ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED ISIOLO – GARBA TULLA - GARISSA 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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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 projects. Among these projects is the 220kV Isiolo – Garbatulla – Garissa transmission line project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Isiolo, and Garissa Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages.

The rationale for the transmission line project is under-pinned by the following points

- Provide electricity for the Lamu Port, South Sudan, Ethiopia, Transport (LAPSSET) Project. The LAPSSET corridor passes through Isiolo County and the plan indicates that power has to be supplied by transmission lines under the scope of KETRACO. A line between Isiolo and Garissa is needed to supply this project. The planned LAPSSET corridor include railway, pipeline and highway will require power from KETRACO with Garissa and Isiolo substations being potential points of supply. The transport links will open up these parts of the country to increased economic growth which in turn will result in greater electricity demand.
- To electrify new areas and meet currently unserved demand. The two counties of Isiolo and Garissa that the line traverses are currently served by 132kV single circuit lines that terminate at the proximity of County headquarters
- It has been reported that major hotels and game reserves in Isiolo are served by a long 33kV feeders that is inefficient and customers are always complaining of poor quality of supply (low voltage). Most of these have resorted to the use of diesel generators to compensate for poor and unreliable power supply. Although expansion of the 33kV network would improve the situation on the very short term, as the resort cities take shape and other proposed industries are established, there is need to reinforce this network with a robust 220kV system
- Meet the Isiolo and Garissa County electricity requirements for their planned development programmes which include agriculture, irrigation, tourism and cement factories
- Strengthening of the networks at Garissa, providing a more robust point for onward transmission to Wajir and other north eastern areas

- Creation of the 220kV loop that includes Rabai- Malindi – Garsen – Garissa – Isiolo – Maua – Kiambere – Rabai will improve security of supply for these areas and especially for the Garissa substation which stands to become a hub for onward transmission to Wajir and other Parts of the North East of Kenya

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 Environmental Management and Co-ordination (Amendment) Act, 2015 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, local administration, opinion leaders and National and Local 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 planning, 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 location (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

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
DO	District Officer
DOHSS	Directorate of Occupational Health and Safety Services
DC	District Commissioner
EA	Environmental Audit
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMCA	Environmental Management and Coordination Act, 1999
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
IPP	Independent Power Producer
KenGen	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KPLC	Kenya Power and Lighting Company
Kshs.	Kenya Shillings
kV	Kilo Volt
KWH	Kilo Watt Hour
KWS	Kenya Wildlife Service
LCPDP	Least Cost Power Development Plan

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
WRMA	Water Resources Management Authority

CHAPTER 1: INTRODUCTION

1.1: 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); Energy Regulatory Commission (ERC); Kenya Electricity Generating Company (KenGen); Kenya Power and Lighting Company (KPLC); 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 Least Cost Power Development Plan (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 KPLC 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), 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; KPLC 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

Voltage (KV)	2014/2015
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 220kV Isiolo – Garbatulla – Garissa transmission line project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Isiolo, and Garissa Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages.

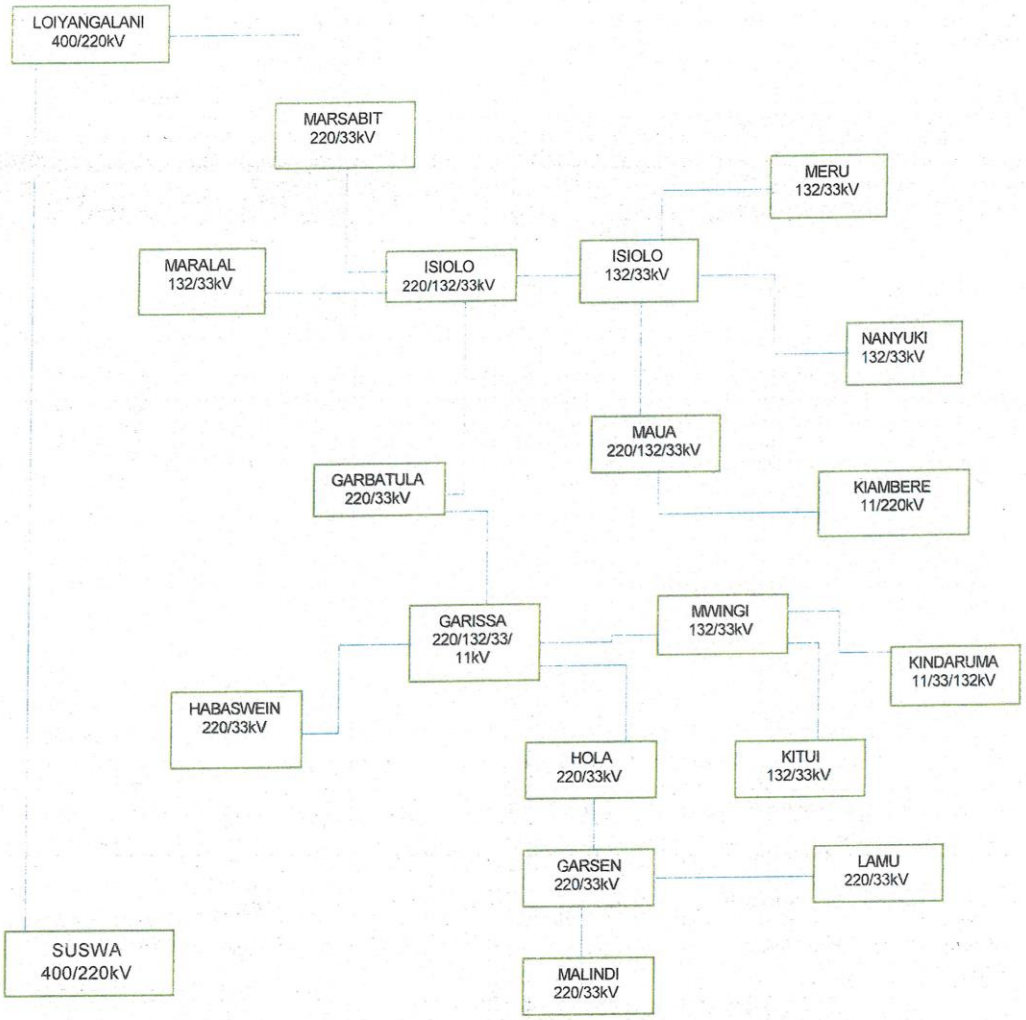
The rationale for the transmission line project is under-pinned by the following points

- Provide electricity for the Lamu Port, South Sudan, Ethiopia, Transport (LAPSSET) Project. The LAPSSET corridor passes through Isiolo County and the plan indicates that power has to be supplied by transmission lines under the scope of KETRACO. A line between Isiolo and Garissa is needed to supply this project. The planned LAPSSET corridor include railway, pipeline and highway will require power from KETRACO with Garissa and Isiolo substations being potential points of supply. The transport links will open up these parts of the country to increased economic growth which in turn will result in greater electricity demand.
- To electrify new areas and meet currently unserved demand. The two counties of Isiolo and Garissa that the line traverses are currently served by 132kV single circuit lines that terminate at the proximity of County headquarters
- It has been reported that major hotels and game reserves in Isiolo are served by a long 33kV feeders that is inefficient and customers are always complaining of poor quality of supply (low voltage). Most of these have resorted to the use of diesel generators to compensate for poor and unreliable power supply. Although expansion of the 33kV network would improve the situation on the very short term, as the resort cities take shape and other proposed industries are established, there is need to reinforce this network with a robust 220kV system

- Meet the Isiolo and Garissa County electricity requirements for their planned development programmes which include agriculture, irrigation, tourism and cement factories
- Strengthening of the networks at Garissa, providing a more robust point for onward transmission to Wajir and other north eastern areas
- Creation of the 220kV loop that includes Rabai- Malindi – Garsen – Garissa – Isiolo – Maua – Kiambere – Rabai will improve security of supply for these areas and especially for the Garissa substation which stands to become a hub for onward transmission to Wajir and other Parts of the North East of Kenya

KENYA ELECTRICITY TRANSMISSION COMPANY LIMITED
Transmission Lines Feasibility Studies – Garissa-Isiolo

Figure 6: Basic representation of network model



Basic Representation of network model

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 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 Impact Assessment Report compliant to the Environmental Management and Co-ordination (Amendment) Act, 2015 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
- Carry out an Indicative Resettlement Action Plan
- Propose mitigation measures against identified environmental and social impacts of the project
- Development of an Environmental and Social 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 TL route 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 Environmental Management and Co-ordination (Amendment) Act, 2015 and the Environmental Management and Coordination (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 Environmental Management and Co-ordination (Amendment) Act, 2015 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 Environmental Management and Co-ordination (Amendment) Act, 2015 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 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 EIA and the level of study. Transmission lines are listed under schedule 2 of EMCA, 2015 among projects requiring EIA 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 project set-up plans and architect's statement, land ownership documentation, environmental legislation and regulations, district development plans, location maps, etc.

Step 3: Site Assessment

Site assessment was conducted between 14th and 27th September 2017 to establish:

- Land ownership, usage and conflicts;
- Flora, fauna and avifauna found on the site;
- The site landscape

- Surface water bodies within the neighbourhood of the site and;
- The general environment and its sensitive receptors found within the environs of the site.

Step 4: Public Consultation

Detailed stakeholders' consultations for this study were undertaken from 14th to 27th September 2017. 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 220kV transmission line from Isiolo substation through Garbatulla, to Garissa with substations at Isiolo, Garbatulla, and Garissa.

Detailed scope of work for the project is as follows:

1. **Transmission Line**
   a) Isiolo – Garbatulla – Garissa Overhead Power Line (285km)

2. **Substation**
   a) Bay Extension at 220/132kV Isiolo Substation
   b) Bay Extension at 220/132kV Garissa Substation
   c) 2 x23 MVA 220/33kV Substation at Garbatulla

2.2: TRANSMISSION LINE DESIGN

2.2.1; Line Configuration

The 220 kV transmission line shall have vertical configuration of conductors.

2.2.2; Towers

The towers shall be self-supporting latticed bolted steel towers fabricated from structural steel. Tower components and bolts & nuts shall be hot dip galvanized.

The following configuration of towers shall be used in the line:

a) 'S' type suspension towers for up to 2-degree angle of deviation.
b) 'LA' type light angle tension towers for up to 15-degree angle of deviation.
c) 'MA' type light angle tension towers for up to 30-degree angle of deviation.
d) 'HA' type light angle tension towers for up to 60-degree angle of deviation and suitable for dead end condition. These shall also be used for terminal locations.

The standard extensions/truncations normally used for various types of towers are as follows:

a) S : -3m, 0m, 3m, 6m,18m

b) LA & MA : : -3m, 0m, 3m, 6m

c) HA : -3m, 0m, 3m, 6m, 18m

Besides the standard body extensions, the following leg extensions shall also be designed to be used at hill slope locations:

All towers : -2m, -1m, 0m, 1m, 2m, 3m

In addition to the above, special towers, for major river crossing, power line crossing and the places where the terrain is particularly different, such as approach to the sub-station, forest stretches etc. shall also be used. All towers shall be designed in accordance with latest edition of International Standards.

Structural steel sections used in towers shall be of Mild Steel (MS) and High Tensile (HT) steel of requisite quality as per ASTM A36M and A572M(Grade 345) respectively or equivalent International Standards.

All structural steel shall be hot dip galvanized in accordance with the requirements of ASTM A123M. The minimum coating thickness shall not be less than 86 microns, equivalent to 610 g/sq.m.

The basic spans, wind spans and weight spans for various towers are as follows:

Basic Span = 300 m

Table 2.1; Basic Spans, Wind Span and Weight Span

Sl. No.	Application	Designation	Angle (degree)	Wind Span (m)	Weight Span (m)	
					Max.	Min.
1	Suspension	S	0 -2	300	450	100
2	Tension	LA	0 - 15	300	450	200
3	Tension	MA	15 -30	300	450	200
4	Tension	HA	30 -60	300	600	500

Source; Feasibility Study for Kenya Power Transmission Improvement Project (Assignment 4)

Tower Type LA, MA & HA can be used for longer wind spans with reduced angle of deviation in the valleys wherever ground clearance permits so.

All international codes for design of Steel Transmission Line Tower have switched over to probabilistic method of design from deterministic method. In this regard, following standards shall be adopted:

a) ASCE-52:1988 - "Guide for Design of Steel Transmission Line Towers" issued by American Society of Civil Engineers.
b) IEC – 826:1991 - “Technical Report on Loading and Strength of Overhead Transmission Line Towers" issued by the International Electro Technical Commission.

All structures shall be designed to withstand loadings due to maximum wind,
maximum ice prevalent in the line route.

2.2.3; Conductors

Conventional ACSR type conductor is proposed based on system requirements as this is the most common type of conductors with proven technology having low cost & easy availability.

Single ACSR Lynx conductor (30/2.79 mm Aluminum and 7/2.79 mm steel) of overall diameter 19.53 mm shall be used.

The maximum allowable every day tension shall not exceed 20% of the ultimate tensile strength of the conductor.

2.2.4; Earth Wire

Optical Ground Wire (OPGW) shall be used on the line. The mechanical & electrical characteristics of OPGW shall be similar to the conventional aluminium clad steel wire of 7/3.15mm. The OPGW shall contain 48 nos. of fibres (DWSM) conforming to ITU-T G.652D.

OPGW shall withstand two successive lightning stroke of 150 kA. Shielding angles of 30 deg is considered for transmission line.

The maximum allowable every day tension shall not exceed 15% of the ultimate tensile strength of the OPGW.

2.2.5; Insulator and Hardware Fittings

The Insulator strings shall consist of Standard discs made of either electro-porcelain or toughened glass for a three phase, 132 kV transmission line in a medium polluted atmosphere (20 mm/kV phase-to-phase) The discs shall be cap and pin, ball and socket type.

As an alternative, insulator strings with composite long rod insulators shall be used. Suitable hardware fittings shall be used for attachment of the insulators with the tower at one end and also for supporting the conductors at the other end. Corona control rings or grading rings will be used for improving corona and RIV performance as well as to improve the voltage distribution across the insulators discs.

2.2.6; Line Accessories

Mid span compression joints for conductor/ earth wire

Compression joints suitable for conductor /earth wire shall be used for joining two lengths of conductor / earth wire. The minimum slipping strength of the joint after compression shall not be less than 95% of the UTS of conductor / earth wire.

Repair sleeve for conductor

Repair sleeve shall be used only for repairing not more than two strands broken in the outer layer of aluminium. It shall be of compression type in two parts with provision of seat of sliding of keeper piece.

Vibration dampers for conductor/ earth wire

Stockbridge vibration dampers shall be used to reduce the maximum dynamic strain caused by aeolian vibrations to a value of 150 micro-strain.

Flexible copper bond for earth wire

Flexible copper bonds shall be used for good electrical continuity between the earth wire and the tower. Two bonds per suspension tower and four bonds per tension tower shall be used.

Suspension/Tension clamps for earthwire

Suitable suspension / tension clamps shall be used for attachment of earthwire at suspension/tension towers.

2.2.7; Tower foundations

Reinforced Cement concrete footings are proposed to be used for all types of towers in conformity with the practice followed in Kenya. All the footing of the tower are proposed to be of spread type footing with maximum depth of 3.0 meters below ground level and all the four footings of the tower shall be similar irrespective of down thrust and uplift.

The locations where chiseling, drilling and blasting is required for excavation, hard rock type foundations are to be used. For these locations rock anchoring is to be provided to resist the uplift.

2.2.8; Grounding

The tower footing resistance shall be kept below 10 ohms. Normally pipe type grounding shall be used. In case of rocky ground where the ground resistance is high, counterpoise earthing shall be used to bring the tower footing resistance down to acceptable level.

2.2.9; River Crossings

Special towers shall be used for major river crossings where the span is more than 600 mtrs with anchor towers on either end of river crossing span.

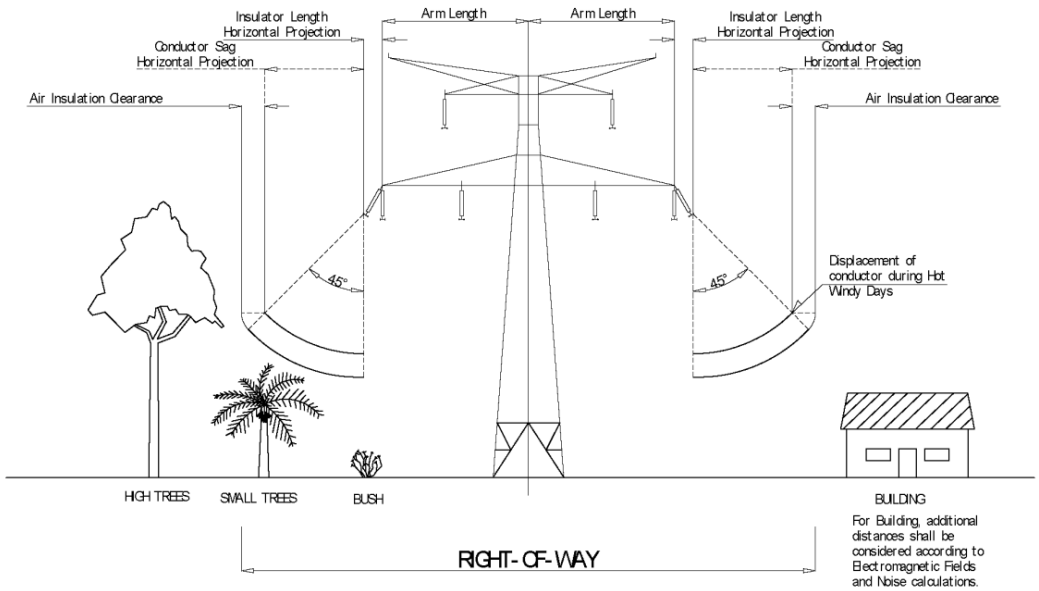
2.2.10; Power line, Railway line, Road and Telecommunication line crossings

The transmission lines shall be crossing power lines, roads and Post & Telecommunication lines for which suitable extensions of towers shall be used. The standard extension normally used for various types of towers are as follows:

a) A & C : 3m, 6m, 9m

b) B & D : 3m, 6m,9m, 18m & 25m

2.2.11; 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 is 40m

2.2.12; Air Space Protection

Where it is likely that the power line is hazardous to aviation and avifauna 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/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.

2.3: SUBSTATION DESIGN

The basic design concepts for the Substations are described in the following paragraphs. It shall be noted that these parameters shall act as basic design parameters for the Substations and for bidding purposes, detailed specifications are to be framed.

The substations are assumed to be designed with the aim of keeping the costs at minimum and accordingly only equipment considered to be strictly necessary have been included. However, due considerations have been taken with respect to:

a) Easy and risk-free operation
b) Enable easy maintenance and repair
c) Enabling future modifications and expansions
d) The importance of the respective substations

The switchgear in the substations would be conventional outdoor air-insulated switchgear for 220kV, 132 kV and 33kV. Equipment for control, protection and auxiliary power will be housed in a small control room building.

2.3.1; 220kV System Substation concept

The 220kV system is considered with one and a half breaker switching scheme for better reliability, availability and enable easy maintenance.

Each line/transformer/bus reactor shall be terminated in respective independent bay having switchgear equipment, protection and control system. The scheme has two main buses. Each diameter comprising of three bays (i.e. 2 nos main bays & 1 no tie bay) shall be terminated to both the buses. All Isolators and earth switches devices are assumed motor-operated.

The following switchgear has been considered:

The main bay for transformer/line/Bus Reactor shall include

a) Circuit-breaker with single pole & three pole operation - 1 pc
b) Isolator with one earth E/S (one on each side of the circuit breaker) - 2 pcs
c) Isolator with one earth switch for line/transformer/reactor - 1 pc
d) Current transformer (one per phase) - 3 pcs
e) Capacitive Voltage transformers (one per phase) - 3 pcs (only for line and main bus)
f) Surge Arrestors (one per phase) - 3pcs

The tie bay shall include

a) Circuit-breaker with single pole & three pole operation - 1 pc
b) Isolator with one earth E/S (one on each side of the circuit breaker) - 2 pcs
c) Current transformers (one per phase) - 3 pcs

Each main bus shall include

a) Bus Capacitive Voltage transformers (one per phase) - 3 pcs
b) Earth Switch - 1 pc

The advantage of one and a half breaker switching scheme is that the availability (line or transformer) will not be generally affected each time the bay equipment for the particular feeder needs to be maintained. However the advantage of better reliability, availability and ease of maintenance is at a small incremental cost.

All equipment shall comply to IEC/equivalent international standards. The switchyard layout is considered with adequate space for road and accessibility for easy maintenance of bay equipment.

2.3.2; Design Requirement

The following table shows the minimum design requirements from point of view of the electrical system and other general data.

Table2.2: Substations Design requirements

Data	220kV
Operating Voltage	220 kV

Max. Continuous System Voltage	245 kV
System frequency	50 Hz
Maximum Design Load	1600 A
Rated Circuit Current	40 kA,1Sec
Power Frequency Withstand Voltage (rms) at System Frequency for 1 min.	460 kV
Rated BIL (Crest)	1050 kVp
System Earthing	Solid

Source; Feasibility Study for Kenya Power Transmission Improvement Project (Assignment 4)

2.3.3; Power Transformers

Outdoor transformers are assumed. Power transformers shall conform to IEC: 60076 in general. These transformers shall generally have OLTC cooling arrangement type ONAN/ONAF .The air core reactance shall be of the order of 20%. Tertiary windings shall be provided for large auto transformers, which shall be capable of being loaded.

The transformers shall be provided with Nitrogen Injection based Fire Prevention & Extinguishing System for all new Sub-stations. All the 220/33kV & 132/33kV transformers would be two-winding type and 220/132kV transformers shall be auto transformer with on-load tap-changers. The neutral earthing of the transformers/reactors shall be solidly grounded.

Space should be foreseen in the layout so that the transformers can be replaced with bigger transformers in future. Also there will be space for accommodating minimum one no. of transformers in future.

2.3.4; Shunt Reactors

Shunt Reactors, wherever provided, shall comply to IEC:289/IS:5553 in general 245kV & 145kV Shunt reactors shall have linear characteristics up to 1.4 p.u. voltage. These should be ONAN Cooled. The neutral of bus reactors shall be solidly grounded.

2.3.5; Circuit Breakers

Circuit breakers shall in general comply to IEC 62271-100 & IEC-60694 and shall be of SF_6 type for 245/145kV and Vacuum type for 36kV. The rated break time shall not exceed 65 ms for 245kV & 145kV circuit breakers. 220kV & 132kV Circuit Breaker shall be suitable for single phase and three phase auto reclosing. However, 132kV CB for Transformer/reactor bays and all the 33kV Circuit breakers shall be suitable for three phase auto reclosing.

2.3.6; Isolators

The isolators shall comply with IEC 62271-102 in general. Isolators shall be generally horizontal double break type keeping in view the bus switching schemes proposed. Isolators shall be motor operated. Earth switches are provided at various locations to facilitate maintenance. Main blades and earth blades shall be interlocked and interlock shall be fail safe type. All earth switches shall be motor operated type.

2.3.7; Current Transformers

Current Transformers shall comply with IEC 60044-1 in general. All ratios shall be obtained by secondary taps. Current transformers shall have five secondary cores for 220KV & 132kV. The metering core shall be of 0.2S accuracy class. For 33kV CT maximum 3 Nos. secondary cores with metering core of 0.2 accuracy class shall be considered. The burden and knee point voltage shall be in accordance with the requirements of the system including possible feeds for telemetry.

2.2.8; Capacitor Voltage Transformers

Voltage transformers shall comply with IEC 60044-5 in general. These shall have three secondaries out of which two shall be used for protection and one for metering. Accuracy class for protection core shall be 3 P and for metering core shall be 0.2. The Capacitance of CVT shall be 4400pF depending on requirements.

2.3.9; Surge Arresters

Station class current limiting, heavy duty gapless type Surge arresters conforming to IEC 60099-4 in general shall be provided. The rated voltage of Surge arrester and other characteristics are chosen in accordance with system requirements. Surge arresters shall be provided near line entrances and transformers/reactors so as to achieve proper insulation coordination. These shall be fitted with pressure relief devices and diverting ports suitable for preventing shattering of porcelain housing providing path for the flow of rated currents in the event of arrestors failure.

The switchgear shall be designed and specified to withstand operating conditions and duty requirements.

2.3.10: Auxiliary power

For new substations, duplicated station service supply should be foreseen, so that there will be no interruption of service even if one supply should suffer a failure. (Cost of duplicated supply is moderate compared to the overall cost of the substation.)

Operation of circuit-breakers and systems for protection and control will be fed from a DC-system with battery back-up. Voltage will be 110V-DC to cope with the physical distances in the sub-stations. The system will be isolated from earth to reduce risk of mal-operation because of earth-faults. The DC system will be duplicated, including two rectifiers and two batteries. This is to enable maintenance, repair and replacements without interrupting the supply.

One No. of DG set of suitable capacity should be considered for each new sub-station.

2.3.11: Control and protection

The control and monitoring of the sub-station shall be using Sub-station Automation System based on IEC 61850 communication protocol. The sub-station shall have provision for operation from local and remote i.e. Remote control centre/National Load Dispatch using Fiber optic based SDH communication equipment.

Protective functions will be split between the two DC systems to ensure the best independency between protection functions that are back-up for each other.

Circuit breakers will have duplicated trip coils. Trip coil circuits will include circuit supervision. Protective relays will be programmable and will include test facilities.

The protection scheme shall include:

220kV lines:

- Line differential protection (Main-I)
- Distance protection (Main-II)
- Directional earth fault protection
- Autoreclosing with synchro-check
- Breaker failure protection
- Synchro-check blocking of circuit-breaker closing

Transformer 220kV bays:

- Differential protection
- Directional overcurrent protection
- Directional earth fault protection
- Restricted earth fault protections
- Overload protection

- Overflux protection
- Breaker failure protection
- Bucholz relay for transformer tank
- Bucholz relay for on-load tap changer
- Temperature protection (oil and winding)
- Oil level protection
- Pressure relief device

Transformer 33kV bay:

- Restricted earth-fault protection
- Non-directional earth-fault protection
- Non-directional earth-fault protection

220kV/132kV bus:

- Busbar protection

33kV lines:

- Non directional over-current protection
- Non-directional earth-fault protection
- Auto-reclosing function
- Synch-check blocking of circuit breaker closing
- Under frequency protection with load shedding of 33kV lines

For tele-protection, data & speech application, optical fibre based telecommunication (SDH) equipment has been considered. For 132kV & 220kV transmission line protection scheme i.e. Line Differential Relays & Distance Relays above communication link has been considered. The new substation shall be integrated into the existing Load Dispatch Centre.

2.4. TRANSMISSION LINE ROUTE

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

Table 2.3; Isiolo – Garbatulla - Garissa –Transmission Line Coordinates

1	Isiolo SS			0:00:00	37 N 343533 51005
2	AP2	11.1km	11.1km	0:00:00 128° true	37 N 352300 44181
3	AP3	55.1km	43.9km	0:00:00 63° true	37 N 391331 64302
4	AP4	85.2km	30.1km	0:00:00 90° true	37 N 421442 64181
5	AP5 Garbatulla SS	110km	24.6km	0:00:00 92° true	37 N 446016 63513
6	AP6	132km	22.3km	0:00:00 124° true	37 N 464582 51204
7	AP7	150km	18.2km	0:00:00 165° true	37 N 469350 33731
8	AP8	169km	18.4km	0:00:00 105° true	37 N 487070 28972
9	AP9	204km	35.3km	0:00:00 118° true	37 N 518267 12403
10	AP10	233km	28.6km	0:00:00 111° true	37 N 545040 2286
11	Garissa SS	283km	50.2km	0:00:00 151° true	37 M 569474 9958444

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$ one hundred and eighteen million eight hundred thousand (118,800,000).

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:

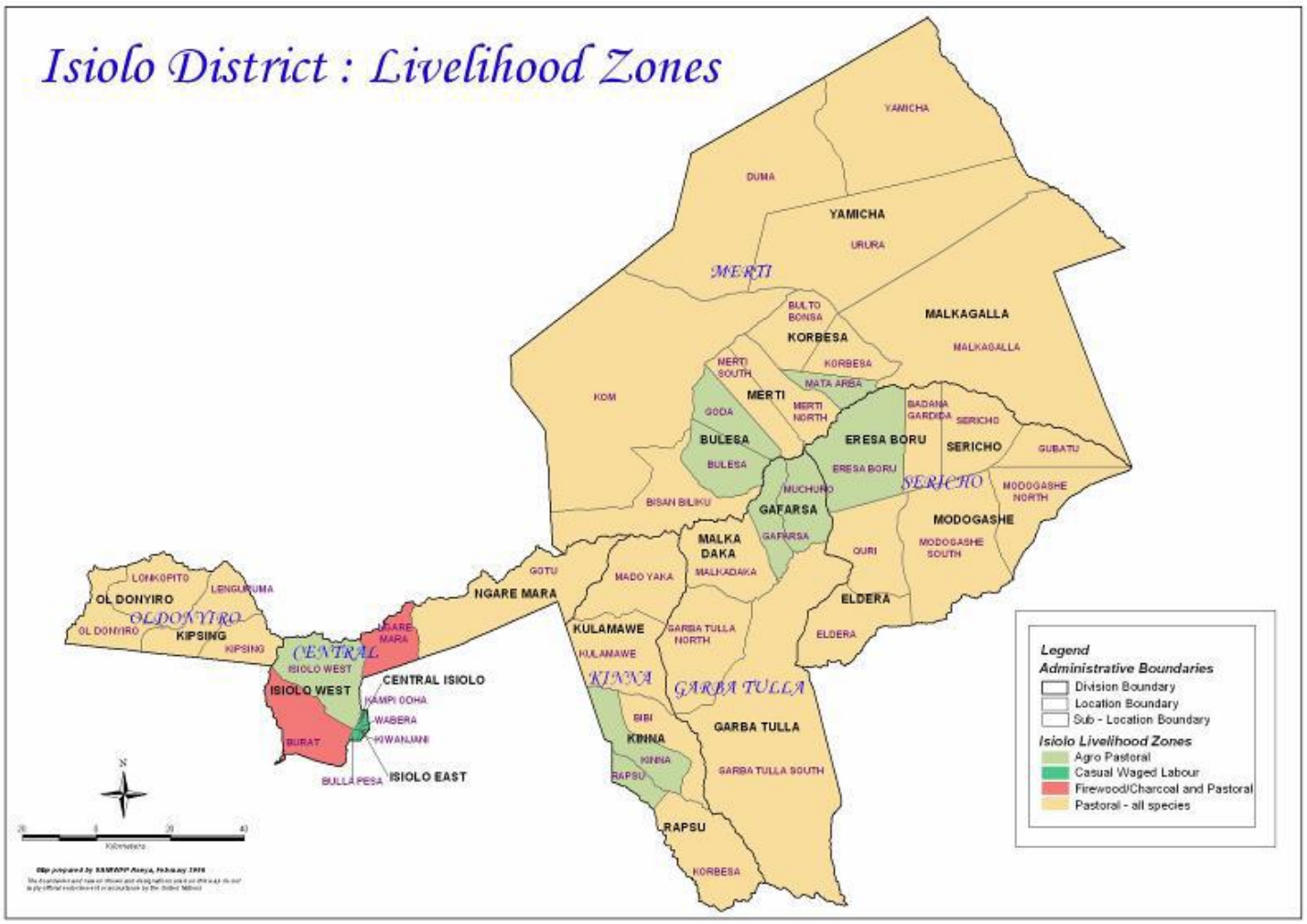
- Funding agencies and donors;
- Relevant government ministries and agencies for policy implementation;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the project;
- Contractors to be engaged in the project;
- People to be involved in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

CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA

3.1; BACKGROUND

Isiolo

Isiolo County is one of the counties in the lower eastern region of Kenya. It borders Marsabit County to the North, Samburu and Laikipia Counties to the West, Garissa County to the South East, Wajir County to the North East, Tana River and Kitui Counties to the south and Meru and Tharaka Nithi Counties to the south West. The county covers an area of approximately 25,700 km^2.



Source; Isiolo County Integrated Development Plan 2013-2017

Garissa

Garissa County is one of the three counties in the North Eastern region of Kenya. It covers an area of 44,174.1Km2 and lies between latitude 10 58'N and 20 1'S and longitude 380 34'E and 410 32'E. The county

borders the Republic of Somalia to the east, Lamu County to the south, Tana River County to the west, Isiolo County to the North West and Wajir County to the north.

3.2; PHYSIOGRAPHIC AND NATURAL CONDITIONS

3.2.1; Physical and Topographic Features

Isiolo

Most of the land in the county is flat low lying plain resulting from weathering and sedimentation. The plains rise gradually from an altitude of about 200 M above sea level at Lorian swamp (Habaswein) in the northern part of the county to about 300M above sea level at Merti Plateau.

There are six perennial rivers in the county namely; Ewaso Ngiro North, Isiolo, Kinna, Bisanadi, Likiundu and Liliaba rivers. Ewaso Ngiro North River has its catchments area in the Aberdare ranges and Mount Kenya. It also serves as a boundary mark between Isiolo North and Isiolo South constituencies. Isiolo River originates from Mount Kenya and drains into Ewaso Ngiro River. Kinna and Bisanadi rivers are found in the Southern part of the county and drains into the Tana River. Likiundu and Liliaba originate from Nyambene hills and drains into Ewaso Ngiro North River.

The county has a combination of metamorphic rocks and other superficial rock deposits. Tertiary rocks (Olive Basalt) are found in the northern parts of the county, where oil exploration has been going on. The areas covered with tertiary marine sediments that have a high potential for ground water harvesting.

Garissa

Garissa County is basically flat and low lying without hills, valleys and mountains. It rises from a low altitude of 20m to 400m above sea level. The major physical features are seasonal Laghas and the Tana River Basin on the western side. The River Tana has tremendous effect on the climate, settlement patterns and economic activities within the county. Given the arid nature of the county, there is great potential for expansion of agriculture through harnessing of River Tana and Laghas.

The soils range from the sandstones, dark clays to alluvial soils along the Laghas, River Tana Basin and the Lorian swamp. White and red soils are found in Balambala Constituency where the terrain is relatively uneven and well drained. The soils have low water retention capacity but support vegetation. These soils have potential for farming.

The rest of the county has sandy soils that support scattered shrubs and grasslands which are ideal for livestock production. The county's land is highly erodible. The exploitation of the soil resource thus must take

into account conservation measures due to their fragile nature. The mineral potential of the soils is not exactly known as no geological mapping has been done. Reconnaissance surveys have however, indicated some occurrences of clay, good quality building sand along Laghas, lime and gypsum in places such as Benane in Lagdera Constituency and in Dadaab Constituency.

3.2.2; Ecological Conditions

Isiolo

The county is classified into three ecological zones namely Semi-Arid, Arid and the very Arid. Semi Arid zone covers part of Wabera Ward, Bulla Pesa Ward and some parts of Burat Ward in Isiolo North Constituency. It also covers some Southern part of Kinna Ward in Isiolo South Constituency. This zone covers five percent of the total area of the county and receives rainfall ranging between 400 – 650 mm annually. The relatively high rainfall is due to influence of Mount Kenya and Nyambene Hills in the neighbouring Meru County. The vegetation in this zone is mainly thorny bush with short grass. Arid zone covers Oldo/Nyiro, Ngare Mara and some parts of Burat Wards in Isiolo North Constituency and whole of Garbatulla Ward and northern part of Kinna Ward in Isiolo South Constituency. The zone covers 30 percent of the total area of the county. Rainfall received here ranges between 300 mm and 350 mm annually and supports grassland and few shrubs.

Severe arid zone covers Chari, Cherab, parts of Oldo/Nyiro Ward in Isiolo North Constituency and Sericho Ward in Isiolo South Constituency. These areas account for 65 percent of total area of the county. Rainfall received here ranges between 150 and 250 mm annually. The area is barren and very hot and dry most of the year.

Garissa

Garissa County is principally a semi-arid area falling within ecological zone V-VI and receives an average rainfall of 275 mm per year. There are two rain seasons, the short rains from October to December and the long rains from March to May. Rainfall is normally in short torrential downpour making it unreliable for vegetation growth. The southern parts of the County such as Hulugho, Masalani and Bura receive more rainfall than the northern parts. Balambala and Fafi Constituencies practice rain-fed agriculture on small scale. During the dry season, there is a general migration of livestock from the hinterland to areas near River Tana where water is readily available. However, some pastoralists move with their livestock to adjacent counties of Tana River and Lamu in search of pasture. Much of the County's livestock population are indigenous sheep, goats and cattle, found in the southern parts which receive more rain while camels occupy the drier north.

3.2.3; Climatic Conditions

Isiolo

The county is hot and dry in most months in the year with two rainy seasons. The short rains season occurs in October and November while the long rain occurs between March and May. The rainfall received in the County is usually scarce and unreliable posting an annual average of 580.2 mm. The wettest months are November with an average of 143 mm of rainfall and April with an average of 149 mm of rainfall.

The erratic and unreliable rainfall cannot support crop farming which partly explains the high food insecurity and food poverty levels recorded in the county. Rain fed crops are grown in Bulla Pesa, Wabera and Kinna wards where the black cotton soil retains moisture long enough to make crops mature.

High temperatures are recorded in the county throughout the year, with variations in some places due to differences in altitude. The mean annual temperature in the county is 29 degrees centigrade. The county records more than nine hours of sunshine per day and hence has a huge potential for harvesting and utilization of solar energy. Strong winds blow across the county throughout the year peaking in the months of July and August. The strong winds provide a huge potential for wind generated energy.

Garissa

Given the arid nature of the county, temperatures are generally high throughout the year and range from 20^0C to 38^0C. The average temperature is however 36^0C. The hottest months are September and January to March, while the months of April to August are relatively cooler. The humidity averages 60g/m^3 in the morning and 55 g/m^3 in the afternoon. An average of 9.5 hours of sunshine is received per day. Strong winds are also experienced between April and August with the rest of the months getting calm winds.

3.2.4; Forestry

Isiolo County

Currently two forests are earmarked for gazettement in the county, namely Gotu and Kipsing forests. The types of trees found are those suitable for dry areas. These are mainly Acacia Prosopis and Cassiasis species.

Garissa County

There are two non-gazetted indigenous forests in the county, namely Boni and Woodlands. Most of the forests in the county are woody trees and shrubs which are mainly browsed by camels and goats and to some extent by grazers. Some species provide forage long into the dry season in form of fallen leaves and seed pods. There are 40 Community Forest Associations (CFA) in the county.

3.2.5; Wildlife

Isiolo County

The main wildlife species found in the county includes: Black rhino (*Diceros bicornis*), African Wild dog (*Lycaon pictus*), Giraffe, Elephant, Ostrich, Monkeys, Antelopes, Impala, Leopard, Waterbuck, Lesser kudu, Greater kudu, Hippo, Grevy zebra, Buffalo, Lion and over 300 species of birds. There is an urgent need to protect the county's wildlife from poachers and illegal traders, especially killing of elephants for ivory.

Garissa County

The main wildlife types found in the county are: Elephants, Lions, Cheetahs, Leopards, Hippopotamus, Crocodiles, Hunters, Hart Beasts, Grants Gazelles, Thompson Gazelle, Gerenuk, Civil Jackals, Spotted Hyena, Buffalos, Grey Zebras, Topi, Giraffes, Dik-dik and Baboons. The wildlife are not confined to parks, they move freely.

3.2.6; Water Resources

Isiolo County

Three big perennial rivers namely Ewaso Ngiro, Isiolo, and Bisanadi flow through the county. Rivers Ewaso Ngiro has its catchment area from the Aberdare and drains into the Lorian Swamp. The Isiolo River originates from Mt. Kenya and drains into Ewaso Ngiro River. Bisanadi river drains into River Tana. Most irrigation schemes are found along these rivers. Where the site conditions are suitable, floodwater harvesting facilities for communities in the county can be be constructed and by excavating shallow pans or ponds.

Most of the springs are situated within game reserves, and as such, are not accessible to local people. Data shows a total of 24 springs scattered along major rivers in Isiolo. However, due to degradation, 12 of these springs with negligible flows seem to have disappeared in recent years.

Over 58 percent of the domestic water is sourced from boreholes and 17 percent from shallow wells. Fifty nine percent of the total number of water sources are operational during the wet season, with only 36 percent operational in the dry season. Merti, Garbatulla and Sericho areas are poorly served with water sources, particularly during the dry season.

In general, water supply in the county can be divided into four majors sources: direct use of natural water sources such as rivers, streams and springs; developed surface water, such as earth dams, sand/subsurface dams, tanks and pans; developed groundwater such as wells, shallow wells and boreholes; and emergency water supply by the government using tankers. Up to 58 percent of the water sources have saline water hence limiting the availability of potable water, especially for human consumption.

Garissa County

Garissa county has one permanent river (River Tana), 25 shallow wells, 65 boreholes, 177 water pans and one dam. The Garissa Water and Sewerage Company (GAWASCO) supplies treated water to the residents. Water from other sources is generally unsafe and as such it is treated at the household level by use of aqua tabs, water guard and other chlorine based purifiers supplied by the relevant government departments. Other areas of the county rely on shallow wells, boreholes and water pans. The county is generally water scarce with acute water shortages experienced during the dry season. Various interventions have been undertaken to mitigate against these water shortages. These include water tinkering and the activation of the rapid response team charged with the responsibility of repairing boreholes during drought.

3.2.7; Energy Access

Isiolo County

The county's main source of energy is wood fuel. Over 70 percent of the households rely on fire wood as their main source of power. This has led to over-harvesting of trees primarily for charcoal causing extensive land degradation in the county. Of the 31,326 households in the county, only 2,500 have access to electricity. 85 percent of the trading centres, most schools and health facilities are not connected with electricity. Provision of clean sources of alternative energy will be critical in slowing down the cutting of trees. It will further save the time spent especially by women and girls in fetching wood fuel for domestic purposes.

Garissa County

About 78.8 per cent of the county's population use firewood as a source of energy for cooking purposes while 18.2 per cent of the population use charcoal. Electricity is only available in Garissa, Ijara, Dadaab, Bura East and Modogashe, and their environs with only 0.7 per cent of the population having access to electricity. In Dadaab, plans are under way to install two generators to supply power. In addition the Ministry of Energy has installed solar systems in health facilities, schools and watering points. Other sources of energy such as biogas and solar are used on a limited scale.

3.2.8; Land Use

Isiolo County

Much of the land (80%) is communally owned and is under the trusteeship of the county government. Government land constitutes 10 % of total land and includes land for schools, administration, army barracks, and health facilities. The remaining 10% of the land is under private ownership and was alienated for private investment in housing, industrial and commercial purposes. Over 80 percent of the land cannot support crop

farming and is used as grazing land by the pastoralists. In some wards areas such Kinna, agro-pastoralism is practised with the inhabitants engaging in both livestock and crop farming.

Mean Holding Size

The livestock land carrying capacity is 25, which imply that only 25 tropical livestock units (TLU) can sustainably be kept under one hectare of land.

Percentage of Land with Title Deeds

The percentage of land with title deeds is less than 1% . Title deed holders are unwilling to sell their land to potential investors. Lack of title deeds to the locals poses great challenge as they cannot use their land as collateral in acquiring loans for development and are unable to earn compensation when land is purchased for investment in national development programmes like the LAPSSET project. Lack of title deeds further discourages willing and potential investors from investing in the county. There is therefore an agent need to fast track county land titling to public, private and communal ownership.

Incidence of Landlessness

The land is communally owned. The landless are mainly found in the towns where the poor from outside the county have not been able to purchase or be allocated plots.

Garissa County

Mean Holding Size

The mean holding size is not known since the land is communally owned. Less than one per cent of the population have title deeds. In terms of land use, the county's population is predominantly pastoralists. This implies that the main land use is nomadic pastoralism. There are farming activities along River Tana with an average farm size of 1.3 hectares. The farms are owned by individual groups. The land has however not been planned and is characterized by demarcating different sections for different activities.

Percentage of Land with Title Deed

Only one per cent of the population own title deeds as majority of the population live on communal land. This has therefore seen increased cases of land related inter-clan conflicts in the recent past consequently leading to loss of human lives.

Incidence of Landlessness

Land in the county is communally owned. It is held in trust for the community by Garissa County Government. Majority of the local communities in the county live in informal settlements.

3.2.8; Population

Isiolo County

Population Size and Composition

The county's population stood at 143,294 as per the 2009 Population Census comprising of 73,694 males and 69,600 females. The population was projected to rise to 159,797 by the end of 2012 and 191,627 by 2017. The population consists largely of Cushites communities (Oromo-speaking Boran and Sakuye) and Turkana, Samburu, Meru, Somali and other immigrant communities from other parts of the country. The planned massive capital investments under development of the LAPSSET Corridor including International Airport, Resort City, and oil storage facilities are expected to boost rapid population growth in the county.

Population density and distribution

Isiolo North Constituency has a total population of 100,176 as per 2009 census report distributed as follows: Wabera ward with a population of 17,431; Bulla Pesa ward 22,722; Burat ward 18,774; Chari ward 4,781; Cherab ward 15,560; Ngare Mara ward 5,520; and Oldo/Nyiro ward 15,388. The 2009 census results also showed that Isiolo North Constituency had a population density of 6 persons per square Kilometre.

Isiolo South Constituency had a total population of 43,118 distributed as follows: Garbatulla ward with a population of 16,401; Kinna ward 14,618; and Sericho ward 12,099. The Constituency had a population density of four persons per Km^2. There is dire need to have strategic plans and spatial plans for the two constituencies.

Garissa County

Population size and composition

The county has a total population of 699,534 consisting of 375,985 males and 323,549 females as at 2012. The population is projected to increase to 785,976 and to 849,457 persons in 2015 and 2017 respectively.

Population Density and Distribution

Garissa Township has the highest population at 131,405 with a density of 194 persons per km^2. This is attributed to the fact that it is the entry point and the administrative centre for the North Eastern region in addition to having relatively well developed infrastructural facilities. Fafi has the lowest population density of seven persons per km^2.

The county is sparsely populated with majority of the population being concentrated in areas with infrastructural facilities such as Garissa Township.

3.3: PROJECT SITE DESCRIPTION

3.3.1; Transmission Line Route Description

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

The proposed 220 kV overhead transmission line will take off from the Isiolo Substation site located at Maili Saba Viilage, Kithima Location, in Isiolo County. The TL will take off from the Isiolo substation site in a North easterly direction, crossing the Nanyuki - Isiolo Road, a perennial stream locally known as River Logoso, and heading farther away from the road. Along this route, the TL passes through sparsely populated areas. The TL then heads towards the Isiolo- Marsabit Road at Kambi Garba and Kampi ya Chumvi villages. These are areas with flat landscape and the dominant tree species being medium to tall acacia vegetation. The line then takes a south easterly direction to look for the Isiolo – Mado Gashi road which it runs parallel to as it heads towards Gambella Village.

Isiolo Substation

Kambi Garba is an area with a flat landscape with some medium to tall acacia trees. The area is sparsely populated with a vast grazing land composed of grassland vegetation as one heads towards Gambella village.

A few kilometers to Gambella village is a valley that, interesting, is the only section in the entire transmission line that supports agriculture. At the time of the assessment, crops had been harvested but a huge number of livestock could be seen grazing on the remains of the harvest.


Section between Kambi Garba and Gambella

The TL passes through Gambella Location, then traverses the peripheries of Nyambene National Reserve, (an important resource in this part of the county that should be taken note of) traversing through smaller villages such as Arthiu, Wario, Kashiuru and Yakabarsadi, before eventually reaching Kula Mawe Trading Centre.

Section of Nyambene National Reserve

At Kula Mawe Location the TL traverses through a generally flat terrain with dry woodland vegetation. This area is also very rocky and slightly hilly. The slopes are gentle. In this area, the TL runs parallel to the Isiolo-Mandera Road. There is an existing diesel-generated power station at Kula Mawe.


From Kula Mawe Trading Centre, the TL runs parallel to the Isiolo- Mandera Road, as it heads towards Boji Trading Centre traversing through a generally flat landscape with a few hilly areas dominated by woodlands. There are also a few laggas that can be seen.

A sign of hard times in this section probably due to prolonged dry spell was evidenced by carcasses on the roadside

Boji Trading Centre is an area characterised by a flat terrain and woodlands. It is also less rocky as compared to Kula Mawe. There are a number of areas of spring water where boreholes and wells have been constructed. Boji is also a pastoralist/ grazing area as evidenced by large flocks of sheep grazing around the water sources. The TL will be a distance from Boji Trade Centre but running parallel to the Isiolo - Mandera Road hence important resources such as the wells mentioned may not be affected by the TL.

The section between Boji and Garbatulla Town, is an area of flat terrain and desert vegetation. It is important to note that the TL will cross the Isiolo - Mandera Road in this region. The line, here, takes a turn to leave the

Isiolo – Mandera road and run parallel to Garbatulla – Benane road. The rocky terrain now starts to give way to a sandy one.

Garbatula Town is a place where the terrain is flat and very sandy. There are some tall trees with the dominant species being acacia. Some laggas are also present as one approaches the town from the Garbatulla Junction. There are also existing structures like old concrete supply water tanks and greenhouses which used to serve the town at some point in time.

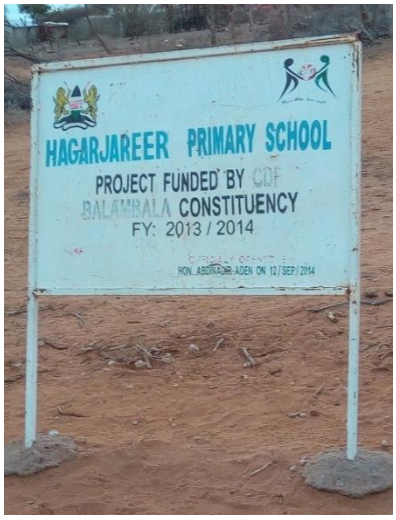

Garbatula Town

Passing out of Garbatulla Town, the TL proceeds to Benane Trading Centre in a south easterly direction, traversing through a landscape that is slightly hilly but generally flat. Gentle slopes can also be sighted. There are also sveral laggas between these two towns (Garbatulla and Benane) and spotted here are palm trees (dominant riverine vegetation) and some woodlands. Some unevenly distributed rock outcrops can also be seen in this section. The TL will also cross the Benane - Garbatulla road as it approaches Benane.


At Benane, the TL will avoid the precincts of the town to the west in areas with short woodland vegetation and flat landscape. Some manyattas can also be seen but this area is generally sparsely populated. The TL will also pass through a lagga and cross the Benane-Hagarjareer road just after leaving Benane Town. It will then take a southward direction towards Hagarjareeer, parallel to the Benane-Hagarjareer road.

Benane Town.

The TL will then traverse Hagarjareer, a centre at the border of Isiolo and Garissa Counties. In this area, the TL passes through areas of short but slightly green desert vegetation and flat landscape. This area is also very dusty due to uneven and very low/ no rainfall over long periods.



From Hagarjareer, The TL turns to the east, crossing the Benane- Mbalambala Road and continues parallel to this road passing through Dogop Village. The land consists largely of woodland vegetation and a flat terrain. The vegetation is mainly short bushes which may not require removal during construction as they are less than 6m in height.

Dogop Village

The TL then proceeds eastwards towards a small village called Ashadin. Here, the TL passes through a small section of the Rahole National Reserve. The vegetation is richer than the other sections of the TL. Some wild animals including giraffes, antelopes, dik diks and others can also be spotted in this region. The proponent should be keen to ensure that wildlife disturbance is as minimal as possible.

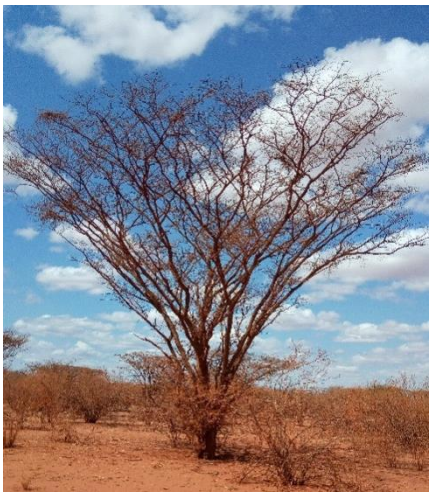
From Ashadin Village, the TL takes a south easterly direction passing near Ohio Village (which is flat and has a mixture of short and tall acacia tress), and Abdigah Village, before heading to Saka Junction at which point it traverses a very dusty flat landscape, full of scarce wooded vegetation before reaching Mbalambala Junction.

Ohio Village

Saka Junction

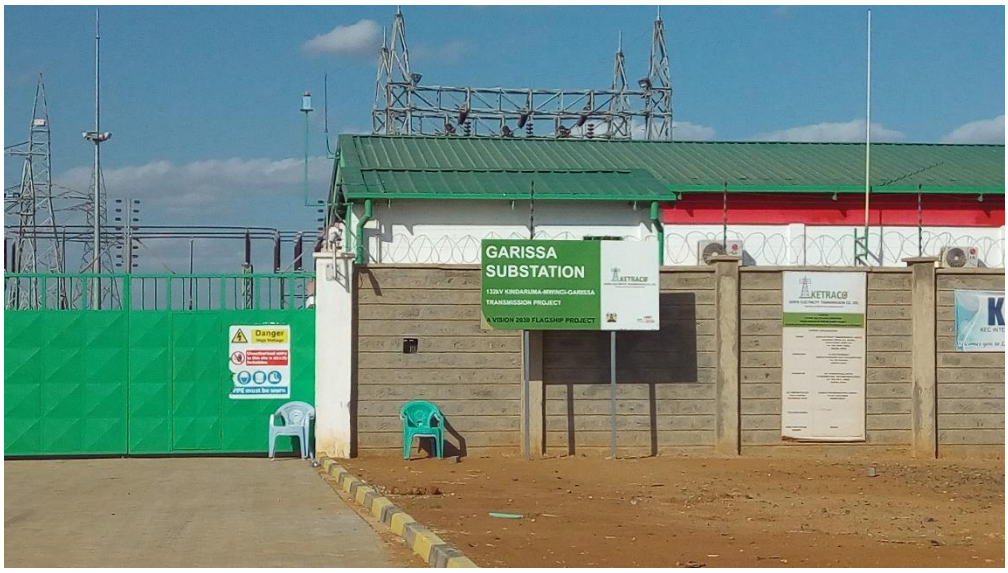
From Mbalambala Junction, the TL crosses the Garissa- Modogashe Road, taking a south-easterly direction, before passing near Shimbrey Village and heading directly to Sankuri Village. Shimbrey Village is an area with many manyattas and semi-permanent houses. There is an excavation site used by a road construction company for the construction of the Garissa-Modogashe Road.

Between Shimbrey and Sankuri Villages, the dominant feature is taller woodland vegetation, some of which might be felled during the construction phase of the proposed TL project and some little short woodland vegetation and a generally dusty flat landscape.



Sankuri Location has predominantly short wooded vegetation and flat terrain. Some wild animials can also be spotted in this area.

From Sankuri, the TL heads directly towards Raya Village. It is at Raya where the TL will terminate at the existing KETRACO Garissa Substation in Garissa County. The terrain here is flat and dusty with a sparse population. The Garissa Substation is 14 kilometres from Garissa Town.



3.3.2; Baseline Biophysical

Appendix II gives a detailed floral and faunal report for the transmission line project.

FLORA AND FAUNA SUMMARY

Vegetation Types

The area traversed by the transmission line is ASALs in AEZ IV-VII. The vegetation types observed varied from woodland, bushland and shrubland. The key differences between these types being the proportion of wood and average vegetation height.

In general, the dominant woody species starting from the driest zones were *Acacia recifens, Dobera glabra, Salvadra persica, Commiphora Africana, Acacia kirkii, balanites aegyptiaca* and *Acacia Senegal*. As for grasses there would appear to have been a shift in dominant species especially where the species were *Themeda triandra, Cenhrus ciliaris* and *Chloris roxburghiana*. This trend has been noted in other rangelands as well and is attributed to intense use, changes in fire regimes and climate change. The most widespread vegetation type is semi-arid woodland and bushland, particularly Acacia / commiphora associations.

In the vegetation types along the proposed transmission line route *Acacia recifens, Dobera glabra, Grewia tenax,* and *Acacia horridi* were most dominant in the most arid conditions while *Acacia Senegal* and species of *Combretum* were dominant in less arid conditions towards isiolo.

The structure of vegetation types found in the study area are presented in sections as discussed below;

SECTION 1:

This area consists of the sub-station area in Raya, 14km from Garissa town. This section is mainly dominated

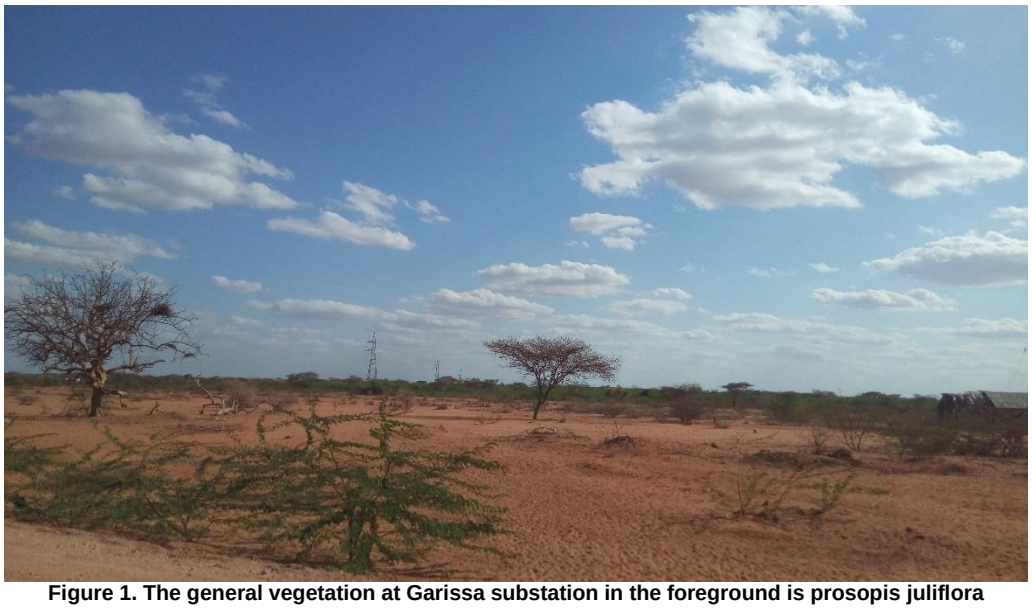


Figure 1. The general vegetation at Garissa substation in the foreground is prosopis juliflora

SECTION 2:

This covers Sankuri, Balamballa junction, Saka junction, Ashadin and Dogop. The area in this section is not suitable for agriculture and mainly found to be used for livestock production. The vegetation is classified as bushland with woody species of high density throughout the area. Dominant species are *Acacia reficiens, balanites aegyptiaca, commiphora Africana, prosopis juliflora* and *Acacia tortilis.*

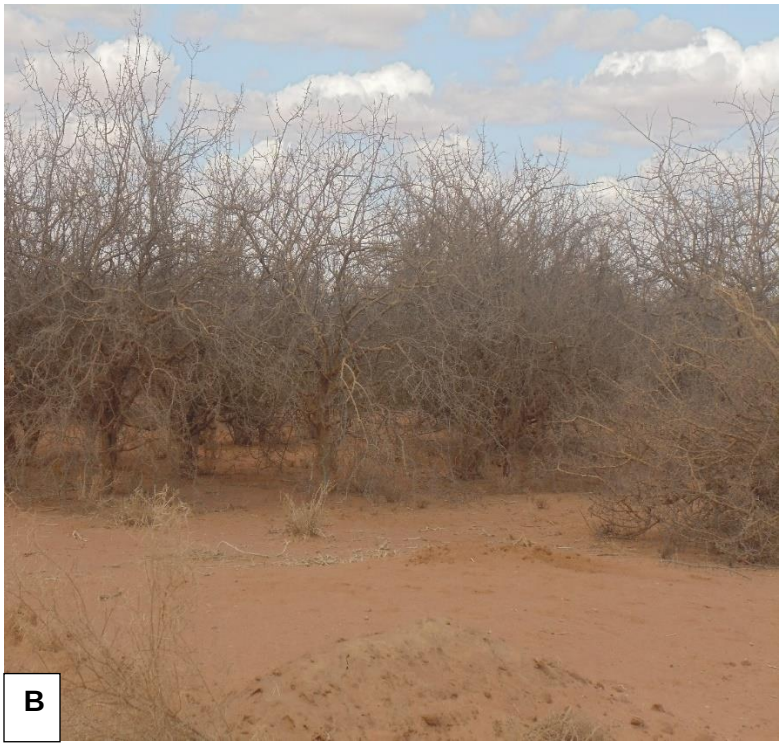


Figure 2. general vegetation from Balambala to Ashadin, where A is a shrub land dominated by *acacia reficiens* and B is a similar vegetation but with different heights

SECTION 3:

This section is represented by the area from Hagarjareer to Benane. This area is characterized by increasing humidity and moisture which modifies the vegetation structure and composition. It is the only area in the whole project site to be having a number of springs. The vegetation shows a gradual change from dominance by

Acacia reficiens and balanites aegyptiaca to increasing relative density of *Diospyros cornii, Thespesia danis* and *Grewia plagiophylla.* Doum palm is also abundant in this region.

Figure 3. vegetation structure in Benane in the background is Doum palm with some Dobera

SECTION 4:

This consist of the section from Garba Tula, Boji to Kula mawe. This site is dominated by rocky outcrop vegetation characterized by the presence of large shrubs like *Commiphora spp, Acacia drepanolobium*, *Acacia reficiens* and some small trees like *Rhus erosa* and *diospyros lyciodes.* Due to the restricted nature and the presence of vegetation that has taken generations to form climax community in a rocky surface, it is ecologically sensitive.

Figure 4. General vegetation in Kula Mawe mostly dominated by Commiphora spp with some *Acacia reficiens*

SECTION 5:

Consist of area from Kachuru to Kampi ya Chumvi where the Isiolo substation is located. The vegetation within these areas in many respects showed high abundance of species such as *Acacia reficiens*, *Mallugo cervian, Jatropha villosa, Themeda triandra, Aristida diffusa* and *Cassia didymobotrya.* .

Figure 5. Vegetation in Isiolo Kachuru region dominated with Acacia reficiens and the ground flora is also evident in this region mostly *Themeda triandra, Aristida diffusa* and *Cassia didymobotrya.*

Grasses are likely to be under-represented in the sample as many grasses has not yet began to grow at the time of the site visit. This is not considered as significant limitations given that there is no listed grass known from the area. Furthermore, the overall vegetation patterns would remain clear and would not be affected by seasonality or rainfall.

A total of 93 plant species were identified. The species consisted of trees, shrubs, forbs, herbs, forbs and grasses. However, the list is not exhaustive since identification was not done on the entire length of the proposed transmission line but rather on selected areas in accordance with the sampling design.

Fauna

The site is in Isiolo and Garissa counties of Kenya. The areas are communally owned and the nomadic pastoralist communities, their livestock and wild animals live in close proximity. The Isiolo – Garissa woodlands is characterized by diverse animal species. The conspicuous mammals that were observed during the faunal survey include Kirk's dik-dik, Gerenuks, Hirola, Giraffes, baboons and monkeys. The area is also rich in other mammals which includes various Antelopes, lions, leopards, hyenas, wild dogs, Jackals and an array of

invertebrates. There are no fences to keep wildlife within certain areas, and their distribution are congruent with climatic gradients

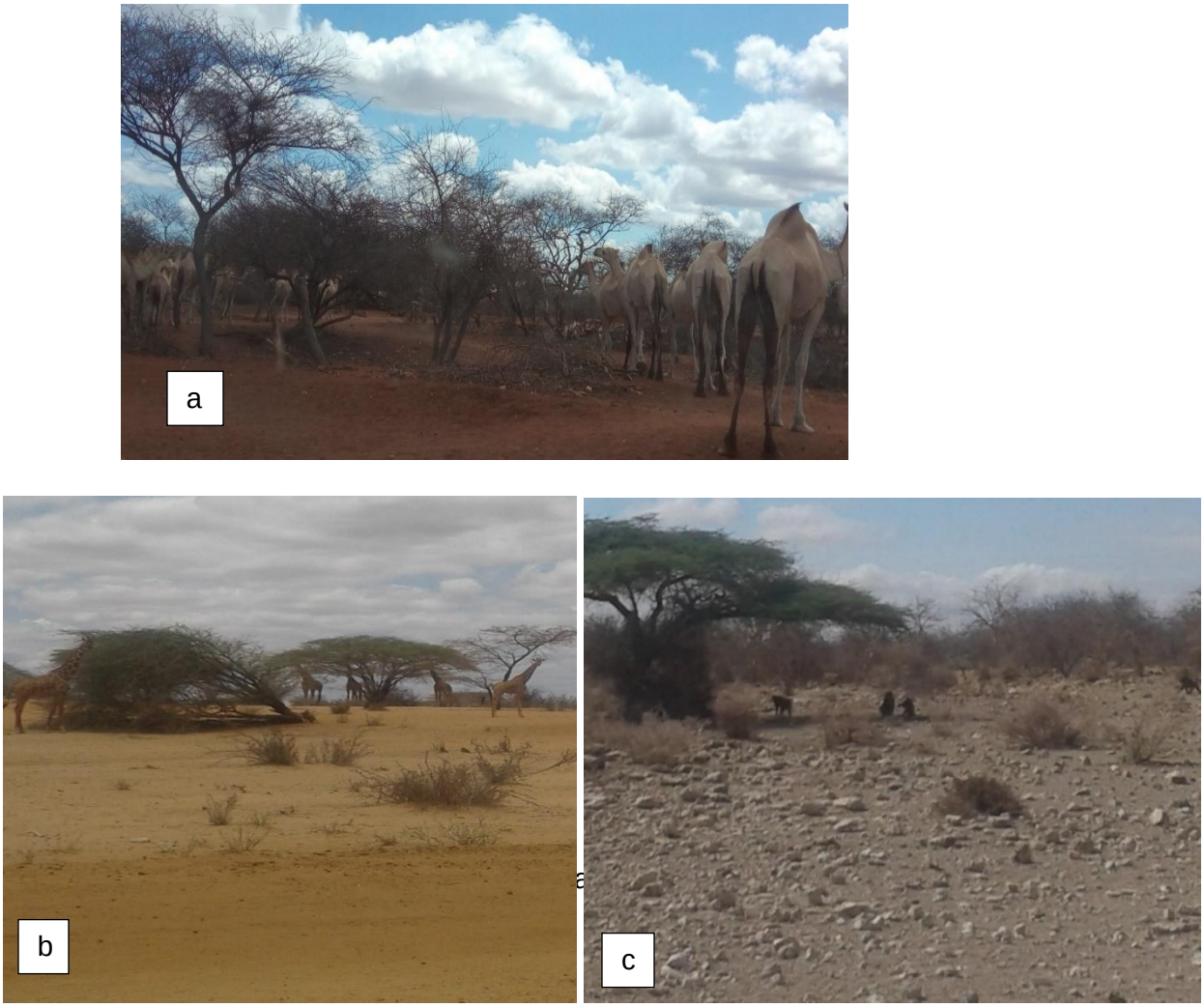


Figure 6. The common fauna in the site (a) camels, (b) giraffes and (c) olive baboons

While various species change their distribution pattern across these climatic gradients, some species like kirks dik-dik were seen all over the site. This indicates that the diversity patterns corresponds to the location across the range rather than the climatic changes alone.

Figure 7. A picture showing Dik-dik dominating most parts of the site

The mechanism of species coexistence in these ASAL communities is a consequence of the pattern of bushy and open areas common in these habitats. It was evident that some species are able to exploit the relatively riskier open habitats by virtue of antipredator morphologies which confers agility and fast speed on its owner at the cost of maneuverability in shrubs.

Figure 8. Gerenuks spotted in the site.

The majority of these 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.

Figure 9. Large avifauna in the site (a) showing ostrich and (b) vulturine guinea fowl

3.3.3; 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.

3.3.4; 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 an International Airport in Isiolo, an airstrip in Garissa and a rarely used airstrip in Garbatulla. Besides this, the transmission line passes an area that have possibilities of low flying aircrafts.

Assessment and licensing by KCAA for the Isiolo Airport and Garissa Airstrip must have been acquired as they are already energized. The TL is over 8km from the Garbatulla Airstrip which may be way too far from any declared area KCAA may impose. The new transmission line in these sections will, therefore, not have any significant impact on aircraft safety.

The above not withstanding 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. The Environmental Management and Co-ordination (Amendment) Act, 2015, is the legislation that governs EIA studies. This project falls under the Second Schedule that lists the type of projects that are required to undergo EIA studies in accordance with section 58 (1- 4) of the Act. Projects under the Second Schedule comprise those considered to pose potentially negative environmental impacts.

Kenyan law has made provisions for the establishment of 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

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 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

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.

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 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 Environmental Management and Co-ordination (Amendment) Act, 2015, prevails.

4.4.1 The Environmental Management and Co-ordination (Amendment) Act, 2015,

Provides for the establishment of appropriate legal and institutional framework for the management of the environment and related matters. Part II of the Environmental Management and Co-ordination (Amendment) Act, 2015, 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 45 days and for full EIA Study is 90 days.

This Project falls within Schedule 2 of EMCA 2015 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; Forests Act

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.

This act will not be invoked as there are no gazetted forests in the project area

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, counseling, 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, WRMA, KWS, IUCN and KFS 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 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 Rahole and Nyambene National Reserve will trigger this treaty

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". This is triggered by presence of River Tana which considering bird movement is not very far from the project site.

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

Detailed stakeholder's consultations for this study were undertaken from the 14th to 27th September 2017. These consultations were conducted in the form of:

5.3.1 Key Informant oral Interviews:

The following people were consulted:

Garissa

- County Environment Officer, National Environment Management Authority.
- Senior Warden, Kenya Wildlife Service.
- Chief Officer, Garissa Water and Sanitation Company.
- Programme Director, IUCN.
- Flood Management Officer, Water Resources Management Authority.
- Senior Clerical Officer, Ministry of Energy and Petroleum.
- County Development Planning Officer, Ministry of Development and Planning (Economic Planning Department).
- County Director, Livestock Production.
- Ecosystem Conservator, Kenya Forest Service.
- Director of Survey, Ministry of Lands.
- County Director of Agriculture.
- Programme Manager, Garissa Land Rehabilitation and Reclamation Programme Department.
- Assistant Director Forestry, County Department of Environment, Energy, Tourism and Mining.
- Public Health Officer, County Directorate of Health.
- Occupational Health and Safety Officer, Ministry of Labour.
- Manager, St. Peters Pro-Cathedral, ACK Church.
- Deputy County Commissioner, Garissa.
- Deputy County Commissioner, Garbatula.
- Chief, Sankuri location.
- Chief, Raya location.

Isiolo

- Regional Coordinator, National Environment Management Authority, Isiolo.
- Acting Director, Water Resources Authority.
- Commercial Manager, Isiolo Water and Sewerage Company Limited.
- County Public Health Officer, Public Health Department.
- Forester, Kenya Forest Service.
- Senior Warden, Kenya Wildlife Service.

- Senior Livestock Production Officer, Ministry of Agriculture, Livestock and Fisheries.
- County Director of Fisheries, Ministry of Agriculture, Livestock and Fisheries.
- County Drought Coordinator, National Drought Management Authority.
- Planning Officer, County Planning and Economic Office.
- Manager, IT Department, Kenya Airport Authority.
- Chief Electrical Engineer, Kenya Airport Authority.
- Senior Grounds Officer, Kenya Civil Aviation Authority, Nairobi
- Director, Ministry of Water and Irrigation.
- Director, Ministry of Energy.
- Assistant County Commissioner, Isiolo Sub-County.
- Chief, Garbatula Location.
- Chief, Benane Location.
- Chief, Hagarhareer Location.
- Chief, Ashadin, Location.
- Chief, Boji Location.
- Kula Mawe Location.
- Chief, Gambella Location.
- Chief, Kambi Garba Location.
- Chief, Maili Saba, Kithima Location, Isiolo.

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 project. Concerns, views and opinions from a total of 22 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 254 respondents were received (Appendix VI).

5.3.4 Public Baraza

Public barazas were held in Sankuri, Raya, Ashadin, Hagarjareer, Benane, Garbatula, Boji, Kula Mawe, Gambella, Kambi Garba and Maili Saba villages 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;

SANKURI; 17th September, 2017- 9:00 am; Venue: Sankuri Primary School

QUESTIONS AND COMMENTS	ANSWERS
Will there be compensation?	Yes. All affected assets will be compensated. There will be compensation for 1. Structures 2. Trees and crops and 3. Land.
Will the transmission line pass next to the road?	Since it requires a 40m wayleave it has to pass away from main road. It will be in the bushes
How will the locals of Sankuri Sub-location be connected to electricity now that the transmission line will pass in their sub-location?	Connection to power will still be done through Kenya Power using the existing infrastructure. The project is to boost the power to make it more reliable and meet the increasing power demand

Participants listen to proceeding of the baraza in Sankuri

RAYA; 19th September, 2017- 9:00 am; Venue: Raya Village

QUESTIONS AND COMMENTS	ANSWERS
Will compensation be done to on those who own land but have titles?	Compensation is done to both those with titles and those who don't have titles.
Will erection of the pylons interfere with the grazing areas and grazing patterns of their livestock, e.g. camels?	The community members are allowed to farm and graze livestock on the wayleave of the TL. Structures and tall trees are the only prohibition.
What will be the criteria for employing people before, during and after project implementation and any possibilities of permanent employment opportunities?	All unskilled labour will be given to the locals. Skilled labour will be advertised nationally.
What are the activities that can be done within the wayleave of the TL?	Examples include grazing and farming
Resources that provide ecological benefits (like indigenous trees) which are beneficial to community members should not be interfered with during the construction phase of the project.	
CSR should not be what KETRACO had provided earlier (Water and classrooms) but should be in form of irrigation channels	


Meeting at Sankuri Raya


Participants ask questions in Raya

ASHADIN; 19th September, 2017- 2:00 pm; Venue: Ashadin Village

QUESTIONS AND COMMENTS	ANSWERS
Will compensation of affected assets be done?	They will get compensated. Where compensation is of three types 1. Structures 2. Trees and crops 3. Land.
What are the CSR initiatives that the proponent has put in place?	The community are to agree on which projects they would like the proponent to do for them for instance, building classrooms and drilling boreholes.
How will the local people be employed when the project is implemented?	Locals will be given first priority when project reaches their sub-locations.
Water for both domestic and livestock is a major problem in the area	

Meeting at Ashadin

Discussion in Ashadin

BENANE; 20th September, 2017- 9:00 am; Venue: Benane Chief's Camp

QUESTIONS AND COMMENTS	ANSWERS
Can the power from the TL be tapped directly like those from distribution lines?	This is high voltage power which must be stepped down first before final distribution to the consumer.
What are the activities that can be done within the wayleave of the TL?	Livestock can graze for instance but the community members can grow trees not exceeding 6 feet tall.
Are there any risks of electrocution to humans/ livestock?	The transmission line will be built with the highest security standards possible. The only energized part of the TL will be the conductors which will be more than 30m high. Security warnings and a perimeter barbed wire fence surrounding the towers will deter children from climbing.

Compensation should be done satisfactorily.	
The project should benefit the local community and not used as a gateway.	
Power will help in boosting water from available springs/ boreholes.	

Meeting at Benane

The ESIA team respond to questions

HAGARJAREER; 20th September, 2017- 2:00 pm; Venue: Hagarjareer Village

QUESTIONS AND COMMENTS	ANSWERS
The project is most welcome as we are going to get power and our youth will get jobs but how soon can we expect it?	These are the early stages of the project which seek NEMA license and can take up to 3 months. There will be other procedures like survey works, soil investigation, procurement of consultants and others. It may take up to a year before the construction starts
The activities that can be done within the	Livestock can graze for instance but the

wayleave of the TL.	community members can grow trees not exceeding 6 feet tall.
Can the power be connected directly from the TLs to the consumers?	Connection to power will still be done by Kenya Power.
The locals should be considered for unskilled labour during construction phase of the proposed project.	
Informal sector will grow in the Sub-location.	
Power will help in boosting water through pumping from the available springs.	
The area has poor telecommunication network and if the project can enhance this, is most welcome	

The Chief Hagarjareer address the meeting

Participants in Hagarjareer follow the proceedings

BOJI; 21st September, 2017- 9:00 am; Venue: Boji Chief's Camp

QUESTIONS AND COMMENTS	ANSWERS
How does the proponent ensure that PAPS are compensated fully?	Policy of KETRACO is very clear that any affected land, structures and trees and crops must be compensated.
Exactly where will the TL pass?	The line would pass about half a kilometre from the venue of the meeting but that may change slightly depending on the results of survey, soil investigation and ease of land acquisition
What is the difference between the consultancy firm and the proponent?	The consultants have been contracted by KETRACO to assist it get a NEMA license and develop an Environmental Management Plan
When will the proposed project be implemented?	Construction stage may take up to a year to commence as there many procedures to be completed before construction can begin.
The location has no electric power and will be connected to the national grid.	

Meeting in Boji


Question time in Boji

KULA MAWE; 21st September, 2017- 2:00 pm; Venue: Kula Mawe Chief's Camp

QUESTIONS AND COMMENTS	ANSWERS
Is this a National or Local Government project?	This is a National Government project to ensure that there is efficient and reliable electric power in Isiolo and Garissa counties.
And if is a National Government project, shouldn't the team go to consult the Isiolo Local Government instead of people of Kula Mawe	As a procedure for the EIA process, both the community and key stakeholders (including the local government) must be consulted. The team will indeed consult various relevant departments of the Local Government to get their inputs but the local community must as well be consulted to ensure their views, opinions and .concerns are taken into account;
What is the difference between KENGEN, KETRACO, Kenya Power and REA and whether or not there are institutional conflicts among them that hinder proposed projects to be implemented in good time?	KenGen generates power at source; KETRACO transmits at high voltage power and over long distance while Kenya Power and REA distribute power once it has been stepped down at the substation.
Where is the source of the power?	The power will be from the existing substation at Isiolo. Isiolo substation is fed by a transmission line from Kamburu via Meru .
How will those individuals living far from the TL benefit from the project?	Once power has been boosted, there will be adequate, efficient and reliable power for

	entire County
Four years ago, Kenya Power dropped many poles to connect more people to power but that has not happened yet, would this project be another empty promise?	We may not be aware of this and may not know the reason why but we have assurances from KETRACO that this is a priority project and funding is almost assured. The project will surely happen


ESIA team give details of the project to participants in Kula Mawe center

GARBATULA; 22nd September, 2017- 9:00 am; Venue: Garbatula Chief's Camp

QUESTIONS AND COMMENTS	ANSWERS
Is this a new source of power and will people be required to choose between KETRACO's power and Kenya Power?	No. The power is a boost to the existing to stabilize it and meet the increasing demand. Kenya Power will continue providing power to end users while KETRACO's role is to transmit the power at high voltage, step it down at its substations and give it to Kenya Power for distribution.
What will be the location of the Garbatulla substation?	The exact location will be identified by KETRACO staff after a scoping exercise.
What is the relationship between KETRACO and Kenya Power?	KETRACO transmits high voltage power over a long distance, steps it down at its substations and passes it on to Kenya Power for distribution to customers. Kenya Power deals with customers while KETRACO deals with KENGEN and Kenya Power.

When will the project be implemented?	It may take up to 3 months to get the NEMA license which is the work of the consultant. Other process require time too. Construction of the TL may take up to a year to start.
Will the distribution lines erected by Kenya Power be removed?	The distribution lines will still remain since they will be used to distribute power to consumers.
The project should be implemented as soon as possible to mitigate the power outages.	

Meeting at Garbatulla Chief's Camp

Participants follow proceedings at the Garbatulla meeting

MAILI SABA, KITHIMA, ISIOLO;25th September, 2017- 10:00 am; Venue: Maili Saba Chief's Camp

QUESTIONS AND COMMENTS	ANSWERS
Where will the transmission line pass?	The participants were given the general direction of the TL in relation to the venue of the meeting. It would start at the Isiolo substation, head northwards to avoid the town

	and then take an easterly direction to run parallel to the Isiolo- Mado Gashi road.
Is the project similar to the line from Meru?	Yes. But the voltage for the current project is a bit higher, 220kV, and would require a bigger way- leave which is 40m as compared to the 30m for the Meru – Isiolo TL
The locals should be given first priority for unskilled employment when the project starts.	

Meeting at Maili Saba Chie's Camp

A participant help the ESIA team explain a point

GAMBELLA; 26th September, 2017- 9:00 am; Venue: Gambella Village

QUESTIONS AND COMMENTS	ANSWERS
We welcome you to Gambella and thank you for your project. The project has many benefits to the community and I wish to thank the Government. If it is true thank you and let the	

project come	
Will it be on the road or will pass on peoples land? If through people's land is there compensation?	The TL will pass on the bushes away from the road. All affected structures, land and trees and crops will be compensated. The PAPs will be in direct discussions and agreement with KETRACO.
What are the benefits to the locals?	Apart from more stable power supply that meets the power demand, the locals will also gain in employment opportunities, increased security due to street lights, business opportunities among others
What is the difference between KETRACO and Kenya Power?	KETRACO transmits high voltage power over long distance from the point of generation to where the power is used, it then steps it down and gives to Kenya Power who distributes to customers.
The economy of the pastoralist community of the area will grow much faster.	

Meeting at Gambella


Participants follow proceedings in Gambella

KAMBI GARBA; 26th September, 2017- 2:00 pm; Venue: Kambi Garba Chief's Office

QUESTIONS AND COMMENTS	ANSWERS
Some Kenya Power people came to Kambi Garba passed their poles (power-lines) on peoples land but refused to pay for compensation?	The team may not be aware of this and may not have an answer to the question as they had be contracted by KETRACO and not Kenya Power. They however, assure participants that KETRACO always pay for compensation for the way-leave corridor.
Will the power be cheaper?	Ultimately, yes. High voltage transmission lines replace 33 and 66kV distribution lines which lose up to 30% of the power they transmit. People will now not pay for these loses and therefore their power bills will show a slightly lower tariff
There must be extensive public consultation for the proposed project.	


Meeting in Kambi Garba

Village Elders follow proceedings at the Kambi Garba meeting

5.4: OUTCOME OF THE STAKEHOLDER CONSULTATIONS:

5.4.1: Important Issues as raised by key informant

Garissa

Key Informant	Information Provided
Garissa Water and Sanitation Company	GAWASCO is the highest consumer of electricity since it pumps its waters. There are a lot of pumping stations since the land is generally flat. The addition of power will be beneficial to smaller towns between Isiolo and Garissa. Furthermore, boreholes may eventually need electricity to make work easier. At the moment, the emergency response towards electrical faults is very efficient. The issue of concern is that the cost of electricity is still high.
County Directorate of Health	The project is of great benefit to the people of these counties directly and indirectly. It will also increase power coverage for health facilities along the said grid line that is being proposed.
County Department of Environment	There will be increase in supply of power. There should be adequate community participation. There should be compensation in terms of land; structures and natural resources. Locals should be considered for jobs. Proper mitigation measures should be observed. The ESIA report should be shared with the Environment Department.
Garissa	The project will sustain development goals for Vision 2030 for the county

Rehabilitation Programme (Land Reclamation Department)	government.
County Directorate of Agriculture	The county will eventually be well lit thus improving security and promoting more economic activities. Households that will be adversely affected should be compensated.
Directorate of Surveys	The project is fully supported aiming at boosting the power source.
Kenya Forest Service	The proposed project should be urgently implemented as per the Vision 2030 and other development blueprints. More power is needed to develop industries.
County Directorate of Livestock Production	The power will be reliable in the county hence supporting the development of value addition to industries in the livestock sector which is the key livelihood of the pastoralist communities. The infrastructure (power lines and main sub-station) should be well established to avoid any disaster.
Ministry of Development and planning (Economic Planning Department)	To boost power in the county. To meet the high demand of power connectivity per household. To enhance the reliability of the power supply. The proposed project should be incorporated in the second generation County Integrated Development Plan to 2018-2022. All key stakeholders must be a consulted in order to gauge the acceptability of the community. Proper consultative process must be adhered.
Kenya Wildlife Service	Consider preservation and conservation of wildlife habitats, i.e., grazing, breeding and watering sites. Mitigate against habitat degradation and displacement of resident wildlife and human population through re-afforestation, CSR on schools, water provision, health centres and infrastructure development like on roads maintenance in collaboration with respective lead agencies. Put in place safety mechanisms on the avifauna in terms of breeding and migration. The area has lots of wildlife and several migratory routes, so the

	Proponent should consider capacity building of locals to preserve and conserve existing natural resources in the area namely, wildlife, swamps, springs, birds, reptiles, mammals, etc. The proponent should develop ethical and legal structures to mitigate involvement of employee on wildlife poaching, animal trafficking, and habitat destruction and so on. A profile of the flora and fauna likely to be affected so as to look into the possible opportunistic vegetation that might take over. Collaborative efforts without unnecessary bureaucracies, i.e. levels of transparency and accountability with concerned stakeholders.
Ministry of Energy and Petroleum	The TL will help the people of the respective areas to access light/ power for their daily operation.
Water Resources Authority	The project to be undertaken with regard and compliance with all acts in regard to the Water Act and other environment related acts.
Directorate of Occupational Health and Safety	Ensure proponent acquires workplace registration certificate. Training on O.H.S. and first aid. Provide first aid facilities. Provide PPEs especially those for work at heights. Site safety officer to manage safety at site mandatory. Permit to work at heights should be in place. Develop risk assessment for the project as per section 6(3). Welfare facilities like sanitary provisions.

Isiolo

Key Informant	Information Provided
Water Resources Authority	The frequent power outages require some improvement on the source of supply and also the transmission methods.
Isiolo Water and Sewerage Company	More energy supply means enhanced sustainability of it. Sustained energy supply is a catalyst to development which is highly welcome in Isiolo.
Public Health Department	It will empower the community economically and their health status will improve. It will have reliable and sustainable power supply to facilities like those used in public health.

	It will improve other infrastructure like communication and transport.
Kenya Forest Service	The proponent should come up with project proposals to rehabilitate the cutting down of trees during construction of power lines to replace them in any other areas. Involve the key stakeholders where possible in the project.
Directorate of Agriculture, Livestock and Fisheries	The project should avoid passing in areas where there are a lot of pastoral activities.
Ministry of Agriculture, Livestock and Fisheries	The local communities must be fully involved so as to understand any side effects of the project especially on issues of compensation or benefits.
National Drought Management Authority	It will help boost economic development in the 2 counties. The transmission line should avoid community grazing reserves, water points and traditional sacred places. Compensation should be done well. Communities should be made aware of the project to avoid resistance and sabotage. The TL should also take care of environmental destruction e.g. destruction of trees, plants and other flora.
County Planning office	The project is going to act as a gateway of opening the remote parts of the county which have high potential for mega projects in the future. It is also likely to solve the challenges that do exist in upcoming towns along Isiolo- Modogashe route via Garbatula. Community should be sensitized before commencement of the project so as to accept it.

5.4.3: Important Issues as raised by the community

- Compensation of affected assets should be done satisfactorily (i.e., land, structures and trees and crops).
- How compensation will be done and the procedure to be followed.
- CSR initiatives that the proponent has put in place e.g. water provision. Water provision should be of high priority.
- The activities that can be done within the wayleave of the TL.
- The difference between KENGEN, KETRACO, Kenya Power and REA.

- The project should be implemented as soon as possible and not be like previous projects in other sectors which were proposed but never implemented.
- Whether power can be connected directly from the TL to the consumers.
- When the proposed project will be implemented.
- The project should benefit the local community and not used as a gateway.
- Risks of electrocution to humans and animals.
- The criteria for employing people before, during and after project implementation any possibilities of permanent employment opportunities. Locals should be given first priority when project reaches their sub-locations.
- Resources that provide ecological benefits (like indigenous trees) which are beneficial to community members should not be interfered with during the construction phase of the project.
- Whether erection of the pylons will interfere with the grazing areas and grazing patterns of their livestock, e.g. camels.
- Whether or not those locals living far away from the power transmission line will still benefit from the proposed project.
- There must be extensive public consultation for the proposed project.

5.4.4: Some of the benefits as identified by the community

- There will be reduced power outages in the project areas.
- There will be affordable electricity within the project affected areas.
- Introduction of industrialization in the various locations and sub-locations.
- Improved standards of living of community members/ the livelihoods of the community will be uplifted.
- Creation of employment to residents of affected counties.
- Promotion of business activities.
- It will reduce insecurity in the counties through efficient lighting.
- There will be enhancement in communication.
- Some areas that have been lacking power for years will be connected to the notational grid.
- Improvement in other sectors like education, health and water.
- Power will help in boosting water from available springs/ boreholes.
- Other development projects will also come along.

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.

In addition, 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 stakeholder concerns.

CHAPTER 6: 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 displaced 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 Isiolo – Garbatulla – Garissa 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 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: METHODOLOGY AND SCOPE

For the preparation of this indicative RAP, a census survey was carried out to identify the number of Project Affected Persons (PAPs), and their structures which will be affected. A valuation of the structures to be affected was done and an estimate of the amount of money to be compensated for each structure provided. The accuracy of the census was, limited by the availability of both financial and time resources, however, the results give a pretty good picture of the true scenario.

Valuation method used for land and structures considered the current replacement cost of lost asset as well as types and levels of compensation under Kenyan law. For trees, reference was made to Diameter at Breast Height (DBH) and Kenya Gazette Supplement No.132, the Forest Act. A 15 percent disturbance cost was added as per KETRACO's Resettlement Policy Framework.

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. 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.

6.5: RESULTS

6.5.1; Results Summary

From the census results, the 40m corridor over the distance of 285km of the transmission line will affect a total of 146 households. The transmission line will affect a total of 2,288 acres of land at an approximated cost of Ksh. 457,676,634. A total of 47,720 different types of trees will be affected at an approximated cost of Ksh. 289,037,900. The transmission line, however, will not affect any structure as no single structure was identified in the way-leave. Detailed results of the RAP are given in appendix III.

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 Isiolo, and Garissa 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 Counties 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 Isiolo and Garbatulla including villages like Gambella, Arthiu, Wario, Kashiuru, Yakabarsadi, Kula Mawe, and Boji 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 lines require use of large amounts of cement. Workers, especially, those who work on the concrete mixture 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.

The road between Isiolo and the Garissa substation is not tarmacked. Motor vehicles accessing the site 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 1,000 towers and that each patch is about a meter squared, the transmission line will create a desert equivalent to 1,000 square meters which is about a quarter (0.25) 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 40 meters width for the 285km. 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.

This impact will be more felt during the construction phase and in areas close to the Gambella Swamp, the Benane and Boji Springs, and the Nyambene and Rahole Game Reserves.

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 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.

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.

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 as you approach Garissa substation which is quite close to Tana River and also in areas near the Gambella Swamp, the Benane and Boji Springs, and the Nyambene and Rahole Game Reserves.

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 30m 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; 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. Insecurity in Isiolo and Garissa Counties
7. road accidents,

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

7.3.10; Soil Erosion

Though no perennial rivers (in exception of River Tana which is quite a distance from the project area) were identified, certain sensitive areas prone to impacts of soil erosion, were identified. These include the Gambella Swamp, and Boji and Benane 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 Swamp and Springs

7.3.11; 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 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.

7.3.12; 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.

7.3.13; 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 and there should be no potential health risks for people living outside of 40m corridor.

7.3.14; 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 towns and near villages.

7.3.15; 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.

7.3.16; Land take – Resettlement and Loss of Use

As mentioned earlier, the proposed project will require a corridor of 40m width. Within the 40m corridor, no structures or tall trees are allowed. All other forms of land use including grazing and farming are allowed.

No structure on the way-leave corridor was identified and therefore, resettlement for this particular project if the status quo holds will not happen.

Loss of land use may occur on areas cleared of vegetation for substations, tower bases and access routes.

The way of life here is pastoralism with goats, sheep, cattle, and camels being the main livestock. Land tenure is mainly communal. Any disturbance of pastureland can create conflict, compensation therefore, will be very important

The indicative RAP survey showed that the transmission line will affect a total of 146 households/communities with a total acreage of 2,288 acres of land consisting mainly of grazing fields and bushes. No single structure was identified 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 (*Prosopis juliflora*) 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; 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

7.4.10; 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.

7.4.11; 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.

7.4.12; 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.

7.4.13; 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

7.4.14; 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.

7.4.15; 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.

7.4.16; 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	**1.** Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	KETRACO & Contractor	Entire construction period	0
	2. Sensitise construction drivers to avoid running of vehicle engines or hooting	KETRACO & Contractor	Entire construction period	0
	3. Regular servicing of engines and machine parts to reduce noise generation	KETRACO & Contractor	Entire construction period	0
	4. 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
	5. Trees to be planted around the site to provide some buffer against noise propagation	KETRACO & Contractor	Entire construction period	40,000
	6. 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)
	7. 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
	8. 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	**1.** Ensure strict enforcement of on-site speed limit regulations	KETRACO & Contractor	Entire construction period	0
	2. Avoid excavation works in extremely dry weather			0
	3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction and vehicles			10,000
	4. Stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions			0
	5. PPE to be provided to employees and ensure proper and constant use			Dust coats and dust masks@5000 per employee
Exhaust emission	**1.** Sensitise truck drivers and machine operators to switch off engines when not in use			0
	2. Regular servicing of engines and machine parts to reduce exhaust emission generation			0
	3. Alternative non-fuel construction equipment shall be used where feasible			0

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
3. Minimize solid and liquid waste generation and ensure efficient waste management during construction				
Increased solid waste generation	1. 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
	2. Accurate estimation of the dimensions and quantities of materials required.			0
	3. 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
	4.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage			Design cost
	5. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste			0
	6. Reuse packaging materials such as removed wooden poles, cartons, cement bags, empty metal and plastic containers to reduce waste at site			0
	7. 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)
	8. 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	1. Provide means for handling sewage generated at the construction site	KETRACO and Contractor	One-off	30,000
	2. 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
	3. 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	1. 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
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. 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)
	4. 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
	5. 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	1. 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
	2. Ensure proper demarcation and delineation of the project area to be affected by construction works.			0
	3. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.			0
	3. Designate access routes and parking within the site.			0
	4. 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)
	5. Design and implement an appropriate landscaping programme for the substations site.			50,000
	6.Support community initiatives in tree planting	KETRACO and community	Entire project period	50,000
6. Minimize Disturbance on faunal species				
Disturbance on wildlife	**1.** Ensure no worker engage in acts of poaching	KETRACO, and Contractor	Entire construction period	0
	2. Restrict construction to day time			
	3. Observe applicable Game Reserve regulations			
	4. Bush clearing to be selective. Only tall trees on the wayleave corridor or vegetation on the footprints of the towers to be removed			
	5. Consult the local KWS officer and conservancy owners for advice on construction timings to avoid disturbing wildlife.			
7. Minimize occupational health and safety risks				
Impacts on workers' and community health and safety	1. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO, DOHSS and Contractor	Entire construction period	100,000
	2. Prohibit access by unauthorized personnel into the construction site			0
	3. Train all employees and regularly sensitize them on safe working procedures			30,000

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	4. Periodic community sensitization of the dangers posed by the project		Quarterly during the entire construction period	50,000
	5. Place warning signs where necessary		Whenever necessary	20,000
	6. Provide necessary PPEs to workers		Continuous	20,000
	7. Erect a perimeter fence to enclose the substations		One-time off	Design cost
8. Reduce soil erosion and storm-water runoff				
Soil erosion and storm-water runoff	1. 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	20,000
	2. 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	
	3. 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.			
	4. Ensure that construction vehicles are restricted to use existing graded roads		Entire construction period	

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	5. Ensure that any compacted areas are ripped to reduce run-off.			
	8. Roof catchments will be used to collect the storm water for some substations uses			40,000
	9. Construction of water pans to collect storm water for substations use, tree planting and landscaping.			5,000 per unit
9. Visual and aesthetic impacts				
Visual and aesthetic impacts	1.Extensive public consultation during project planning	KETRACO and community	Planning phase	50,000
	2. Structures at the site should be designed in such a way that they will improve the beauty of the surroundings.			
	3. 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
	4. Design and implement an appropriate landscaping programme		Quarter one	20,000
10. Increase in social vices				
Increase in social vices including HIV/AIDS	1. 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

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Guidance and counselling on HIV/AIDS and other STDs to employees	KETRACO and contractor		10,000
	3. Provision of condoms			10,000
	4. 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
11. Cultural Heritage and Archaeological Finds				
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
12. 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	1. Vehicle idling time shall be minimised	KETRACO	Entire implementation time	0
	2. 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	1. 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
	2. Provide solid waste handling facilities such as rubbish bags and skips		One-off	20,000
	3. Ensure that wastes generated are efficiently managed through recycling, reuse and proper disposal procedures.		Continuous	0
	4. 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)
	5. Place in strategic places signs against littering and dumping of wastes			10,000 /year
	6. Audits on waste generation and development of Waste Reduction Action Plans (WRAP)			To be determined
Liquid waste generation	1. 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
	2. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			
	3. Audits on liquid waste generation and development of liquid Waste Reduction Action Plans			
Release of sewage into the environment	1. 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)
	2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately			0
	3. 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	1. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles	KETRACO	Continuous	0
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. 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

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	4. Design appropriate protection devices against accidental discharge of transformer oil substances.			
	5. The substations design should provide adequate storage areas for the transformer oil			
	6. Drains should be routed through an oil/water separator		One-off	Part of construction cost
	7. Frequent inspection and maintenance of the transformers should be done to minimize spilling		Continuous	0
	8. 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
	9. 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)
	10. 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
	11. 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	1. 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
	2. 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	1. Put in place a maintenance system to ensure physical integrity of project equipment is maintained	KETRACO	Planning stage	0
	2 Access to the substations should only be by authorization and trained personnel		Continuous	
	3. Erect a perimeter fence to deny unauthorized people access the substations			
	4.. Clear warning signs to be placed on strategic places			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	5. 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	1. 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	1. 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
	2. Guidance and counselling on HIV/AIDS and other STDs to employees			
	3. Provision of condoms			
	4. 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	1. Install portable barriers to shield compressors and other small stationary equipment where necessary.	KETRACO and Contractor	Continuous	To be determined
	2. Demolish mainly during the day. The time that most of the neighbours are out working.			
	3. Provide appropriate PPE to workers			
	4. Co-ordinate with relevant agencies and neighbouring communities regarding all substations demolition activities			
2.Abatement of air pollution				
Generation of dust	1. 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)
	2. 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		
	3. 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
	4. Provide appropriate PPE to all workers		Continuous	Dust coats and dust masks@5000 per employee
Generation of exhaust emission	1. Vehicle idling time shall be minimised	KETRACO and Contractor	Continuous	0
	2. Regular servicing of engines and machine parts to reduce exhaust emission generation			
3. Waste management				
Demolition waste	1. 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)
	2. 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
	3. 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	1. 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
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. Close surveillance of the fuel and cooling oil store			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
5. Impacts on workers' and community health and safety				
Health and Safety for workers' and community members	1. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO DOHSS and Contractor	Continuous	To be determined
	2. Prohibit access by unauthorized personnel into the demolition site			
	3. Place warning signs where necessary			
6. Rehabilitation of project site				
Vegetation disturbance	1. Implement an appropriate re-vegetation programme to restore the site to its original status	KETRACO and community	One-off	20,000
	2. Consider use of indigenous plant species in re-vegetation			
	3. 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. 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

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
9. 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
10. Visual and aesthetic impacts	Quarterly			Reports on public consultation held; landscaping programme designed and implemented	KETRACO and Contractor
11. 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

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
12. Perceived danger of Electrostatic and Magnetic force		Quarterly		Reports on education and awareness campaigns held	KETRACO and Contractor
13. 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
14. Cultural Heritage and Archaeological Finds	Monthly			Reports on heritage areas and archaeological finds found	KETRACO
15. Land take - Resettlement and Loss of use	Monthly			Reports on RAP implementation including compensation for land, structures and crop/trees damage	KETRACO
16. 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 Isiolo and Garissa 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 Isiolo, and Garissa 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.

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.

10.5; Proceed with the proposed project with mitigation measures

This option is the preferred option and it entails carrying out the proposed project with mitigation measures to prevent, offset, or avoid its negative impacts thereby maximizing it gains. This option would therefore lead to achieving the proposal's objectives sustainably and contribute to the achievement of other sectorial and policy goals and objectives. As compared to the other options, this option uses the strengths of the other options such as using different water and energy sources thereby creating synergy and increasing the project's cost-effectiveness. This option also involves using the best available building materials and process to minimize risks to environmental and social systems in the area and globally.

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 220Kv transmission line and 220/33 kV transmission substations, 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 EMP
- The proponent to conduct and implement a detailed and elaborate Resettlement Action Plan
- The proponent to monitor implementation of the EMP using the developed EMoP
- 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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