawful use or enjoyment of his property shall use recognised good practices and procedures to reduce such odours to a level determined by the odour panel, including any guidelines published by the Authority for reducing odours.

The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document in an effort to comply with the provisions of these Regulations on abatement of air pollution.

4.4.7; Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009.

The Objectives of these Regulations include-

a) to provide for the conservation and sustainable use of wetlands and their resources in Kenya;
b) to promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development;
c) to ensure the conservation of water catchments and the control of floods;
d) to ensure the sustainable use of wetlands for ecological and aesthetic purposes for the common good of all citizens;
e) to ensure the protection of wetlands as habitats for species of fauna and flora;
f) provide a framework for public participation in the management of wetlands;
g) to enhance education research and related activities; and
h) to prevent and control pollution and siltation.

The Proponent shall comply with the provisions of these regulations

4.4.8; Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006.

The regulations observe that;

(1) A person shall not engage in any activity that may-

a) have an adverse impact on any ecosystem;
b) lead to the introduction of any exotic species;
c) lead to unsustainable use of natural resources,

Without an Environmental Impact Assessment Licence issued by the Authority under the Act.

The Proponent shall comply with the provisions of these regulations

4.4.9 Environmental Management and Coordination (Controlled Substances) Regulation, 2007, Legal Notice No. 73

The Controlled Substances Regulations defines controlled substances and provides guidance on how to handle them. The regulations stipulate that controlled substances must be clearly labelled with among other words, "Controlled Substance-Not ozone friendly'' to indicate that the substance or product is harmful to the ozone layer. Advertisement of such substances must carry the words, "Warning: Contains chemical materials or substances that deplete or have the potential to deplete the ozone layer." Persons handling controlled substances are required to apply for a permit from NEMA.

Proponent will not use controlled substances in the operation of the project. Hazardous materials such as PCB based coolants will not be used in the transformers, capacitors, or other equipment.

4.4.10; The Occupational Health and Safety Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. Of importance to the proposed project are:

- Registration of workplaces
- Health General Provisions (including cleanliness, overcrowding, ventilation, lighting, drainage of floors, and sanitary conveniences)
- Safety General Provisions (including ladders, ergonomics at the workplace, Fire prevention, safety provisions in case of fire, evacuation procedures)
- Welfare General Provisions (including supply of drinking water, washing facilities, accommodation for clothing, facilities for sitting, and first-aid)

- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.
- Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.
- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

Failure to comply with the OSHA, 2007 attracts penalties of up to Ksh. 300,000 or 3 months' jail term or both or penalties of Ksh. 1,000,000 or 12 months' jail term or both for cases where death occurs and is in consequence of the employer

The report advices the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost, as a basic guideline for the management of Health and Safety issues in the proposed project.

4.4.11; The Public Health Act (Cap. 242)

The Act Provides for the securing of public health and recognizes the important role of water. It provides for prevention of water pollution by stakeholders, among them Local Authorities (county councils). It states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health.

The Proponent shall observe policy and regulatory requirements and implement measures to safeguard public health and safety.

4.4.12; Occupiers Liability Act (Cap. 34)

Rules of Common Law regulates the duty which an occupier of premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic material in the premises.

The Proponent shall endeavour to ensure that the management of health and safety issues is of high priority during the operational phase of the project.

4.4.13; The Standards Act Cap 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of

rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

The Act contains various specifications touching on electrical products. The Proponent shall ensure that commodities and codes of practice utilized in the project adhere to the provisions of this Act.

4.4.14; Energy Act, 2006

The Act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any or all of these purposes. The Act establishes an energy commission, which is the main policy maker and enforcer in the energy sector. This commission among other things is responsible for issuing all the different licenses in the energy sector. Section 6 (1) observes that, the Cabinet Secretary shall develop and publish national energy plans in respect of fossil fuels, renewable energy and electricity, which shall be reviewed every three years. Subsection 4 (e), observes that the development of the energy plans shall take into account environmental, health, safety and socio-economic impacts

The Proponent shall observe the guidelines as set out in the Energy Act

4.4.15; Land Registration Act, 2012

An Act of Parliament to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes

The Proponent shall adhere to the requirements of the Act in the implementation of land acquisition.

4.4.16; The Community Land Act, 2016

AN ACT of Parliament to give effect to Article 63 (5) of the Constitution; to provide for the recognition, protection and registration of community land rights; management and administration of community land; to provide for the role of county governments in relation to unregistered community land and for connected purposes

The Proponent shall comply with the provisions of the Act in the acquisition of community Land.

4.4.17; The Forest Conservation and Management Act, 2016

An Act of Parliament to provide for the establishment, development and sustainable management, including conservation and rational utilisation of forest resources for the socio-economic development of the country. The Act applies to all forests on public, community and private lands.

The principles of this Act include

- good governance in accordance with Article 10 of the Constitution;
- public participation and community involvement in the management of forests;
- consultation and co-operation between the national and county governments;
- the values and principles of public service in accordance with Article 232 of the Constitution;
- protection of indigenous knowledge and intellectual property rights of forests resources; and
- international best practices in management and conservation of forests.

The proponent will strictly adhere to this act as it is key in ensuring the integrity of our forests

4.4.18; National Museums and Heritage Act, 2006

An Act of Parliament to consolidate the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya; to repeal the Antiquities and Monuments Act (Cap. 215) and the National Museums Act; and for connected purposes

The proponent shall follow due procedures in case of unearthing any antiquity.

4.4.19; The Civil Aviation Act, 2013

Under this Act, the Kenya Civil Aviation Authority (KCAA) has to authorize and approve the height of the mast for the purpose of ensuring the safety of flying aircraft over the proposed project area.

Section 56 of Civil Aviation Act (Restriction of building in declared areas) observes that, the Cabinet Secretary may, where he considers it to be necessary in the interests of the safety of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any building or structure above a height specified in the order. A “declared area” in this case means any area adjacent to or in the vicinity of an aerodrome which the Cabinet Secretary may by notice in the Gazette declare to be a declared area.

Section 57 (Control of structures, etc., on or near aerodromes), observes that, the KCAA Director General may consider provisions for civil aviation safety and security or efficiency of air navigation ought to be made;

- whether by lighting or otherwise for giving aircraft warning of the presence of any building, structure, tree or natural growth or formation on or in the vicinity of an aerodrome; or
- by the removal or reduction in height of any such obstruction or surface,

The Proponent shall comply with the provisions of the Act in seeking authorization from KCAA.

4.4.20; Physical Planning Act (Cap286)

The Act provides for the preparation and implementation of physical development plans and for related purposes. It gives provisions for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land.

The Proponent shall secure all mandatory approvals and permits as required by the law.

4.4.21; Penal Code Act (Cap.63)

The Act states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution is dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.

The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendation provided for mitigation/ minimization/ avoidance of adverse impacts arising from the project activities.

4.4.22; Work Injury Benefits Act, 2007.

An Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes

The proponent will ensure that, any consultant work for this project observes this law

4.4.23; Workmen's Compensation (Compulsory Insurance) Order.

The Oder observes that, every employer to whom this Order applies shall insure and keep himself insured with an insurer carrying on business in Kenya as an insurance company, in respect of any liability which he may incur, under the Act, to each workman employed by him either exclusively or in part in any undertaking or in part of any under-taking referred to in paragraph 2 of the order.

The proponent will ensure that, any consultant work for this project observes this law

4.4.24; The Wildlife Conservation and Management Act, 2013.

An Act of Parliament to provide for the protection, conservation, sustainable use and management of wildlife in Kenya and for connected purposes. The act observes that, it is desirable that the present powers relating to the management and conservation of wildlife in Kenya be amalgamated and placed in a consolidated Service of the Government; and that the prime objective of the Service be to ensure that wildlife is managed and conserved so as to yield to the Nation in general and to individual areas in particular, optimum returns in terms of cultural, aesthetic and scientific gains as well as such economic gains as are incidental to proper wildlife management and conservation and which may be secured without prejudice to such proper management and conservation. The Act however, observes that, it is necessary, for the achievement of that objective, that full account should be taken of the varied forms of land use and the interrelationship between wildlife conservation and management and other forms of land use.

The proponent will ensure that, the requirements of this law are observed.

4.4.25; The Water Act, 2016.

An Act of Parliament to provide for the regulation, management and development of water resources, water and sewerage service; and for other connected purposes. This Act provides for the regulation, management and development of water resources and water and sewerage services in line with the Constitution. Authorities shall, in administering or applying this Act, be guided by the principles and values set out in Articles 10,43. 60 and 232 of the Constitution. it establishes the Water Resources Authority ("Authority"), the National Water Harvesting and Storage Authority, the Water Services Regulatory Board, the Water Sector Trust Fund and the Water Tribunal.

The proponent will ensure that, the requirements of this law are observed.

4.4.26; HIV and AIDS Prevention and Control Act, 2006.

An Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counselling, support and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes.

The object and purpose of this Act is to;-

a) promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS;
b) extend to every person suspected or known to be infected with HIV and AIDS full protection of his human rights and civil liberties by;-
   - prohibiting compulsory HIV testing save as provided in this Act;
   - guaranteeing the right to privacy of the individual;
   - outlawing discrimination in all its forms and subtleties against persons with or persons perceived or suspected of having HIV and AIDS;
c) (iv) ensuring the provision of basic healthcare and social services for persons infected with HIV and AIDS;
d) (c) promote utmost safety and universal precautions in practices and procedures that carry the risk of HIV transmission; and
e) (d) positively address and seek to eradicate conditions that aggravate the spread of HIV infection.

The proponent and all his contractors will ensure that, the requirements of this law are observed.

4.4.27; National Gender and Equality Commission Act, 2011.

An Act of Parliament to establish the National Gender and Equality Commission as a successor to the Kenya National Human Rights and Equality Commission pursuant to Article 59(4) of the Constitution; to provide for the membership, powers and functions of the Commission, and for connected purposes. Key to this act is the affirmative action, popularly known as the Two-thirds gender rule, that requires not more that two-thirds of people who hold public office be from the same gender.

The proponent will try to ensure that, the requirements of this law are observed.

4.4.28; Agriculture and Food Authority Act, 2013.

An Act of Parliament to provide for the consolidation of the laws on the regulation and promotion of agriculture generally, to provide for the establishment of the Agriculture and Food Authority, to make provision for the respective roles of the national and county governments in agriculture excluding livestock and related matters in furtherance of the relevant provisions of the Fourth Schedule to the Constitution and for connected purposes

The proponent will ensure that, the requirements of this law are observed, although only a small section of the project site practice agriculture.

4.4.29; Mining Act, 2016.

AN ACT of Parliament to give effect to Articles 60, 62 (1)(f), 66 (2), 69 and 71 of the Constitution in so far as they apply to minerals; provide for prospecting, mining, processing, refining, treatment, transport and any dealings in minerals and for related purposes

Section 20 (Functions of the Director of Mines) part 1(l) observes that, the Director of Mines shall, through the Principal Secretary, be responsible to the Cabinet Secretary for exercising regulatory administration and supervision over the use of commercial explosives in accordance with the Explosives Act (Cap. 115).

The proponent will, before any blasting or explosive is used, apply for a blasting License from the Director of Mines

4.4.30; Valuers Act.

This is an Act of Parliament to provide for the registration of valuers and for connected purposes. The Act establishes a Valuers Registration Board, which has the responsibility of regulating the activities and conduct of registered valuers in accordance with the provisions of the Act.

The proponent will ensure that, the requirements of this law are observed.

4.4.31; Employment Act, 2007.

An Act of Parliament to repeal the Employment Act, declare and define the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children, and to provide for matters connected with the foregoing

The proponent will ensure that, the requirements of this law are observed.

4.5 INTERNATIONAL OBLIGATIONS

4.5.1 World Bank's Safeguard Policies

This EIA is also based on internationally respected procedures recommended by the World Bank, covering environmental guidelines. Reference has been made to the Environmental Assessment Operational Policy (OP) 4.01, and Environmental Assessment Source Book Volume II, which provides the relevant sectoral guidelines as discussed below.

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local populations. (World Bank, 1999-2006)

4.5.1 World Bank Safeguard Policy 4.01-Environmental Assessment

The environmental assessment process provides insights to ascertain the applicability of other WB safeguard policies to specific projects. This is especially the case for the policies on natural habitats, pest management, and physical cultural resources that are typically considered within the EA process. The policy describes an environmental assessment (EA) process for the proposed project. The breadth, depth, and type of analysis of the EA process depend on the nature, scale, and potential environmental impact of the proposed project. The policy favours preventive measures over mitigatory or compensatory measures, whenever feasible.

The operational principles of the policy require the environmental assessment process to undertake the following

- Evaluate adequacy of existing legal and institution framework including applicable international environmental agreements. This policy aims to ensure that projects contravening the agreements are not financed.
- Stakeholder consultation before and during project implementation
- Engage service of independent experts to undertake the environmental assessment
- Provide measures to link the environmental process and findings with studies of economics, financial, institutional, social and technical analysis of the proposed project.
- Develop programmes for strengthening of institutional capacity in environmental management

The requirements of the policy are similar to those of EMCA which aims to ensure sustainable project implementation. Most of the requirements of this safeguard policy have been responded to in this report by evaluating the impact of the project, its alternatives, existing legislative framework and public consultation.

4.5.2 Bank Safeguard Policy 4.04-Natural Habitats

This safeguard policy requires that the study use precautionary approach to natural resources management to ensure environmental sustainability. The policy requires conservation of critical habitat during project development. To ensure conservation and project sustainability the policy requires that:

- Project alternative be sought when working in fragile environment areas;

- Key stakeholders be engaged in project design, implementation, monitoring and evaluation including mitigation planning.

The requirements of this policy were observed as much as possible during the EIA study. The consulting team engaged several stakeholders during project impact evaluation and those consulted included the NEMA, WRA, KWS, KFS, and County Government Officials among others.

4.5.3 Bank Safeguard Policy 4.09-Pest Management

This policy promotes the use of ecologically based biological or environmental pest management practices. The policy requires that procured pesticides should meet the WHO recommendations and not be among those on the restricted list of formulated products found in the WHO Classes IA and IB or Class II.

This policy is not triggered since routine maintenance of project site will not involve the use of pesticides or agrochemical materials to control vegetation growth. In practice clearance of vegetation growth along way leave is done using mechanical methods especially slashing of grass.

4.5.4 Bank Safeguard Policy 4.12-Involuntary Resettlement

Resettlement due to infrastructure development is not a new phenomenon in Kenya but the government has no Policy Document or Act that aims at ensuring that persons who suffer displacement and resettlement arising from such development activities can be compensated adequately for their losses at replacement costs.

The World Bank's Operational Policy 4.12 has been designed to mitigate against impoverishment risks associated with Involuntary Resettlement and the restoration or improvement of income-earning capacity of the Project Affected People (PAP).

The proponent already has a RAP Policy Framework. For this project, the proponent will conduct, at the right time, a detailed RAP and ensure it is implemented as per this OP

4.5.5 Bank Safeguard Policy 4.12-Indigenous People

This policy requires project to be designed and implemented in a way that fosters full respect for Indigenous Peoples' dignity, human rights and cultural uniqueness and so that they receive culturally compatible social and economic benefits and do not suffer adverse effects during the development process.

This policy is not triggered as the proposed project area (transmission line route) is not occupied by IP (in the strict sense of the Banks definition of IP) who identifies with the areas.

4.5.6 World Bank Safeguard Policy BP 17.50- Public Disclosure

This BP encourages Public Disclosure (PD) or Involvement as a means of improving the planning and implementation process of projects. This procedure gives governmental agencies responsibility of monitoring and managing the environmental and social impacts of development projects particularly those impacting on natural resources and local communities. The policy provides information that ensures that effective PD is carried out by project proponents and their representatives. The BP requires that Public Involvement should be integrated with resettlement, compensation and indigenous peoples' studies. Monitoring and grievances address mechanism should also be incorporated in the project plan.

The proposed project incorporated public participation and stakeholders' consultation as part of the ESIA studies in order to collect the views of the local communities and their leaders for incorporation in the project mitigation plan. The consultation was successful and the community members gave a number of views that have been considered in the mitigation plan. Further public sensitization and disclose in Counties and Sub-County offices will be done by KETRACO during project implementation

4.5.2 United Nations Framework Convention on Climate Change, 1992

The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Bush clearing on the way-leave trace, extra efficiency (30% of energy is lost while transmitting power on 33kV line as opposed to high voltage lines), and communities using electricity as opposed to fuel wood will invoke this treaty

The Proponent shall comply with the provisions of this convention

4.5.3 United Nations Convention on Biological Diversity, 2000

The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

The Proponent shall comply with the provisions of this convention

4.5.4 Ramsar Convention – on Wetlands of International Importance especially as a Waterfowl Habitat

The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".

The Proponent shall comply with the provisions of this convention

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1: INTRODUCTION

Stakeholder consultation was undertaken among people living in the environs of the proposed transmission project as an integral part of the ESIA study. The aim was to ensure that all stakeholder interests were identified and incorporated in project development: at planning, implementation and operation phases.

The specific objectives for consultation process were to:

- Create public awareness about the proposed project
- Seek public opinion and concerns relating to the project and more specifically problems they anticipate and ways of overcoming them.
- Obtain professional advice from sector heads including departmental heads and local administration
- Consultatively and in a participatory way identify potential positive and negative impacts of the project and seek remedial measures
- Sell the project to the public for their acceptance and ownership

These meetings enabled interested and affected parties to contribute their concerns (views and opinions on the proposed project) which might have been overlooked during the scoping exercise. Findings of stakeholder analysis were very important in predicting impacts and development of ESMP. Public consultations for the proposed project followed several steps as described below:

5.2: IDENTIFICATION OF STAKEHOLDERS

The proposed project will typically involve land acquisition for construction of permanent structures and/or infrastructure including steel pylons, transformers, towers, bus bars, among other infrastructure. Of necessity, land for the location of these permanent structures must be acquired. Communities living within the environs of the proposed site were identified as Project Affected Persons (PAPs).

This study also identified a second category of stakeholders comprised of GoK officers in charge of diverse sectors, which are likely to be impacted by the project. This category was also consulted as key informants on sectoral policy and to advise the ESIA study on mitigation measures to be put in place so as to minimize adverse impacts in respective sectors. This category also included local policy makers and opinion leaders, local administration, local authorities and civic leaders.

5.3: APPROACH TO STAKEHOLDER CONSULTATIONS

A detailed stakeholder's consultation for this study was undertaken from 5th February to 21st February, 2018. These consultations were conducted in the form of:

5.3.1 Key Informant oral Interviews:

The following people were consulted:

Bomet County

1. County Director of Environment; National Environment Management Authority
2. Forester, Kenya Forest Service
3. Physical Planner, Physical Planning Department
4. Assistant Director, Livestock Development
5. Director, Health, Administration and logistics, Department of Medical Services and Public Health
6. Chief Officer, Environment and Natural Resources
7. Surveyor, Survey Department
8. Director, Human Resource, Bomet Water Company
9. Assistant Director, Energy
10. Senior Fisheries Officer, Fisheries Department
11. Director, County Agriculture
12. Ag. Director, Water and Irrigation Department
13. Pastor, Faith of Miracle Church

Nakuru County

1. County Director of Environment, National Environment Management Authority
2. Head of Conservancy- Mau, Kenya Forest Service
3. Ecosystem Conservator; Kenya Forest Services (Elburgon)
4. Deputy Senior Warden, Kenya Wildlife Service
5. Assistant Director- Central Rift Conservative Area, Kenya Wildlife Service
6. Director, Water Resources Authority
7. Regional Technical Manager, Water Resources Authority
8. Physical Planner, Lands, Housing and Physical Planning
9. Deputy County Director of Fisheries, Fisheries Department
10. County Director Livestock Production, Livestock Production Department
11. Chief Officer, Environment, Energy and Natural Resources

12. Director, Environment, Energy and Natural Resources
13. Director, Occupational Health and Safety
14. Public Health Officer, Nakuru County Teaching and Referral hospital
15. Managing Director, Gogar Farm
16. Managing Director, Redshank Limited- Gogar Farm
17. Head teacher, Gogar Primary School
18. Livestock Officer, Veterinary Office, Kuresoi Sub county
19. Agricultural Officer, Ministry of Agriculture, Livestock and Fisheries, Kuresoi Sub county
20. Senior Fisheries Officer, Fisheries Department, Kuresoi Sub county
21. Sub county Public Health Department, Ministry of Health, Kuresoi Sub county
22. Livestock Production Officer, Ministry of Agriculture, Livestock and Fisheries, Kuresoi Sub county
23. Assistant County Commissioner, Ministry of Interior and Coordination of National Government, Kuresoi Sub county
24. Inspector, National Police Service, Kuresoi Sub county
25. Honorable Wilson K. Leitich

Narok County

1. County Environment Officer, National Environment Management Authority,
2. Forester 1, (Forest Station Manager), Kenya Forest Services, Nyangores Forest Station
3. Forester, Kenya Forest Services, Narok Office
4. Warden, Kenya Wildlife Service, Narok Office
5. Warden, Kenya Wildlife Service, Transmara Sub County (Kilgoris)
6. Director, Water Resources Authority
7. Senior Physical Planning Assistant, Department of Physical Planning
8. Senior Lab Technologist, Water Resources Authority
9. Chief Veterinary Officer, Department of Veterinary Services
10. Director, Fisheries Department
11. DCDA- Agriculture Engineer, Department of Agriculture
12. Statistician II, Finance and Economic Planning
13. Senior County Livestock Production Officer, Livestock Production Department
14. Chief Officer, Department of Environment, Energy, Water and Natural Resources
15. County Public Health officer
16. Director, Kenya National Council of churches of Kenya, Narok County
17. Assistant County Commissioner 1, Ministry of Interior and Coordination of National Government
18. Assistant County Commissioner 2, Ministry of Interior and Coordination of National Government

In addition, the Senior Grounds Officer 1, of The Kenya Civil Aviation Authority, Nairobi, was also consulted.

5.3.2 Key Informant Questionnaires:

Open-ended questionnaires were administered to stakeholders comprised of GoK officers and civil society groups in charge of diverse sectors which are likely to be impacted by the proposed project. Concerns, views and opinions from a total of 47 respondents were received (Appendix V.

5.3.3 Community Questionnaires:

Open-ended questionnaires were administered to households, and small business enterprises neighboring the site. Concerns, views and opinions from a total of 288 respondents were received (Appendix VI).

5.3.4 Public Baraza

Public barazas were held in Salgaa, Matuiku, Elburgon, Chandera, Keringet, Muchorwe, Kiptagich, Mugango/ Masese, Silibwet/Tenwek, Ndanai and Kilgoris villages/towns with the assistance of the local administration and leaders. In the Barazas, the team introduced themselves, their consultancy and the proponent; explained to the communities the proposed project; highlighted the advantages of the project; informed the participants that, they had been contracted among others to help develop an environmental management plan that would ensure any negative impacts of the project are mitigated and that the participants had been identified as an important stakeholder who would assist in developing the management plan and therefore the reason for the visit; they then gave the participants a chance to ask questions which were then answered. Appendix VII gives the lists of attendance for the public barazas.

Questions and comment by the participants and responses from the ESIA team are highlighted below;

KIPTAGICH (7TH February, 2018- 2:00 pm) Venue: Kiptagich Social Hall

Questions and Comments	Answers
Where will the Transmission Line Pass?	The TL will pass through peoples farms; some distances from the main road
When will the project start?	After a NEMA license is issued, the project will not take long to commence. This may take about a year from now
How will people be employed? The criteria that will be used	It is KETRACO's policy that, at least 75% of available non skilled labour be given to the

	locals. The chiefs and the village elders in conjunction with the RAP committees will help ensure that this rule if followed
Will the old power be removed or combined with the new one?	The new TL is meant to boost the existing power so that it can be reliable and efficient. The existing Kenya Power infrastructure will still remain.
What guarantee do we have that Kiptagich will benefit from the project?	The chiefs and village elders will ensure that unskilled labour is given to the locals and that raw materials for the project are sourced locally
How will people be compensated?	There are three types of compensation; Land Structures Trees and crops If any of the above mentioned is affected by the TL, the land owner must be compensated as per KETRACO's policy.
Is one allowed to farm or graze on the wayleave?	Yes; one can farm and graze on the wayleave but they cannot construct any structure or plant tall trees.
Will the compensation be done once or in bits?	For structures, the affected person is paid 70% first (which we assure you will be enough to construct a new structure) and when the structure is removed, the remaining 30% is paid. Compensation for land, crops and trees is paid once
Is the power given directly to consumers?	No; this is high voltage power that needs to be stepped down first before it is distributed to the final consumer.
The project will boost the area's economy and also increase the security of the area due to increased security lights.	
The cost of electricity will reduce	

The cost of living will be reduced	
The project will help those who have not have had the opportunity to get access to power.	
The economy of the area will improve	
The youth will get jobs	
Power supply will be boosted	
The wayleave route be discussed first with the affected persons and be informed on all areas and issues which will affect them and concern of persons be addressed accordingly	Point well taken
The project will promote new industries/ factories in the county e.g. tea and flour mills	
The project should start as soon as possible	


The Chief of Kiptagich calling the baraza to order and one of the ESIA consultants explaining about the proposed project.


Left: An ESIA team member responds to some of the issues raised during the public consultation. Right: community members present listening following the proceedings of the meeting.

SALGAA (12TH February, 2018- 10:00 am) Venue: Salgaa

Questions and Comments	Answers
The venue of the meeting is land meant for a proposed hospital; if the TL happens to pass through it, what will be the repercussions?	A hospital is a public utility and hence will not be affected since it is public property. The TL will have to be diverted to another direction. The Team takes note of this very important information and will inform KETRACO
Salgaa is a growing town and soon the frontage will have permanent buildings all over. Where will the transmission line exit if all the area is built up	In choosing the substation land, KETRACO must have considered many factors including this. However, if all the area is build up, KETRACO will consider underground cables which can pass on road reserves for the build-up sections. Underground cables are more expensive but require less wayleave
Where will the location of the Rongai Substation be and what is the size?	Mr. Hamish Grant (M.D. Gogar Farm) confirmed that there exists 20 acres of land that had been bought (from Hon. William Leitich) for the establishment of the substation.
What are some of the direct benefits that the communities might benefit from the project, e.g. building hospitals and schools?	KETRACO has CSR initiatives whereby 1% of the profits are channelled towards community projects. However, it is the people within the project area to come together and decide on what kind of initiative they would like to have and to apply for the same. Procedures for application will be explained by KETRACO staff when project starts
How will pollution be handled by the proponent?	High voltage transmission lines are not considered to produce heavy pollution. Pollution will be in terms of motorized machines and transformer oil. The consultant is developing management systems to address this including ensuring that, Vehicles used to transport construction materials will be

	switched off and not left idle with the engine running as a mitigation measure for noise pollution and to control air pollution from dust, the proponent will water the roads leading to the project site to ensure that minimal dust is released to the atmosphere.
If many people are shifted from where they live to different far away areas, wouldn't that affect the schools in terms of many students transferring to other schools?	The proposed project will not lead to mass relocation of people as compared to a project like that of a dam construction. Experience show that, people do in fact construct new structures within the sections of their farm that is not affected. Again, after compensation, the land still belongs to the affected person and so they are unlikely to move far.
How will people be employed?	When the project reaches a particular area, for example, Salgaa, it is the residents of Salgaa that will be employed to provide unskilled labour.
The project will boost power in the area	
Employment for the youth will be created	
Security will be enhanced	
The economy of the area will improve and the town will grow	

Left: chief of Rongai calling the meeting to order. Right: a team member from Tingori Consultancy elaborating on the proposed project.


ESIA team explaining about the importance of the project and responding to some of the questions raised during the meeting.

The Managing Director, Gogar Farm, Rongai, asking some questions during the public consultation

MATUIKU (12TH February, 2018- 2:00 pm) Venue: Matuiku Chief's Office

Questions and Comments	Answers
What is the width of the wayleave and what can be done on it?	The wayleave will be 60 metres and some examples of the activities that can be done are: grazing and farming. However, one cannot plant a tall tree neither can he build a structure on the wayleave
Is compensation sufficient?	Compensation is sufficient since all affected land, structures, trees and crops will be compensated as per KETRACO's policy. In addition, there is the 15% disturbance fee given to a PAP.
When will the project start?	The project will start once a NEMA license is issued. Probably at least a year from the time

	of this public consultation.
What is the market value for land in Matuiku?	Market value will be determined by certified valuers and this value is arrived at based on the location of the property. A full RAP will also be done to ensure all PAPs are satisfied with the compensation.
What is the difference between KenGen, KETRACO and Kenya Power?	KenGen generates power, and then KETRACO transmits high voltage power over long distances while Kenya Power distributes the power to the final consumer once it has been stepped down at the substation. Kenya Power deals directly with consumers of electricity.
The project should be implemented as soon as possible	
The area will become developed due to more power availability hence introduction of industries	
The project is highly welcome	
The project will provide some employment to the locals	
There will be more power connection by the locals	

Left: the ESIA team introducing the proposed project to the community members. Right: one of the consultants explaining about the importance of the proposed project.


Left: a team member answering the questions raised during the baraza. Right: residents of Matuiku at the meeting.

ELBURGON (13TH February, 2018- 9:00 am) Venue: Elburgon Chief's Camp

Questions and Comments	Answers
Will people be allowed to build structures on the wayleave?	No; one cannot build a structure or plant a tall tree on the wayleave. However, one can graze and also cultivate.
Is it true that if you live on the wayleave for more than 12 years, you will get cancer?	No. Studies done show that, the lines have no such health effects. The conductors are over 30m high and any EMFs produced hardly reach the ground level. Further, no one is allowed to live on the wayleave and outside the wayleave everyone is safe. This technology has been adopted from America, Japan, and Europe. These countries would not use it if it in deed caused cancer.
Where will the affected PAPs go?	The affected PAPs will be compensated in terms of land, structures and trees and crops. In many cases, they can still find space to reconstruct their structures within their farm but if the farm is small, they are given enough compensation to move elsewhere. The affected land is still theirs and so they normally choose not to move very far.
The people of Elburgon wish to have a 24 hour economy. Sometimes blackouts can last the whole day. What is the guarantee that the	When the project is implemented, there will be reliable and sufficient power since the existing power will be boosted and the issue of power

blackouts will be solved?	blackouts will be a thing of the past.
In some previous projects involving the oil pipeline, people were not allowed to live within the wayleave; will this project also have the same repercussions, and where will the TL pass?	Within the wayleave of the TL, one is prohibited to put up structures and plant tall trees. They are allowed to farm and graze. The TL will pass through people's farms and in the bushes. It will not pass along the road since it is high voltage and needs a 60 metres wayleave.
What will be the payment for the locals for labour and when will the project start?	Payment will depend on the type of labour. KETRACO is a government company and so they will ensure payment by contractor to employees is fair. Project will start when all licenses are acquired and contractor is on board which can take a minimum one year.
How will people be employed?	Locals will be employed through the office of the chief. In addition, when the project will be at Elburgon, the people of Elburgon will be given first priority.
What is the difference between KenGen, KETRACO and Kenya Power?	KenGen generates power; KETRACO transmits high voltage power over long distances while Kenya Power distributes power once it has been stepped down at the substation.
Employ workers who are disciplined.	
The chief of the area encouraged the residents to own the project.	
The project will enable a 24 hour economic growth and create employment opportunities and guaranteed security.	
More business opportunities will be created	
The project will reduce the cost of living and also assist the youth to improve their skills and employment.	


Left: The chief of Elburgon introducing the ESIA team. Right: some of the opinion leaders at the meeting.


Left: Members of the community listening to the proceedings of the meeting. Right: Elburgon Chief explaining a point to the community members during the meeting.

CHANDERA (13TH February, 2018- 2:00 pm) Venue: Chandera Chief's Camp

Questions and Comments	Answers
Where will the power reach and when will the project start?	The high voltage power will come from Rongai Substation and terminate at Kilgoris substation. Power will be stepped down at these substations and distributed in the project areas. The project will be implemented once a NEMA licence is issued but the construction might begin at least a year from the day of the public consultation.
Where will the residents go for employment?	Locals will be employed through the coordination of the office of the chief and the village elders when the project is implemented.
How will people be compensated?	It is the policy of KETRACO to compensate the following:

	Land Structures Trees and crops
Majority of the residents do not have power; what is the guarantee that they will get power once the TL passes Chandera?	It is the mandate of Kenya Power and not KETRACO to connect households. However, when the project will be implemented, the power will be enough to cater for everyone since it will be sufficient, efficient and reliable.
Let another substation be located at Chandera	
The project will be of great use to the residents both at home and in businesses.	
The proposed project will give the residence more light in our areas and security lights will be available, the area will have more industries and residents will benefit from more jobs.	


Left and Right: locals from Chandera listening to the ESIA team.


Left: An ESIA team member explaining about the proposed project. Right: some of the community leaders at the meeting.

KERINGET (14TH February, 2018- 10:00 am) Venue: Kuresoi Social Hall

Questions and comments	Answers
Where will the TL pass and in case it affects people's properties, will there be compensation?	The TL will pass through people's farms and in the bushes since it requires a wayleave of 60 metres. However, the properties that will be affected will be compensated as per KETRACO's policy. The following will be compensated; Land Structures Trees and crops. For structures, there will also be a 15% disturbance fee given to the affected PAPs.
What can be done on the wayleave?	Activities like farming, grazing and cultivation can be done on the wayleave. However, one is not allowed to plant tall trees and put up structures on the wayleave.
Hon. Leitich, former area MP, observed that, this was a very important project, as it would spar development in Kuresoi. He informed participants that, he had in deed agreed to sell his land in Rongai to KETRACO for the substation as he fully understood the project would help the local people. He urged residents to support the project.	
The project will help access electricity. It will also develop areas where the TL will pass.	
Employment will be available to the residents.	
Living standards of the people will be uplifted	
This is a good project which should be started forthwith so as to enhance all the economic activities of the proposed counties.	
The project will enhance industrialization due to accessibility of power hence boost youth	

employment.	
The project is supported since it is environmentally friendly.	
The project enhances communication	
The area will have a 24 hour economy	
The project is good but more awareness needs to be done	
Since the power will be cheaper, the tea factories will turn to the power hence reduce market for trees.	


Left: Hon. Leitich welcoming the ESIA team and commending the proposed project. Right: a staff from the consultancy firm explaining about the proposed project.


ESIA team responding to the issues of concern raised during the public consultation

MUCHORWE (14TH February, 2018- 2:00 pm) Venue: Muchorwe Chief's Camp

Questions and Comments	Answers
Will there be compensation for the affected people by the TL?	Yes; there will be compensation for the following: Land

	Structures Trees and crops
Will the TL go straight to Kilgoris or it can deviate to other areas?	Obstacles may force the TL to be diverted. However, the TL is not for direct connection to final consumer. The power has to be stepped down in a substation before distribution to users
When will the project start?	The project will start once all licences are obtained and a contractor procured. However, if everything goes as planned without delays, probably construction may begin about a year from the period the public consultations are exhausted.
Are there any health issues related with the project?	No; the high voltage transmission lines are a technology that has been tried and tested in many countries globally and there are no negative health impacts as a result of their existence. The electrical conductors will be more than 30m high ensuring no EMFs reach the ground level. Again no one is allowed to live under the power lines.
If the TL passes through a forest, for example Bararget Forest, what will be done?	It will have to be re-routed into farmlands to avoid the forest areas.
Will the people affected be required to have lawyers during compensation?	KETRACO employs wayleave officers from members of the community who help in the negotiations for compensation. PAPs will not be required to employ lawyers but they will be free to do so if they wish
What kind of power is this?	This is high voltage power that has to be transmitted first over long distances before it is stepped down at the substation then distributed to the final consumer.
What are the direct benefits to the people?	For those who have power connected already, for example, they will have reliable, affordable

	and efficient power. There will be no over voltages that lead to malfunction of electrical items and also there will no longer be black-outs
How will the property be valued?	Structures will be compensated based on replacement cost. Rates of compensation of trees and crops will obtained from KFS and Ministry of Agriculture while land will be valued as per the market values in the areas. This will be done through the assistance of certified valuers.
There will be creation of employment of which the youth will be considered.	
All the affected persons should be compensated.	
The issue of power blackouts will be mitigated	
More power will translate to more connectivity to the same	
There will be communication efficiency	


ESIA team introducing themselves and taking the community members through the proposed project.


Left: A team member of the consultancy firm explaining a point to Muchorwe community members. Right: Muchorwe members present at the meeting.

SILIBWET/ TENWEK (15TH February, 2018- 9:00 am) Venue: Silibwet Chief's Camp

Questions and Comments	Answers
Will people be paid for their properties where the TL will pass?	Yes; those PAPs whose properties lie within the wayleave of the TL will be compensated and compensation of the following will be done as per KETRACO's policy; Land Structures Trees and crops For structures, 70% will first be given to the PAP, followed by 30%. In addition, a 15% disturbance fee will also be given.
How will land be compensated?	Land will be compensated based on the market value of land within that area as at the time.
What are the effects of living near the TL and what can be done on the wayleave?	There are no effects living near the TL. However, just for precautionary measures, no one is allowed to live on the wayleave. Some of the activities that can be done include, grazing and cultivation. The only two restrictions are putting up a structure and planting a tall tree on the wayleave.
Power blackouts will be mitigated.	
People affected are compensated well within	

the market prices.	


Left: some of the members in attendance during the baraza. Right: an ESIA team member responding to the issues raised by the community.


Left: A staff from the consultancy firm explaining about the proposed project. Right: community members listening to the responses given by the ESIA team.

MUGANGO/ MASESE (15TH February, 2018- 2:00 am) Venue: Mugango Market

Questions and Comments	Answers
Will there be compensation of the affected properties where the TL will pass?	Yes; there will be compensation of the land, structures and trees and crops. Land will be compensated based on the market value. There will also be an additional 15% disturbance fee given to owners of structures which will be affected.
Will trees also be compensated?	Yes; since they fall into one of the categories of the items to be compensated, the number of trees affected will be paid.
Has survey of the route of the TL been done?	Yes; the feasibility study of the proposed TL

	had been done to determine a tentative route from Rongai to Salgaa. The line will pass about a kilometer from here (the meeting venue)
Why would the TL be allowed to pass underground within the forested areas but after exiting such areas, it is diverted from the road away from towns?	Forested areas are protected and this project aims to have the least possible negative impacts on resources such as forests (it avoids passing overhead at forests to prevent many vegetation from being destroyed as a result of wayleave acquisition). In addition, it avoids built up areas since that would result in relocation of many persons within the wayleave. Hence sparsely populated zones are preferred.
Will people benefit directly from this power in terms of connection?	This is high voltage power that needs to be stepped down at the substation before it is finally distributed to the final consumer. But boosting of the existing power will reduce cases of black-outs and power will have no over-voltages that lead to destruction of electrical items
What is the difference between KETRACO's power and the power we are using currently?	There is no difference in the power that is utilized. KETRACO's mandate is to transmit high voltage power over long distances then the power is stepped down at the substation before it can be distributed to consumers by Kenya Power.
How will people be paid?	The rates will vary depending on the qualifications they have. There are skilled and unskilled labour hence the rates will not be equal.
Does KETRACO need a map or a guide to show them where the TL will pass when the work starts?	No; however, the proponent knows where the TL will pass and they will get other assistance through the local administration and the

	wayleave officers.
Sometimes compensation for instance trees becomes difficult after a person has been convinced to give up their property. Why can't the owners of the project pay the affected people there and then?	It is not possible to pay for affected properties immediately since a register of all affected properties (structures, land and trees and crops) must be compiled and other procedures followed before compensation can be actualized. But compensation does not take long.
The project will help in; Employing the youth Putting up industries Boosting the current electric power Boosting security in the area in terms of street lighting	
The project is highly welcome	


Left: a village elder from Masese welcoming the ESIA team. Right: an assistant chief of Masese introducing the team.


Left: the chief of Masese translating some of the points by the ESIA team to the community members. Right: community members listening to the information being passed across by an ESIA team member.

KILGORIS (16TH February, 2018- 9:00 am) Venue: Kilgoris Hall

Questions and Comments	Answers
Will there be compensation for the structures affected by the TL?	Yes; there will be compensation for properties that will lie on the wayleave of the TL. compensation will be done on the following: Land- this will be compensated by looking into the market value of land within the area in general. Structures- in addition to the compensation for these, there will be an additional 15% of the total, as a disturbance fee. Trees and crops- the number of trees and crops cleared on the wayleave will be taken note of and compensated accordingly. However, the felled trees will still remain property of the PAP.
Will people be given power connections?	The mandate of KETRACO is to transmit high voltage power over long distances then step down at the substation before it is distributed by Kenya Power. Kenya Power does connections to the final consumers of power.
Why is this power coming to Kilgoris?	The area has not had reliable and efficient power and the demand is high. The 33kV line that supplies power to Kilgoris is no longer able to meet the demand leading to poor quality power and black-outs. When more power is added, these problems will be addressed. This is a development agenda for the people of Kilgoris by the National Government.
Has survey for the TL been done?	Yes, feasibility study had been done and found putting up such a TL on the proposed project area to be feasible. However, the proposed route might change.

This project helps the development and also employment for women, youth and all through businesses e.g. hawkers along the centres and towns.	
Let the project management contact the community for more information needed and also local leaders for more details.	
When the project starts, involve the local community.	
There should be more meetings for public participation/ awareness funded by the company to create more awareness and importance of the power.	
The project is supported fully because the current electricity used is not enough.	
The project will improve the standards of living of the people.	
Kilgoris town will attract more investments due to more power.	

Left: The Assistant County Commissioner 1, Transmara, calling the meeting at Kilgoris to order. Right: residents of Kilgoris following the proceedings of the public consultation.


Left: an ESIA team member explaining about the proposed project to the community. Right: a staff of the consultancy firm responding to the issues of concern raised during the community participation.

Members of Kilgoris in attendance during the public consultation

NDANAI (16TH February, 2018- 2:00 pm) Venue: Ndanai Chief's Camp

Questions and Comments	Answers
Will the affected properties be paid?	Yes; there will be compensation for the following which will lie on the wayleave of the TL; Land Structures Trees and crops In addition, one is not allowed to put up a structure or plant a tall tree on the wayleave. However, one can graze and cultivate on the wayleave.
Where will the TL pass?	The TL will pass around 1 kilometre from the venue of the meeting but the route may

	change since it is just a proposal.
When will the project start?	The project will start after all licenses are obtained and a contractor is procured. The actual construction might take at least a year from the period when the stakeholder participation has been conducted.
How will people be paid?	KETRACO will ensure payment of workers by the contractor is fair. The chiefs, village elders, and RAP committee will also be requested to ensure this happens
Will skilled labour also be obtained from the locals?	Skilled labour is acquired from all over the country since everyone with required qualifications can apply from any part of the country. However, the contractor may subcontract some jobs which the required expertise may come from the locals.
Is this power hydro or geothermal?	The high voltage power will come from the proposed Rongai substation. The Rongai substation will be fed with geothermal power from Olkaria and Menengai and hydropower from Jinja Uganda.
Will people in between the towers (if no tower falls on your land) be compensated?	Yes; as long as the PAP is on the wayleave, they will be compensated as per the policy of KETRACO.
How does the project benefit the people of Ndanai directly?	The Rongai-Kilgoris TL will also pass through the Bomet Substation. Bomet substation also feeds the Sotik substation which feeds Ndanai.
Can the TL be made to serve a nearby market centre near Ndanai?	The TL will have high voltage power which cannot be used for direct connections to consumers. Kenya Power connects power to the final consumers.
The project is good since it increase power availability hence reducing power shortage. In	

this area, it will change the lives of people because it will increase industrialization hence employment. The economy of the area will be boosted.	
Communication will be enhanced	
Employment opportunities will be created	


Left: some of the members of the public at the meeting. Right: a staff of Tingori Consultancy explaining about the proposed project.


The chief of Ndanai responding to some questions from the community members.

5.4: OUTCOME OF THE STAKEHOLDER CONSULTATIONS:

5.4.1: Important Issues as raised by key informant

Bomet County

Key Informant	Information Provided
Livestock Development	It is a positive development since it increases the amount of electricity coming into the county. Hope it leads to a more reliable supply and reduce power blackouts. Engage fully the land owners/ farmers/ livestock keepers on how

	it will affect their land. Ensure that any compensation due are made promptly. Hope the project will be followed up with more distribution of power in the rural areas.
Physical Planning Department	The project would be very vital to the County Government of Bomet and the community. This will translate to the effectiveness and efficiency in communication services. The project should start as soon as possible.
Department of Medical Services and Public Health	This is a very important project that we believe will provide reliable power supply to Bomet residents and beyond. We recommend stakeholders and public participation to get views and further advice especially on the health impact on high power transmission. We also propose corporate social responsibility from KETRACO.
Department of Water, Sanitation and Environment	Actually, a good move, timely and will enhance rate of economic development. An environmental project that KETRACO will undertake in Bomet county as a friend to the environment. A community project that will benefit members/ students/ schools in the affected counties.
Survey Department	The proposed project should go on as proposed. It will enhance and improve the distribution of electricity within the affected communities.
Kenya Forest Service	The contractor should adhere to ESIA opinions. Where the line will pass in gazetted forest, they should not do overhead instead should be underground and in road reserve to avoid felling of trees.
Bomet Water Company	Ensure the safety of residents by constructing the lines in low density population areas. Compensate the residents appropriately. Do public participation to ensure residents are informed about the project. Commend the project proposal
Trade, Energy, Tourism,	Private property (land/structures) to be handled in accordance to

Industry and Investment	the law. The project is welcomed as it stabilizes power supply within the region. Keep the department/ county informed throughout the project.
Fisheries Department	I support the project fully in realization that the benefits will positively change the lives of the community.
County Agriculture	The people who will be affected should be compensated according to the areas affected.
Water and Irrigation department	Compensation- I am aware that there are people who have never been compensated to date on projects by KETRACO. There should be a proper compensation mechanism for the affected people. Re-afforestation- the project must have a component of re-afforestation for affected Mau areas and also for other areas like Chepalungu Forest. Long term effects- the project should conduct extensive public awareness to educate the masses on the long term effects of the project. Alternatives- the project should consider other alternatives for the transmission route. CSR- the project should bring up the proposed CSR projects to public for consideration and adoption. This should include; schools and other public amenities and re-afforestation of Chepalungu Forest.

Nakuru County

Key Informant	**Information Provided**
Gogar Farm	Give work to local contractors Protect the interests of local infrastructure projects such as hospitals. CSR funds should go to this.
Gogar Primary School	Consider the school coverage area and the already existing projects. Avail employment to our parents who feed the school with their children.

Redshank Limited- Gogar Farm	This project is critical for the future of the community and Kenya as a whole.
Kenya Forest Service	Power (electricity) is very important to the economic development of the county
Kenesiyah Worship Centre	The project will upgrade the area.
CDF Chairman, Elburgon	The programme seems very helpful to the people. We would suggest that the project be affected as soon as possible. The project should have local leaders to enhance fast-tracking. Energetic youths should be and ought to be willing and focused.
Livestock Office- Kuresoi Sub county	I support the project because it touches many lives. We need more proper compensation to the people affected. The community members from the line to be insured in case of radiation.
Ministry of Agriculture, Livestock and Fisheries- Kuresoi Sub county	The project will assist to boost the power within so that more industries can run concurrently without break. Safety, quite safe for crop production because of no restriction underneath. Should be cheaper compared to the available.
Fisheries Department- Kuresoi Sub county	The project will benefit the communities around. Proper assessment and compensation should be carried out. Environmental issues should be taken into consideration to avoid interference with forest and water sources.
Ministry of Health- Kuresoi Sub county	I support the project; this will enhance availability of power throughout. This area is usually affected by power blackouts frequently. This will increase the economic output.
Ministry of Agriculture, Livestock and fisheries (Livestock Production Office)- Kuresoi Sub county	The project is for the benefit of the entire country. All must support it but compensation must be done to the affected people at an agreed market rate. The residents must be encouraged to support the project.
National Police Service- Kuresoi Sub county	I support fully the project
Ministry of Interior and Coordination of National Government	We support the project.

Honorable Wilson K. Leitich	Honorable Leitich encouraged the residents to support the proposed project. He also assured the residents that the land for the proposed substation project is already available.
Water Resources Authority	It is a key infrastructure development that will spur economic development within the counties it will traverse. However, they should take precautionary measures to ensure that water sources and water catchment areas, the line will be passing are not interfered thus preserving their quality adequately.
Ministry of Lands, Housing and Physical Planning	The proposed expansion of power transmission will increase reliability of power in domestic, commercial and industrial use. The project affected persons along the proposed wayleave should be compensated after wide consultations with the relevant stakeholders. The county government should be involved in identification of the proposed wayleave and the same should be earmarked in the survey plans.
Fisheries Department	Fisheries Sector is a consumer and relies on electricity for some of our crucial activities (i.e. fish feed processing, raw materials milling for agro/animal feed processing and fish seed hatcheries and for cold storage facilities as a harvest control measures). This project if implemented to completion will greatly alleviate the drawbacks envisaged due to power blackouts/ rationing and the like.
Livestock Production	With more power, milk processors will realize maximum output. There will be more power to the community and hence a boost to the security system. The many power blackouts that had been realized lately will be mitigated. There should be more research done to find out empirical evidence whether or not the TLs cause cancer to those living near them.
Kenya Forest Service- Head of Conservancy	Transmission Line to follow the road alignment in the forest reserve in order not to disturb forest vegetation.

	During the constructions the contractor to engage the forest rangers to provide surveillance in the forest. As informed we agree that underground transmission is less destructive to the environment.
Kenya Wildlife Service- Central Rift Conservative Area	The project is a National Government that will benefit Kenyans. However, implementation of the project should not affect tree cover – no tree should be cut/lost in the Mau Forest Complex as it is a key water tower. Mau Forest is also a habitat for several wildlife species, we welcome underground cabling to secure several bird species as opposed to overhead cabling.

Narok County

Kenya Forest Service- Masese (Nyangores Forest Station)	The proposed project when implemented will improve the livelihoods of the citizens of the three counties (Nakuru, Narok and Bomet) by raising the standards of life. When the project is authorized to commence and all stakeholder brought on board, my concern is that when it passes through the forest after obtaining authority from the chief conservator of forests, there should be very minimal destruction of trees (forest) for purposes of conserving the environment and catchment areas. The section of Mau Forest near Masese forms the Transmara Forest Block, which is the source of River Mara. Kiptagich- Masese Road is the boundary of Bomet and Narok County. Kiptagich- Masese Road is classified under Class D roads and has a road reserve of 25 metres.
Kenya National Council of Churches of Kenya- Kilgoris	The project will help to create jobs for our young and ladies.

Ministry of Interior and Coordination of National Government- Kilgoris	The proposed project would be a key ingredient to development of Kilgoris and Narok County as a whole upon implementation. Project viable due to power shortage within Transmara area. Community participation and involvement is key for it requires huge wayleave. Community to be consulted at every stage taking in mind resistance and demonstrations that have affected other projects in Maasai land.
Kenya Wildlife Service- Transmara Sub county	KWS Narok, Nakuru, Kericho, Bomet and Transmara participation is key before, during and after implementation. Rangers- KWS/ KFS attachment in areas with wildlife is vital for wildlife security, Human Wildlife Conflict mitigation and project staff security from wildlife. Wildlife Management Act 2013, Forest Act, Water Act, KFS, NEMA-EMCA laws to be adhered to and protected areas regulations. No indigenous tree felling of Mau Complex before hydrology survey is conducted and effects/impact to Mau, Mara River identified. Probably the proponent can have leaflets informing people about the project. Endangered species in Mau; Elephants, rhinos, bongo and wild-beast along the Mara River. What are the mitigation measures for reduced poaching for elephant and rhino tusks or bush meat? Inside the Mau are the habitats for wildlife. The

	outside areas are the dispersal areas. Reflectors for the birds especially in the Mau are important mitigation measures. In migratory corridors, the proponent should involve communities. Recommendations: Engage community in areas of dispersal or habitat areas. Attachment at KWS rangers along the Mau to avoid wildlife destruction. Observe Wildlife Management Act (2013) and other related laws. Involve KWS in all stakeholder meetings before implementing the project. No trees should be cut in the Mau especially indigenous trees. But if a tree must be cut, restoration has to be done and a hydrology survey. The project is good if all these recommendations are met to boost power in these areas.
Department of Veterinary Services	We experience poor outages (blackouts) which interfere with cold chain of vaccines stored in our refrigerators. Concern- holes dug should be well taken care to avoid falls of animals which can cause fractures in livestock.
Fisheries Department	The project is good, but KETRACO needs to do the following; Support agroforestry activities because the project will lead to cutting of trees. Ensure people affected are properly compensated.
Department of Agriculture	The project will increase agricultural

	production in these areas and as well support agriculture commercialization, rural employment and farmer incomes. The project will need to address potential negative impacts such as soil erosion and clearing vegetation along power line/stations. To address these, the project can support farmers low cover vegetation such as grass along power lines and with tree seedlings to plant in other areas. The project also may require sensitizing communities along the power lines on the dangers of high power voltage.
Finance and Economic Planning	Connect all households in the whole county. Please help reduce the power outages in the locality/ weak power. Enhance safety measures as you put up the new line. Create awareness widely.
Kenya Wildlife Service	Along critical water towers like within Mau, there should be no destruction of the forest and underground cables should be considered. Within wildlife areas the lines should be high enough to prevent wildlife from getting electrocuted. Signs and warnings should be put in place in all wildlife areas.
Water Resources Authority	No environmental pollution will be expected on water resources. The project will generate huge socio-economic development to the affected counties. No water resources depletion (both in quantity or quality) will be evidenced. Liabilities of the eventualities as a result of

	electrification will squarely be the responsibility of the implementer and not WRA. Based on the above therefore, this office has no objection to the project.
Livestock Production	The project will transform lives of the Narok County residents through increased accessibility to energy which will be needed in supporting activities such as value addition technologies like milk cooling facilities, livestock feed, manufacturing, etc. The project shall also boost in poverty alleviation in the county through increased agricultural mechanization as farmers shall access energy to drive some of the machine. The project should put in place measures to minimize any occurrences of pollution as a result of increased mechanization.
Department of Environment, Energy, Water and Natural Resources	The project will benefit the said part of the county by providing electricity for domestic, commercial and industrial purposes. Water supplies operated on diesel engines will be connected to electricity for sustainability and efficient provision of water services.
Department of Physical Planning	There are frequent power interruptions in the county and adding more power will reduce the interruptions. More people will be connected so their businesses such as welding, workshops, salons etc will be opened throughout the county.

The Senior Grounds Officer 1, of The Kenya Civil Aviation Authority, Nairobi, provided the following information;

The line needs to take cognizance of the existing aerodromes near the power line which are Gogar, Canzan Rongai, St. Andrew Turi, Emom, Bomet and Kilgoris to ensure that the safety of aircraft operations into the airstrips is preserved.

5.4.3: Important Issues as raised by the community

In summary, the following issues of concern were raised by the members of the community in Bomet, Nakuru and Narok counties:

- Employ workers who are disciplined.
- The project should start as soon as possible
- Let another substation be located at Chandera
- Both positive and negative effects should be highlighted
- People affected are compensated well within the market prices.
- Let the project management contact the community for more information needed and also local leaders for more details.
- There should be more meetings for public participation/ awareness funded by the company to create more awareness and importance of the power.
- Whether or not compensation will be done to only those PAPs with title deeds.
- When compensation will be done (before or after the project construction).
- Whether or not valuation for compensation will be the same for each PAP.
- The benefits that the PAPs will experience when the project is implemented.
- The CSR initiatives that have been put in place by the proponent. The proponent should assist with CSR initiatives like drilling of boreholes/ wells.
- Health effects of the proposed TL. (The radiation effects from the proposed project).
- Citizens should be involved in the planning process and/ or phases of the proposed project.
- The project should be implemented as soon as possible.
- How long it will take before the project is implemented and the duration of the project to be completed.
- Where the TL will pass and how far from the roads it will pass.
- Activities that can be done on the wayleave.
- Whether or not the feasibility study had been done and if there's a final map of the route of the TL.
- The criteria for employment; locals should not be discriminated upon like in previous projects where people from other localities came to work in other locations.
- Linkage between KenGen, KETRACO and Kenya Power
- If KETRACO connects power to consumers.
- KETRACO should make sure that when they transmit power to Kenya Power, final consumers are connected to the power without delay.

- Dangers of living on the wayleave of the TL.
- Where the substations will be located.
- If the TL will pass underground.
- Role of the community concerning the proposed project.
- Direct benefits to those people living far away from the proposed TL.
- The wayleave route be discussed first with the affected persons and be informed on all areas and issues which will affect them and concern of persons be addressed accordingly.

5.4.4: Some of the benefits as identified by the community

- The project will promote new industries/ factories in the county e.g. tea and flour mills
- The project is supported since it is environmentally friendly.
- Since the power will be cheaper, the tea factories will turn to the power hence reduce market for trees.
- It will promote business activities.
- There will be adequate and reliable power for use by consumers.
- Employment opportunities will be created within and around the project areas.
- The project will assist in empowering the locals.
- Introduction of industries to process various raw materials within the counties (tea and flour milling).
- Efficient and reliable power/ electricity throughout the counties.
- Communication will be enhanced in regions where poor communication had not been addressed.
- Informal sector will grow such as jua kali.
- The cost of electricity will be lowered hence making it affordable.
- Enhancement of security in the project areas.

5.5: OVERALL PICTURE FROM THE STAKEHOLDER CONSULTATIONS.

The overall picture emergent from the stakeholder consultations is that their attitude towards the project is positive and desirous. However, strong feelings were aired in relation to the effects of the transmission line on the Mau Forest Complex especially from KFS, KWS and WRA. All officers consulted from different stations of these organisations indicated their support for the project on condition that, KETRACO considers underground cabling within the Mau Forest. Outside this, the project is seen as being strategic to stabilising power supply, which is crucial to sustained economic growth. In order to sustain this overwhelming public support, the project development should proceed simultaneously with resolution of stakeholders' concerns.

CHAPTER 6: INDICATIVE RESETTLEMENT ACTION PLAN (RAP)

6.1: INTRODUCTION

A Resettlement Action Plan (RAP) is a document drafted by a project proponent (where there is a likelihood of people being resettled due to the project) or an appointee of the project proponent, specifying the procedures to be followed and the actions to be taken to properly resettle and compensate affected people and communities.

A RAP must identify the full range of people affected by the project and justify their displacement after consideration of alternatives that would minimize or avoid displacement. The RAP outlines eligibility criteria for affected parties, establishes rates of compensation for lost assets, and describes levels of assistance for relocation and reconstruction of affected households.

The Rongai - Kilgoris high voltage transmission line is a linear project and will lead to Linear resettlement. Linear resettlement describes projects having linear patterns of land acquisition (highways, railways, canals, and power transmission lines). In sparsely populated rural areas, a linear project such as an electric transmission line may have minimal impact on any single landholder. Compensation is characterized by a large number of small payments for the temporary loss of assets such as structures, crops and land. If well designed, linear projects can easily avoid or minimize the demolition of permanent structures. Conversely, in a densely populated urban area, a linear project such as a road upgrading may require the demolition of structures along the project right-of-way, thereby significantly affecting large numbers of people. Linear resettlement contrasts with site specific resettlement because of the problems that frequently arise when resettlement actions have to be coordinated across multiple administrative jurisdictions and/or different cultural and linguistic areas.

6.2: OBJECTIVES OF RAP

The main objectives of a RAP is to;

- To avoid or minimise involuntary resettlement;
- To ensure that affected individuals and households and/or displaced communities are meaningfully consulted, have participated in the planning process, and are adequately compensated to the extent that at least their pre-displacement incomes have been restored and that the process has been a fair and transparent one to ensure that people and enterprises affected by the project are compensated for any loss of property and/or socio-economic displacement as a result of the project;

- To provide project affected people (PAPs) with the opportunities to restore or improve their living standards and income earnings capacity to at least pre-project levels; and
- To provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project, including rehabilitation/ resettlement operations in order to ensure that PAPs will not be impoverished by the adverse social impacts of the project.

6.3: COMPONENTS OF RAP

An effective RAP will have the following essential components;

- identification of project impacts and affected populations;
- a legal framework for land acquisition and compensation;
- a compensation framework;
- a description of resettlement assistance and restoration of livelihood activities;
- a detailed budget;
- an implementation schedule;
- a description of organizational responsibilities;
- a framework for public consultation, participation, and development planning;
- a description of provisions for redress of grievances; and
- a framework for monitoring, evaluation, and reporting.

6.4: SCOPE OF THE STUDY

This study, unlike a full RAP which will be conducted by KETRACO immediately before the construction phase of the project, is an indicative RAP. The study enumerates all the PAPs, and for each PAP

1. Computes land acreage within the wayleave,
2. Identifies all the structures within the wayleave, and
3. Tallies all the trees within the wayleave

Cost estimates provided are based on information provided by the locals and the consultants experience in doing the same. Proper valuation by registered Land Valuers was not done. The values therefore, only give an indication of the funds required and do not constitute the exact values of the property identified.

6.5: METHODOLOGY

For the preparation of this indicative RAP, a census survey was carried out to identify the Project Affected Persons (PAPs), their structures within the wayleave, their land acreage which will be affected, and the total number of trees which will need to be cut to give way to the transmission line. An estimated worth for each structure, affected land, and trees was provided.

It is imperative to note here that, the processes preceding the construction phase of the project, which include EIA License approval, mobilization of project funds, and sourcing for a contractor, may take a considerable duration of time (on average KETRACO projects take 18 months to reach construction phase) and that by the time of construction;

1. More people may have resettled on the way-leave corridor and
2. Property prices may have escalated

Conducting an elaborate RAP at this time may not be the most appropriate. An effective RAP is done immediately before the construction phase of the project.

This RAP report, therefore, is an indicative Resettlement Action Plan and should form a guide to a more elaborate RAP to be conducted by the project proponent immediately before project construction phase.

The report comprises the findings of the site visit carried out and the census survey against the background of the national legal and institutional frameworks, and the World Bank Involuntary Resettlement Policy (OP/BP 4.12). It provides an overview of the affected households and communities, structures on the way-leave at the time of the study, and an estimate budget to be used by the proponent for the purposes of compensating Land, structures, and trees. The report also contains a comprehensive Terms of Reference (TOR) – appendix IV - to be used by the project proponent for an elaborate RAP immediately before the construction phase.

6.6: RESULTS

6.6.1; Results Summary

From the census results, the 60m corridor over the distance of 155km of the transmission line will affect a total of 1,086 households. The transmission line will affect a total of 2,207acres of land at an approximated cost of Ksh. 684,182,633. A total of 477 different types of structures will have to be relocated and this will cost KETRACO approximately Ksh. 375,500,000 and a total of 8,754 different types of trees will be affected at an approximated cost of Ksh. 83,870,930. Detailed results of the RAP are given in appendix III.

6.6.2; Housing typologies amongst the PAPs

The type of housing in the project areas are of different kinds including permanent, and semi-permanent structures and huts, sheds and toilets. The following are some of the structures on the way-leave.

PERMANENT STRUCTURES




SEMI – PERMANENT STRUCTURES




























HUTS, SHEDS AND TOILETS

CHAPTER 7: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

7.1: INTRODUCTION

A summary of the main potential impacts of the proposed project based on stakeholders' views; Assessment of the project area and evaluation of project processes, JBIC Environmental Checklist 15: Power Transmission and Distribution Lines; World Bank Project/Site Screening Criteria Worksheet; KETRACO ESIA Screening Form; ADB Guidelines; and consultants' previous experience in undertaking ESIAs is discussed below.

7.2: POSITIVE IMPACTS

Broadly, the identified positive impacts associated with the proposed transmission line project include;.

7.2.1; Reliable and Secure Electricity Power Supply

The project will enhance the adequacy, reliability, and security of electricity power supply in Nakuru, Bomet, and Narok Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages (blackouts).

7.2.2; Contribute towards reduction in Greenhouse Gas emission

Current electricity power transmission mode in the Country's rural areas is mainly through 33kV distribution lines. Studies show that, the 33kV distribution lines loose up to 30 per cent of the power they transmit. High voltage transmission lines on the other hand are efficient and hardly lose any power they are transmitting. The project therefore, will contribute towards saving power loses which translates to reduced generation of excess power (lost during transmission) and therefore a reduction in the generation of greenhouse gasses. The project will further eliminate the need for diesel generated power and reduce dependence on fuel-wood. This will again help reduce emission of greenhouse gasses.

7.2.3; Contribute towards lowering the cost of electricity

The project as stated above will help reduce transmission loses by about 30 percent. This will translates into reduced power production costs and as a consequence the final power tariffs per kilowatt hour charged to Kenya Power customers.

7.2.4; Employment Opportunities

The construction of the proposed project will create employment opportunities for both skilled and unskilled personnel. The proponent has committed to ensure that priority is given to the local community.

7.2.5; Contribution towards reduction of environmental pollution

Studies show that, the dominant energy source in the county is fuel-wood. The project will provide alternative energy source and thus reduce reliance on fuel-wood thereby contributing towards among others, the national goal of meeting the minimum forest cover

7.2.6; Gains in the Local and National Economy

Expected gains in the local and national economy from the construction and operation of the proposed project will be in the form of consumption of locally available materials including: fine and course aggregates, timber, cement, glass, metal, and among other construction materials; taxes levied from contractors and employees; and income from business associated with the project.

7.2.7; Informal Sector Benefits

The project will require supply of large quantities of building materials most of which will be sourced locally. It will also spur the growth of small business enterprises including kiosks to serve construction workers and employees, barbershops, mills, cell phone charging, photocopying shops among others.

7.2.8; Development of Other Sectors

Increase in reliability and security of power supply in the region will enhance efficiency and productivity of other sectors including health, education, water supply, agriculture and livestock production, industry, etc.

7.2.9; Security

With increased lighting in the project area and presence of guards on the project site the security of the area will be enhanced.

7.3: NEGATIVE IMPACTS

The following negative impacts are also associated with the proposed project.

7.3.1; Noise Pollution

The construction and decommissioning works of the project will most likely be noisy due to the moving machines (concrete mixers, tippers, drilling etc) and incoming vehicles to deliver construction materials to site or take away debris.

This impact will be more localized and felt in the construction of the substations as compared to the construction of the transmission line. Machines like tippers and concrete mixtures produce continuous high

levels of noise over a long period of time every day. Operators of these machines are therefore exposed to high levels of noise over long period which is continuous. This as a stand alone can be rated as high but overall noise impact for this project is however rated moderate to low.

Areas between Matuiku and Elburgon, Chandera and Keringet, Bomet and Ndanai, and Ndanai and Kilgois have rocky outcrops. Blasting of rocks, to excavate for tower foundation, in these areas might be necessary. Depending on the frequency and area of blasting, the impact can be rated as high to medium.

7.3.2; Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the motored equipment during the construction and decommissioning phase of the proposed project. Motor vehicles that will be used to ferry construction materials, take away debris during decommissioning phase or those used for general operation activities (operation phase) will also have impacts on air quality. Diesel operated power back-ups (Generators) if used may also produce exhaust emission.

7.3.3; Dust Emissions

The construction phase of transmission line projects require use of large amounts of cement. Workers, especially, those who work on the concrete mixers will therefore be exposed to cement dust.

Dust emission is also likely to occur during the site clearance, excavation and spreading of the topsoil during construction of the substations, excavation of foundation for steel towers and by uncovered trucks delivering loose aggregates to the site.

Many of the access roads to the project sites are not tarmacked. Motor vehicles using these access roads will for sure lead to dust emissions.

Dust emissions are also likely to occur during the decommissioning phase.

7.3.4; Solid and Liquid Waste Generation

It is expected that solid waste will be generated in all phases of the project.

During construction, generated waste will include; excavated soil and rocks, residual loose and fine aggregates, cement bags, wooden boxes used to deliver tower parts, drums used to deliver mineral oil for transformers, conductors, steel, metal, plastic, glass, paper, organic, cables, paints, adhesives, sealants, fasteners, wastewater, sewage etc.

Experience from the already built transmission lines in Kenya show that, many contractors fail to collect (effectively) the remnants of the loose aggregates (locally known as kokoto) and concrete from the tower bases. This creates a small patch that is not ecologically productive and can be seen many years after construction. Nothing can grow on this patch. Assuming that, this transmission line will have an approximated 500 towers and that each patch is about a meter squared, the transmission line will create a desert equivalent to 500 square meters which is about 0.13 of an acre. Not big but a significant figure.

7.3.5; Oil Spill Hazards

Mineral oil is used in the transformers as a coolant. Oil spill, may therefore, occur during storage, transportation, and when the transformers are being filled with oil.

Motorized machinery on the proposed site may be containing moving parts which will require continuous oiling to minimise the usual corrosion or wear and tear. This has a potential for oil spills and accidents.

7.3.6; Destruction of Existing Vegetation and Habitats

The project will require a way-leave of 60 meters width for about 132km (outside the Mau Forest Complex). Within the way-leave, selective clearing of vegetation will be necessary to (1) remove any tall trees that pose a risk to the transmission line, (2) give way for the construction of the towers; and (3) give room for workers to do survey work and stringing of the transmission line. Also vegetation within sections of the substations that will hold the power lines and buildings will be cleared.

The impact will be long-term, as it would persist as long as the facility is in operation. However, the overall intensity of this impact is rated as medium, as much of the wayleave fall on farmlands (cultivation areas and grazing areas) and that, the impact is not likely to be of wider significance given the paucity of species of conservation concern in the area, the overwhelmingly intact nature of the surrounding landscape as well as the fact that average tree/shrub height in the transmission line corridor is less than 6m and may require no clearing.

Operational phase impacts are likely to be restricted to maintenance activities within the way-leave corridor. As such these impacts are considered to have low intensity, and an overall moderate-minor significance. This significance rating is based on vegetation clearance without the use of herbicides, which is not recommended.

Section 7.3.9 looks at the effects of the TL on Mau Forest while a detailed description of Flora of the proposed transmission line, how they will be impacted and proposed mitigation measures are given in Appendix II.

7.3.7; Disturbance of Faunal Species

The potential impacts associated with vegetation loss are closely linked to potential impacts on fauna, since a key determinant of faunal disturbance is generally habitat quality. Fauna such as small mammals are likely to occur at various habitats throughout the site.

The Mau Forest Complex is rich in Faunal species including small mammals, Elephants, and Bongos.

Construction phase activities that will impact on animal life in the area include:

- Increased human activity and associated noise
- Possible increase in hunting due to increased number of people in the area.
- Increased traffic of trucks and heavy machinery and associated noise.
- Increased noise and dust levels due to construction activities.
- Stripping of vegetation and soil to clear and level areas for infrastructure.

Shy mammals will move away from the noise and disturbance during the construction phase. Some mammals will be vulnerable to illegal poaching due to the presence of personnel in the site.

A detailed description of Fauna of the proposed transmission line, how they will be impacted and proposed mitigation measures are given in Appendix II.

7.3.8; Avifauna Mortalities

During the assessment, various types of avifauna were recorded. The transmission line therefore, is quite likely to have impacts on the birds.

This impact will be more felt on areas close to the Mau Forest Complex where the transmission line will have overhead cables. Areas close to Chepalungu forest will also experience heightened impacts.

Avifauna mortality by power lines can either be due to bird electrocution or bird strikes by the conductors. The separation between the conductors of the transmission line shall be a minimum of 3m and therefore, bird electrocution will be highly unlikely (electrocution can only occur if the bird touches at least two conductors). Bird strike by the conductors is however, likely and in a few circumstances may lead to mortality.

A detailed description of avi-fauna of the proposed transmission line, how they will be impacted and proposed mitigation measures are given in Appendix II.

7.3.9; The Mau Forest Complex

The Mau Forest Complex is a critical water tower that give rise to over 12 rivers, a key wildlife habitat and an important Bird Area. The following are the anticipated impacts;

1. Vegetation clearing
2. Increased human activity and associated noise
3. Possible increase in hunting due to increased number of people in the complex.
4. Increased noise and dust levels due to construction activities.

7.3.10; Impacts on Workers' and Community Health and Safety

Workers and community members in the project area may be exposed to various risks and hazards. The most serious hazards in the construction of transmission lines is probably

1. falling from height during tower erection and stringing
2. falling objects i.e. from high levels of towers and excavations,
3. collapsing of excavations,
4. poor hygiene as the contractor may find it difficult to provide sanitary welfare in the bushes
5. attack by wild animals,
6. road accidents,

Other hazards may include; slips and trips, electrical shocks, dust, noise and vibrations, fire, bruises and cuts, etc

7.3.11; Soil Erosion

Certain sensitive areas prone to impacts of soil erosion, were identified. These included hilly areas and areas with rivers, streams, and springs. In these areas, if not checked, soil erosion from the loose excavated soil, may lead to deposition which may in turn lower the output of the areas.

7.3.12; Visual and Aesthetic Impacts

The physical presence and profile of the proposed transmission line and substations will alter the visual and aesthetic effects of the surrounding area. The project terrain in most section is rather flat and concealing the tall pylons of the TL will be a difficult challenge.

Contractor's materials' yard/camp sites and the temporary structures built by the contractor in both the substations and materials yard/camp sites will also impact on visual and aesthetic nature of the surrounding areas.

7.3.13; Incidences of Electrocution

This impact will be felt during the operation phase of the project.

Various stakeholders were concerned by the fact that, the project may lead to members of the community being electrocuted. Some were even worried that, touching the pylons may lead to electrocution. While it is true that the proposed project will be dealing with electricity, the safety design of the project leaves very little chance of electrocution. The conductors are 30m high, the towers at some height are surrounded by barbed wire and have clear danger warnings to deter people from climbing, and should a tower collapse or a conductor snap, a signal is sent in seconds which results in an immediate shut down.

Access to the substation by unauthorised people or animals may lead to electrocution incidences.

7.3.14; Perceived Danger of Electrostatic and Magnetic force

Electric power lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. The strength of both electric and magnetic fields is a function of the voltage and the lateral distance from the power lines to the receptor. Many studies published during the last decade on occupational exposure to Electro-Magnetic Fields (EMF) have exhibited a number of inconsistencies and no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields are a threat to human health. However, the EMF decrease very rapidly with distance from source (30m high) and there should be no potential health risks for people living outside of 60m corridor.

7.3.15; Increase in Social Vices

With an increase in the population of the area boosted by the project employees the social set up of the area will be affected. This change may be in the form of loose morality, an increase in school drop-out due to cheap labour, child labour, and increased incidences of HIV/AIDS and other communicable diseases.

This impact will be more pronounced in town centers and near villages.

7.3.16; Cultural Heritage and Archaeological Finds

Though not identified during the EIA assessment, the transmission line may traverse through cultural heritage areas. Further, during excavations for the tower bases, workers may come across Archaeological finds.

7.3.17; Land take – Resettlement and Loss of Use

As mentioned earlier, the proposed project will require a corridor of 60m width. Within the 60m corridor, no structures or tall trees are allowed. All other forms of land use including grazing and farming are allowed.

The indicative RAP survey showed that the transmission line will affect a total of 1,086 households with a total acreage of 2,288 acres of land consisting mainly of farmlands, grazing fields and bushes. A total of 477 different types of structures were identified to be on the way-leave corridor.

7.4: PROPOSED MITIGATION MEASURES

The following are proposed mitigation measures to avoid, offset or minimize the identified negative impacts.

7.4.1; Noise Pollution

Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of site and nearby communities. No worker should be exposed to continuous loud noise for over 4 hours and those working in continuous loud noise should be provided with necessary PPEs and impelled to use them.

The contractor will adhere to the EMCA Noise and Excessive Vibration Pollution Control Regulation, 2009 and will be required to implement noise control measures amongst exposed work force and community. This will include provision of hearing protective devices such as ear plugs and ear muffs; avoiding construction or demolition activities during the night, education and awareness programmes and creation of a buffer to propagate against noise pollution among other noise control measures.

The contractor should only blast rocks where it is very necessary. Blasting may require a variation of the NEMA License.

7.4.2; Generation of Exhaust Emissions

To mitigate against exhaust emissions, the proponent is advised to sensitise truck drivers and machine operators to switch off engines when not in use; regularly service engines and machine parts to increase their efficiency and reduce generation of exhaust emission; and where feasible use alternative non-fuel construction equipment.

7.4.3; Dust Emissions

The proponent will endeavour to minimize the effect of dust on the surrounding environment resulting from use of cement, site clearance, excavation, spreading of the topsoil, demolition works and temporary access roads to ensure protection of health and safety of workers and communities. Control measures will include, use of PPE; regular sprinkling of water on dusty areas and temporary access roads; and observing set speed limits among other measures.

7.4.4; Solid and Liquid Waste Generation

To avoid waste generation or to minimize the amount of waste generated, the following measures are recommended;

- use of an integrated solid waste management system i.e. the 3 R's: Reduction at source, Reuse and Recycle;
- accurately estimate the dimensions and quantities of materials required especially fine and loose aggregates for tower bases;
- use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time;
- providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage;
- use of building materials that have minimal or no packaging to avoid the generation of excessive packaging waste;
- providing waste collection bins at designated points on site;
- Ensuring that, all remnants of loose gravel and concrete are effectively collected from the tower bases and re-used or disposed of in an environmentally friendly manner.
- disposing waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.
- drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations;
- construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a regular basis
- proper procedures for the management of human waste will be put in place in order to prevent outbreak of diseases;
- place in strategic places signs against littering and dumping of wastes;
- audits waste generation and develop Waste Reduction Action Plans (WRAP).

7.4.5; Oil Spill Hazards

The proponent will endeavour to prevent petroleum products used in the substations which include bitumen, oils, lubricants and gasoline from contaminating soils and water resources (ground and surface water). To accomplish this, the proponent will;

- install oil trapping equipment in areas where there is a likelihood of oil spillage;

- collect the used oils and re-use, re-sell, or dispose of appropriately using expertise from licenced waste handlers;
- prepare a written substations response plan and display it on strategic areas and train workers on specific procedures to be followed in the event of a spill;
- immediately institute clean up measures in case of an oil spill;
- design the substations to have spill prevention and detection systems to protect the environment especially where the transformers will be located;
- design appropriate protection devices against accidental discharge of transformer oil substances;
- route drains through an oil/water separator;
- ensure regular inspection and maintenance of the transformers to minimize spillage;
- ensure that all waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.

7.4.6; Destruction of Existing Vegetation and Habitats

To minimize destruction of existing vegetation and habitats;

- Vegetation clearing will be kept to a minimum. The vegetation of the site is largely low and open and therefore whole-sale vegetation clearing will only be applied if necessary and within the project route.
- Document pre- and post- construction vegetation cover and recovery of the ground layer incase available.
- All no-go areas will be clearly demarcated.
- Regular monitoring will be undertaken to ensure that alien plants are not increasing as a result of the disturbance that has taken place.
- Any extensive cleared areas that are no longer or not required for construction activities will be re-seeded with locally sourced seed of suitable species. Bare areas can also be packed with bush removed from other parts of the site to encourage regeneration and limit erosion.
- No construction vehicle will be allowed to drive around the veld. All construction vehicles will remain on properly demarcated roads.
- Fires will only be allowed in fire-safe demarcated areas
- Vegetation clearing for maintenance activities will be done manually wherever possible. The use of herbicides will be avoided.
- Collection or harvesting of any plants on the site is to be strictly forbidden throughout all phases of the project.
- with assistance from community, KFS and KWS, KETRACO to initiate a tree planting exercise. School Greening Programmes in schools that are along the transmission line would be very useful.

- On the un-used portions of the acquired substations land; design and implement an appropriate landscaping programme for the substations site;

7.4.7; Disturbance of Faunal Species

To minimize effects on faunal species

- Ensure no worker engage in acts of poaching
- Restrict construction to day time
- Observe applicable Game Reserve regulations
- Bush clearing to be selective. Only tall trees on the wayleave corridor or vegetation on the footprints of the towers to be removed
- Consult the local KWS officer and communities to advice on construction timings to avoid disturbing wildlife.
- Tower foundation pits should be properly condoned to ensure no animal stray into the pits
- Any fauna directly threatened by the construction activities will be removed to a safe location by the environment control officer or other suitably qualified ecologist.
- No dogs will be allowed on the site.
- Fires will only be allowed in fire-safe demarcated areas
- Should the site need to be fenced, the fencing will be constructed in a manner which allows for the passage of small and medium sized mammals, at least at strategic places.
- In order to reduce collisions of vehicles with fauna, a 30km/hr speed limit will apply to all vehicles using the site.
- Animals will have right of way
- No unauthorized persons will be allowed onto the site and those authorized to be instructed to follow the measures stated herein.

7.4.8; Avifauna Mortalities

To minimize bird collisions leading to their mortality;

- In consultation with KFS, KWS, Nature Kenya, IUCN, WWF, and any other organizations that deals with bird conservation, the proponent will identify all bird migration corridors in the project area
- In these corridors, the proponent will undertake wire marking to alert birds of the presence of power lines, allowing them time to avoid collision and will build raptor platforms for bird roosting and nesting
- The proponent will ensure that any maintenance on the transmission infrastructure of the site retains the bird friendly design features

- Any electrocution and collision events that occur should be recorded, including the species affected and the date. If repeated collisions occur, then further mitigation and avoidance measures may need to be implemented.

7.4.9; The Mau Forest Complex

To minimize impacts on the Mau Forest Complex

- Within the Forest Complex KETRACO to consider underground cabling or at a minimum reducing the way-leave to 15m
- The proponent (and the contractor) must strictly adhere to The Forest Conservation and Management Act, 2016
- The proponent (and the contractor) must strictly adhere to The Wildlife Conservation and Management Act, 2013
- At the Proponent's cost engage KFS and KWS rangers to guard workers against wildlife and to protect wildlife from hunting and poaching
- Ensure no worker engage in acts of hunting or poaching
- Restrict construction to day time
- Observe applicable Protected Area regulations

7.4.10; Impacts on Workers' and Community Health and Safety

The proponent will implement all necessary measures to ensure health and safety of the project workers and the general public during construction, operation and decommissioning of the proposed project as stipulated in the Occupational Safety and Health Act, 2007. This will include but not limited to

- Registration of workplaces by the contractor where it is required
- Identify all hazards before undertaking a process
- Conduct and continually review a risk assessment
- Hold daily morning toolkit talks where safety is the key issue
- Train workers on health and safety
- Identify and train fire marshals and first aiders.
- Only use experienced workers during erection of towers and stringing. Before climbing the towers, the workers should be reminded of the danger ahead and the need for being careful. Strict supervision on those on top of towers should be the norm.
- Ensure use of double harness while atop the towers
- Where there are risks of attack by wild animals, ensure workers are accompanied by armed guards
- Collect daily security briefs and avoid insecure places
- Ensure no un-authorised persons access live sections of substations

- Provide all necessary PPEs

7.4.11; Soil Erosion

To reduce soil erosion, the proponent will;

- apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil;
- ensure that construction vehicles are restricted to use existing graded roads;
- implement a storm water management plan that minimizes impervious area infiltration by use of recharge areas and
- use of detention and/or retention with graduated outlet control structure will be designed.

7.4.12; Visual and Aesthetic Impacts

To reduce impacts on visual and aesthetic values of the area, the project proponent will;

- undertake extensive public consultation during the planning of the project;
- design structures at the site in such a way as to improve the beauty of the surroundings;
- restore site areas through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers;
- design and implement an appropriate landscaping programme.

7.4.13; Incidences of Electrocution

To reduce incidences of electrocution, the proponent will;

- ensure strict adherence to the safety designs established;
- all towers should have safety warnings and a perimeter barb wire to ensure people and animal don't climb the towers
- put in place a maintenance system to ensure physical integrity of project components;
- ensure that access to the live sections of the project should only be by authorization and trained personnel;
- erect a perimeter fence on substations to deny unauthorized people access the substations;
- place warning signs on strategic places;
- conduct periodic awareness and sensitization campaigns for the neighbouring communities.

7.4.14; Perceived Danger of Electrostatic and Magnetic force

The proponent will conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces

7.4.15; Increase in Social Vices

To minimize project effects on local social set up, the proponent will;

- conduct periodic sensitization forums for employees on ethics, morals, general good behavior and the need for the project to co-exist with the neighbours;
- offer guidance and counseling on HIV/AIDS and other STDs to employees;
- provide condoms to employees; and
- ensure enforcement of KETRACO's policy on sexual harassment and abuse of office.

7.4.16; Cultural Heritage and Archaeological Finds

There is need to conduct a detailed Cultural Heritage and Archaeological Impact Assessment for this transmission line. It is also suggested that the contractor and sub-contractors be trained on this issue by National Museums of Kenya (NMK) in consultation with KETRACO.

Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the NMK informed for further instructions.

7.4.17; Land take – Resettlement and Loss of Use

- Conduct a detailed and elaborate RAP
- Conduct consultation meetings with Project Affected Persons
- Ensure timely compensation for loss of property and land use.
- Ensure adherence to country legal legislations and World Bank Safeguard Policy 4.12 on Involuntary Resettlement

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1: ESMP FOR THE CONSTRUCTION PHASE

Table 8.1: ESMP for the construction phase of the proposed project

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of Noise and Vibration				
Noise and vibration	The contractor to adhere to the EMCA Noise and Excessive Vibration Pollution Control Regulation, 2009	KETRACO & Contractor	Entire construction period	0
	Contractor to ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum	KETRACO & Contractor	Entire construction period	0
	Sensitise construction drivers to avoid running of vehicle engines or hooting			
	Regular servicing of engines and machine parts to reduce noise generation	KETRACO & Contractor	Entire construction period	0
	Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.	KETRACO & Contractor	Entire construction period	Design cost
	Trees to be planted around the site to provide some buffer against noise propagation	KETRACO & Contractor	Entire construction period	40,000
	The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.	KETRACO & Contractor	Entire construction period	0

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Provide necessary PPE to workers who may be exposed to high levels of noise and ensure proper and constant use	KETRACO & Contractor	Entire construction period	Ear plugs and ear muff @1000 each
	All construction equipment and machinery to be used must be tested to verify if they are compliant with Kenya and the internationally acceptable standards of noise.	KETRACO & Contractor	Entire construction period	
2. Abate Air Pollution				
Dust emission	Ensure strict enforcement of on-site speed limit regulations	KETRACO & Contractor	Entire construction period	0
	Avoid excavation works in extremely dry weather			0
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction and vehicles			10,000
	Stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions			0
	PPE to be provided to employees and ensure proper and constant use			Dust coats and dust masks@5000 per employee
Exhaust emission	Sensitise truck drivers and machine operators to switch off engines when not in use			0
	Regular servicing of engines and machine parts to reduce exhaust emission generation			0
	Alternative non-fuel construction equipment shall be used where feasible			0
3. Minimize solid and liquid waste generation and ensure efficient waste management during construction				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Increased solid waste generation	Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle	KETRACO and Contractor	Entire construction period	0
	Accurate estimation of the dimensions and quantities of materials required.			0
	Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time			0
	Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage			Design cost
	Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste			0
	Reuse packaging materials such as removed wooden poles, cartons, cement bags, empty metal and plastic containers to reduce waste at site			0
	Waste collection bins to be provided at designated points on site			20,000

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.			20,000/month
Generation of wastewater	Provide means for handling sewage generated at the construction site	KETRACO and Contractor	One-off	30,000
	Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies		Entire construction period	0
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			10,000 - quarterly
4. Minimize Oil Spills				
Oil spills Hazards	Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles.	KETRACO and Contractor	Continuous	0
	In case of an oil spill, immediate clean up measures will be instituted			
	Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water		One-off	10,000

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	A written substations response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.		One-off	0
	Collected used oils should be re-used, disposed of appropriately by licenced waste handlers, or be sold for reuse to licensed firms		Continuous	5,000 per month
5. Minimize vegetation disturbance at and or around construction site				
Destruction of existing vegetation and habitat	Conduct selective clearing of vegetation on the way-leave corridor. Avoid unnecessary vegetation clearing; only tall trees that pose a danger to the transmission line and vegetation on the foot plinth of the tower to be removed.	KETRACO and Contractor	Continuous	0
	Ensure proper demarcation and delineation of the project area to be affected by construction works.			0
	Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.			0
	Designate access routes and parking within the site.			0
	With Assistant from community, KWS and KFS, initiate a tree planting exercise		Entire construction period	50,000

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Design and implement an appropriate landscaping programme for the substations site.			50,000
	Support community initiatives in tree planting	KETRACO and community	Entire project period	50,000
6. Minimize Disturbance on faunal species				
Disturbance on wildlife	Ensure no worker engage in acts of poaching	KETRACO, and Contractor	Entire construction period	0
	Restrict construction to day time			
	Observe applicable protected areas regulations			
	Bush clearing to be selective. Only tall trees on the wayleave corridor or vegetation on the footprints of the towers to be removed			
	Consult the local KFS and KWS officer for advice on construction timings to avoid disturbing wildlife.			
7. Minimize Disturbance on Mau Forest Complex				
Disturbance on Mau Forest Complex	Within the Forest Complex KETRACO to consider underground cabling or at a minimum reducing the way-leave to 15m	KETRACO, and Contractor	Entire construction period	0
	The proponent (and the contractor) must strictly adhere to The Forest Conservation and Management Act, 2016 and The Wildlife Conservation and Management Act, 2013			

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	At the Proponent's cost engage KFS and KWS rangers to guard workers against wildlife and to protect wildlife from hunting and poaching			
	Ensure no worker engage in acts of hunting or poaching			
	Restrict construction to day time			
	Observe applicable Protected Area regulations			
8. Minimize occupational health and safety risks				
Impacts on workers' and community health and safety	Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO, DOHSS and Contractor	Entire construction period	100,000
	Prohibit access by unauthorized personnel into the construction site			0
	Train all employees and regularly sensitize them on safe working procedures			30,000
	Periodic community sensitization of the dangers posed by the project		Quarterly during the entire construction period	50,000
	Place warning signs where necessary		Whenever necessary	20,000
	Provide necessary PPEs to workers		Continuous	20,000
	Erect a perimeter fence to enclose the substations		One-time off	Design cost

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
9. Reduce soil erosion and storm-water runoff				
Soil erosion and storm-water runoff	Surface runoff and roof water shall be harvested and stored in tanks so that it can be used for cleaning purposes.	KETRACO and Contractor	Entire construction period	
	A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.		First quarter	20,000
	Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.			
	Ensure that construction vehicles are restricted to use existing graded roads		Entire construction period	
	Ensure that any compacted areas are ripped to reduce run-off.			
	Roof catchments will be used to collect the storm water for some substations uses			40,000
	Construction of water pans to collect storm water for substations use, tree planting and landscaping.			5,000 per unit
10. Visual and aesthetic impacts				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Visual and aesthetic impacts	Extensive public consultation during project planning	KETRACO and community	Planning phase	50,000
	Structures at the site should be designed in such a way that they will improve the beauty of the surroundings.			
	Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers,		Continuous	50,000
	Design and implement an appropriate landscaping programme		Quarter one	20,000
11. Increase in social vices				
Increase in social vices including HIV/AIDS	Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours	Contractor	Entire construction period	50,000
	Guidance and counselling on HIV/AIDS and other STDs to employees	KETRACO and contractor		10,000
	Provision of condoms			10,000
	Contractor to have a strong policy on sexual harassment and abuse of office guided by proponent's policy on the same	Contractor	Quarter one	0
12. Cultural Heritage and Archaeological Finds				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Cultural Heritage and Archaeological Finds	Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.	Contractor and KETRACO	Entire construction period	0
13. Land take – Resettlement and loss of use				
Resettlement and loss of use	Conduct consultation meetings with Project Affected Persons and ensure timely compensation for loss of property and land use. Ensure adherence to country legal legislations and World Bank Safeguard Policy 4.12 on Involuntary Resettlement	KETRACO	Continuous	To be determined

8.2: ESMP FOR THE OPERATION PHASE

Table 8.2: ESMP for the operation phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Abate Air Pollution				
Generation of exhaust emission	Vehicle idling time shall be minimised	KETRACO	Entire implementation time	0
	Regular servicing of engines and machine parts to reduce exhaust emission generation			
2. Minimization of solid and liquid waste generation and ensuring more efficient waste management				
Solid waste generation	Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle	KETRACO	Continuous	0
	Provide solid waste handling facilities such as rubbish bags and skips		One-off	20,000
	Ensure that wastes generated are efficiently managed through recycling, reuse and proper disposal procedures.		Continuous	0
	A private licensed company to be contracted to collect and dispose solid waste on regular intervals			30,000 /year

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Place in strategic places signs against littering and dumping of wastes			10,000 /year
	Audits on waste generation and development of Waste Reduction Action Plans (WRAP)			To be determined
Liquid waste generation	Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies	KETRACO	Continuous	20,000 / annum
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			
	Audits on liquid waste generation and development of liquid Waste Reduction Action Plans			
Release of sewage into the environment	Provide adequate and safe means of handling sewage generated at the substations	KETRACO	One-off	40,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Conduct regular inspections for sewage pipe blockages or damages and fix appropriately			0
	Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated		Continuous	0
3. Minimize Oil Spills				
Oil spills Hazards	Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles	KETRACO	Continuous	0
	In case of an oil spill, immediate clean up measures will be instituted			
	The substations should be designed with spill prevention and detection systems to protect the environment especially where the transformers will be located.		One-off	Part of construction cost
	Design appropriate protection devices against accidental discharge of transformer oil substances.			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	The substations design should provide adequate storage areas for the transformer oil			
	Drains should be routed through an oil/water separator		One-off	Part of construction cost
	Frequent inspection and maintenance of the transformers should be done to minimize spilling		Continuous	0
	A written substations response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.		One-off	0
	The substations operator should ensure the proper containment or collection and disposal for the waste oil or used oil		Continuous	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	All waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan			20,000/year
	Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water		One-off	Project construction cost
4. Avifauna mortality				
Avifauna mortalities	To minimize collisions, undertake wire marking to alert birds to the presence of power lines, allowing them time to avoid the collision	KETRACO	One-off	Part of construction cost
	Build raptors platforms for bird roosting and nesting			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
5. Minimize occupational health and safety risks				
Impacts on workers' and community health and safety	Implement all necessary measures to ensure health and safety of the project workers and the general public during operation of the proposed project as stipulated in the Occupational Safety and Health Act, 2007	KETRACO	Continuous	50,000/month
6. Minimize Electrocution Incidents				
Electrocution from live power lines or electric equipment	Put in place a maintenance system to ensure physical integrity of project equipment is maintained	KETRACO	Planning stage	0
	Access to the substations should only be by authorization and trained personnel		Continuous	
	Erect a perimeter fence to deny unauthorized people access the substations			
	Clear warning signs to be placed on strategic places			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Conduct periodic awareness and sensitization campaigns for the neighbouring communities		Continuous	20,000/session
7. Electrostatic and magnetic forces				
Perceived danger of Electrostatic and Magnetic force	Conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces	KETRACO	Continuous	20,000 / annum
8. Increase in social vices				
Increase in social vices including HIV/AIDS	Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours	KETRACO	Continuous	30,000/year
	Guidance and counselling on HIV/AIDS and other STDs to employees			
	Provision of condoms			
	enforcement of KETRACO's policy on sexual harassment and abuse of office			

8.3: ESMP FOR DECOMMISSIONING PHASE

Table 8.3: ESMP for decommissioning phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Reduction of Noise and vibrations				
Increased noise and vibration	Install portable barriers to shield compressors and other small stationary equipment where necessary.	KETRACO and Contractor	Continuous	To be determined
	Demolish mainly during the day. The time that most of the neighbours are out working.			
	Provide appropriate PPE to workers			
	Co-ordinate with relevant agencies and neighbouring communities regarding all substations demolition activities			
2.Abatement of air pollution				
Generation of dust	Watering all active demolition areas as and when necessary to lay dust.		Continuous	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.	KETRACO and Contractor		
	Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.		One-off	10,000
	Provide appropriate PPE to all workers		Continuous	Dust coats and dust masks@5000 per employee
Generation of exhaust emission	Vehicle idling time shall be minimised	KETRACO and Contractor	Continuous	0
	Regular servicing of engines and machine parts to reduce exhaust emission generation			
3. Waste management				
Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1.Source reduction 2.Reusing 3. Recycling 4.Incineration 5. Sanitary land filling.	KETRACO and Contractor	Continuous	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site	KETRACO and Contractor	One-off	0
	Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.	KETRACO and Contractor	Continuous	Cost borne by the contractor
4. Oil spills				
Oil spills Hazards	Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of construction facility and vehicles.	KETRACO and Contractor	Continuous	0
	In case of an oil spill, immediate clean up measures will be instituted			
	Close surveillance of the fuel and cooling oil store			
5. Impacts on workers' and community health and safety				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Health and Safety for workers' and community members	Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO DOHSS and Contractor	Continuous	To be determined
	Prohibit access by unauthorized personnel into the demolition site			
	Place warning signs where necessary			
6. Rehabilitation of project site				
Vegetation disturbance	Implement an appropriate re-vegetation programme to restore the site to its original status	KETRACO and community	One-off	20,000
	Consider use of indigenous plant species in re-vegetation			
	Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.			

CHAPTER 9: ENVIRONMENTAL MONITORING PLAN (EMoP)

9.1: ENVIRONMENTAL MONITORING PLAN

Table 9.1: Environmental Monitoring Plan for the proposed project

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
1. Noise and vibration impacts	Daily observation; monthly noise level analysis		Daily observation; monthly noise level analysis	Noise level analysis; quarterly reports on log of vehicle and machine servicing; trees planted; number of (noise) licences given; PPE provided; and sensitization meetings held	KETRACO and Contractor
2. Impacts on air pollution	Daily dust observation; monthly air quality analysis	Monthly air quality analysis	Daily dust observation; monthly air quality analysis	Daily dust observation; quarterly air sampling and lab analysis; quarterly reports on PPE provided; log of vehicle and machine servicing; sensitization meetings held; frequency of sprinkling water	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
3. Solid and liquid waste generation	Monthly	Monthly	Monthly	Reports on waste management plans developed; amounts of waste generated; facility provided for handling and storage of waste; methods employed for waste disposal; training meetings held, Waste water quality analysis; Reports on liquid waste management plans developed; number of inspections held to identify leaking or blocked pipes	KETRACO and Contractor
4. Oil spills	Daily	Monthly	Daily	Reports of oil trapping equipment installed; number of oil spill incidents and corrective measures taken	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
5. Destruction of existing vegetation and habitats	Daily			Reports on site zoning program; community initiatives held on tree planting; landscaping programme on re-vegetation implemented	KETRACO and Contractor
6. Disturbance of faunal species	Monthly			Reports on wildlife sighted, meetings with KWS and conservancy owners, bush clearing	KETRACO and Contractor
7. Avifauna mortalities		Quarterly		Reports on wire marking and raptor platforms build; incidents of bird strikes	KETRACO and Contractor
8. Disturbance of the Mau Forest Complex	Daily	Quarterly	Daily	Reports on incidents of hunting and poaching; engagement of KFS and KWS rangers;	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
9. Health and Safety issues	Daily	Monthly	Daily	Quarterly reports on health and safety plans; SHE training programs; records of any incident, accident; investigation and corrective actions; PPE provided; progress of perimeter wall construction; warnings posted;	KETRACO and Contractor
10. Soil erosion	Daily			Reports on storm water management and soil erosion control plans developed; amounts of run-off and roof water harvested; water harvesting and storage facilities installed	KETRACO and Contractor
11. Visual and aesthetic impacts	Quarterly			Reports on public consultation held; landscaping programme designed and implemented	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
12. Electrocution incidences		Quarterly		Reports on maintenance system developed; electrocution accidents occurrence and corrective measures taken; visitors and employees access to the substations log; progress on construction of the perimeter wall; warning signs posted; sensitization workshops held	KETRACO and Contractor
13. Perceived danger of Electrostatic and Magnetic force		Quarterly		Reports on education and awareness campaigns held	KETRACO and Contractor
14. Increase in social vices	Monthly	Monthly		Reports on sensitization forums held; sessions held on guidance and counselling on HIV/AIDS and other STDs; number of condoms issued	KETRACO and Contractor
15. Cultural Heritage and Archaeological Finds	Monthly			Reports on heritage areas and archaeological finds found	KETRACO

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
16. Land take - Resettlement and Loss of use	Monthly			Reports on RAP implementation including compensation for land, structures and crop/trees damage	KETRACO
17. Rehabilitation of project site			Monthly	Reports on re-vegetation programme developed and implemented; number and species of trees planted	KETRACO and Contractor

CHAPTER 10: ANALYSIS FOR ALTERNATIVES

10.1: INTRODCUTION

One of the functions of the Environmental and Social Impact assessment process is to describe and evaluate various alternatives to the proposed project. Alternatives examined during the study are discussed below;

10.2: THE "DO NOTHING" OPTION

For this project, the no-development option would mean the proposed project will not be implemented. The implications of this would be no additional reliability and security of electricity supply to Nakuru, Bomet, and Narok Counties and the surrounding regions. Given that the level of impacts associated with the project are low and that there is high probability of mitigation of these negative impacts, the "no-go" option would not be the most viable option in this instance.

10.3: DEMAND-SIDE MANAGEMENT OPTION

Demand Side Management (DSM) is a function carried out by the electricity supply utility aimed at encouraging a reduction in the amount of electricity used at peak times. This is achieved by influencing customer usage to improve efficiency and reduce overall demand. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is the price differentiation (such as time-of-use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for managing the level of growth forecast for Nakuru, Bomet, and Narok Counties.

10.4: LINE ROUTING AND SUBSTATION SITING ALTERNATIVES

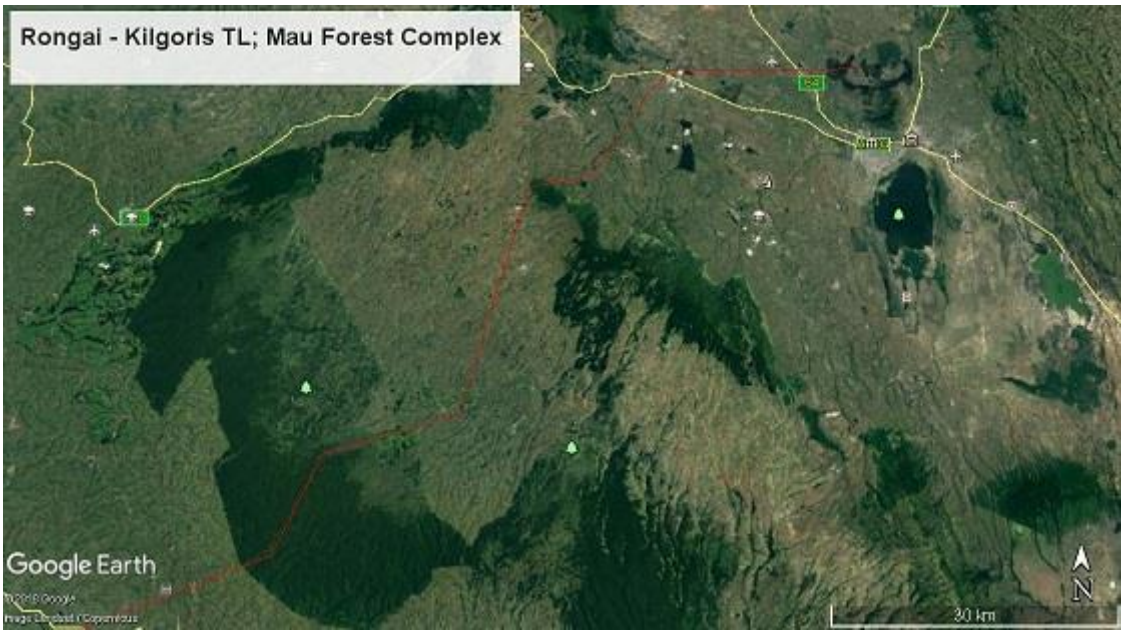
In proposing the above line route and substation location, consideration was given to social and environmental impacts of the project. The transmission line will generally follow open ground with minimum settlement and hence the need for relocation/resettlement will be minimal. The transmission line and substation sites have been located to avoid areas of dense settlement and where impacts on environment and local people e.g. from loss of farmland, grazing land, or environmentally sensitive areas are minimal. However, within the Mau Forest Complex, some adjustments need to be done.

10.4.1; Entirely Avoiding the Mau Forest Complex

The Mau Forest Complex is a very expansive forest, stretching all the way from Eburu Forest in Nakuru County, to Mau Narok and to Kericho County. Re-routing the transmission line to avoid this forest complex would either mean;

- passing east of the complex towards Njoro Sub-County, going parallel to the Njoro – Narok Road to Mau Narok, Narok, Bomet to Kilgoris or
- passing west of the complex, initially parallel to the Nakuru-Eldoret Road, then Mau Summit – Kericho Road to Kericho, Bomet and Kilgoris

This alternative would increase the length of the line by almost double and would require a new feasibility study. The alternative was therefore, not explored.



Overview of Mau Forest Complex

10.4.2; Avoiding the Bararget Forest

The line cuts across the Bararget Forest, which forms part of the lager Mau Forest Complex.

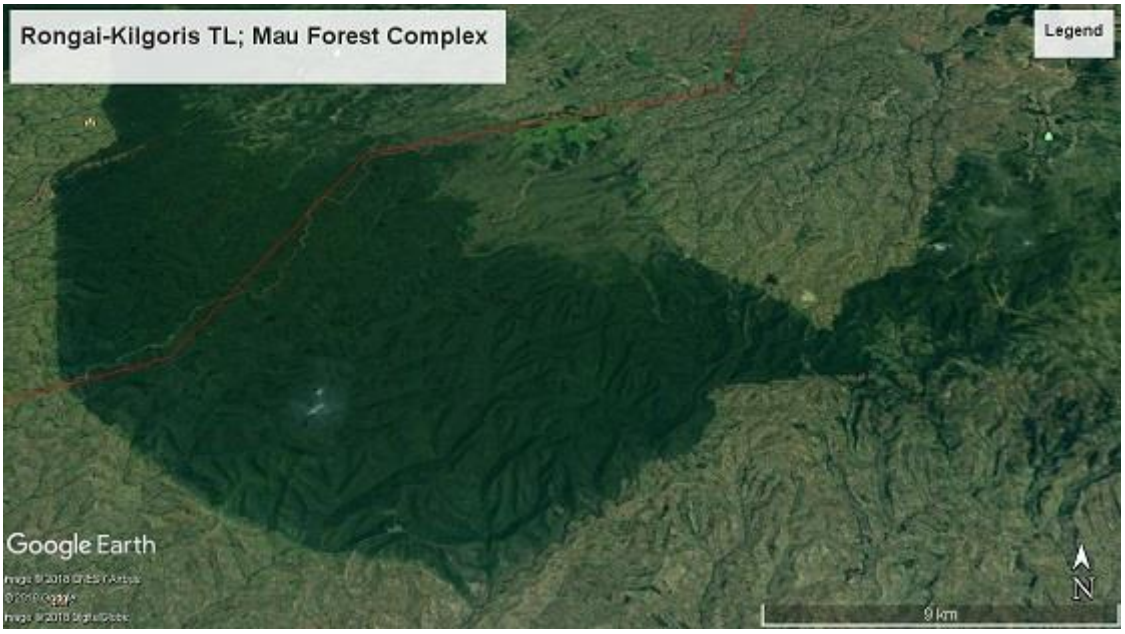
Bararget Forest section

The ESIA Team suggests the following re-routing to avoid the forest.

Suggested alternative route at Bararget Forest

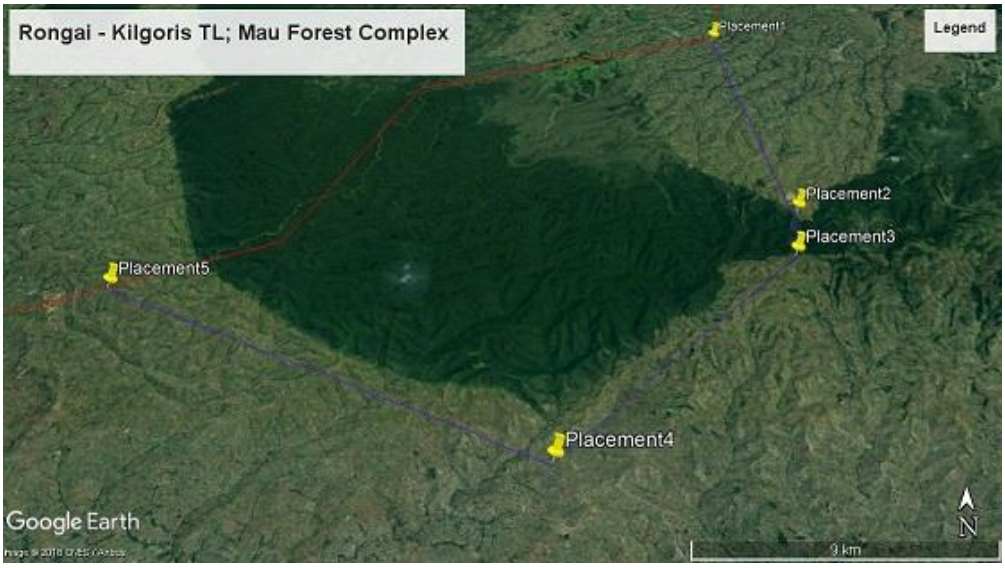
10.4.3; Crossing the Mau Forest Complex at its Narrowest Section

The proposed transmission line enters the Mau Forest complex at Kiptagich Tea Farm, follows the Olenguruone – Bomet Road and exits the forest at Masese Village in Bomet County covering a distance of about 23km.



Section where TL cross the Mau Forest

To avoid this long stretch inside the Mau Forest, the ESIA Team recommends that, rather than the TL make a right angle at Wamkong Village (00 34' 33.7"S and 350 37' 47.8"E), it should proceed on, in a straight line in a southerly direction to meet the Mau Forest Complex at a village called Sogoo. Here, the Mau Forest Complex is only about 4km wide and provides an opportunity for the line to pass the complex with the least amount of disturbance.



Suggested alternative route to reduce length of the TL within the Mau Forest from 23km to 4km

This option will increase the total length of the transmission line by about 12km (from 155km to 167km). Outside the 4km Mau Forest section the suggested route will be on farmlands mainly cultivated with tea, Maize, and various types of vegetables. Dairy farming is also common in these areas.

10.4.4; Reduce the Width of the Way-Leave Corridor within the Mau Forest Complex

This alternative would see the way-leave corridor reduced from the current 60m to 15m within the forest complex. This would result in a reduction in the amount of vegetation cover that would require to be removed which would in turn reduce the amount of disturbance of the Mau Forest. A combination of this alternative with alternative 10.4.3 would result in very optimal option.

10.4.5; Under-Ground Cabling within the Mau Forest Complex

This option would require the transmission line within the forest complex to be underground. This option would require more funding as underground power cables are more expensive than overhead lines.

A combination of this alternative with alternative 10.4.3 would result in a most optimal option.

10.4.6; Conclusion

The Mau Forest complex is a vast area of very sensitive and fragile ecosystem. It forms a critical water tower that give rise to various rivers, a key wildlife habitat and an important Bird Area. Any disturbance of this forest complex would be most unwelcome.

From the foregoing, the proponent should consider implementing alternative 10.4.2 to avoid the Bararget forest section.

Further to this, alternative 10.4.5 provides the most optimal option as it would require no cutting of trees and no avifauna mortalities in the forest complex. This option had support of most people consulted including lead agencies like KFS, KWS, and WRA. The proponent is requested to seriously consider this option.

10.4: ALTERNATIVE PROCESSES AND MATERIALS

Highly refined mineral insulating oils are used to cool transformers and provide electrical insulation between live components. Sulfur hexafluoride (SF_6) may also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines and transformers. Polychlorinated Biphenyls (PCB) can be used as a dielectric fluid to provide electrical insulation. SF_6 is a greenhouse gas with a significantly higher Global Warming Potential (GWP) than carbon-dioxide. PCB is a highly toxic substance that is no longer commonly used for electrical insulation. For this project the proponent is advised to use mineral insulating oil for cooling and insulation and to minimize or completely stop the use of SF_6 and PCB.

CHAPTER 11: RECOMMENDATIONS AND CONCLUSION

11.1: INTRODUCTION

An Environmental Management Plan (EMP) for the project has been developed to ensure sustainability of the site activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, and mitigation action plans. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the 400kV transmission line project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed transmission line project will bring positive effects in the project area including improved supply of electricity, cleaner environment, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, Informal sectors benefits, increase in revenue, improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that no immitigable negative impacts were encountered and that no community objection was received, the project may be allowed to proceed.

11.2: RECOMMENDATIONS

Following the impact analysis presented in the previous sections, the following recommendations were made

- The proposed project to be implemented in compliance with the relevant legislation and planning requirements
- The proponent to ensure implementation of the mitigation measures provided in the ESMP
- The proponent to conduct and implement a detailed and elaborate Resettlement Action Plan
- The proponent to monitor implementation of the ESMP using the developed ESMoP
- The proponent to conduct annual Environmental Audits and submit to NEMA
- NEMA to consider, approve and grant an Environmental Impact Assessment License to the proponent

11.3: CONCLUSION

From the foregoing, it is noted that;

- no immitigable negative impacts were encountered
- No objection from the community was received
- Identified potential negative impacts can be mitigated
- Benefits to the community, region, and the country at large are immense

The ESIA team, therefore, recommends to NEMA to consider, approve and grant an **Environmental Impact Assessment License** to the proponent and the proponent to implement the project with strict adherence to the proposed EMP

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