ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED TURKWEL-LODWAR-LOKICHOGIO TRANSMISSION LINE PROJECT

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EXECUTIVE SUMMARY

Introduction

Turkana County since independence has never been connected to the national grid. It has depended on off-grid diesel generated power which is unreliable, unsecure and not able to meet the increasing demand. Further, the diesel generators are noisy and produce lots of exhaust emissions leading to deteriorating environmental health.

In the 1980s when the Turkwel Hydro Power Generating Station was constructed, the communities were apprehensive that some of the power would be channelled to Turkana. This did not happen and left a bitter community. It contributed to the insecurity around the boundary with the Pokot community.

At present Lodwar and Lokichogio are off-grid stations having installed capacities of 1,540kW and 640kW respectively. The demand at Lodwar and Lokichogio by 2030 is expected to be about 10MW and 8MW respectively. To improve the quality and reliability of power supply to these areas and the entire of Turkana County, it is proposed to construct Turkwel – Lodwar – Lokichogio 220kV transmission line.

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.

Study Objectives

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

Study Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 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 departmental heads. The consultations were based on the proposed project, site planning and the project implementation plan;
- Physical inspections of the proposed project area which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

Conclusion

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

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. 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, 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
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 Double Circuit Turkwel – Lokichar – Lodwar - Lokichoggio transmission line project. The project, which for the first time will connect Turkana County in to the National Grid, is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Turkana County. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages.

At present Lodwar and Lokichogio are off-grid stations having installed capacities of 1540kW and 640kW respectively. The demand at Lodwar and Lokichogio by 2030 is expected to be about 10MW and 8MW respectively.To improve the quality and reliability of power supply to these areas, it is proposed to construct Turkwel – Lodwar – Lokichoggio transmission line under this scheme. Turkwel is an existing generating station with 220kV switchyard which is presently connected to Lessos through a 220kV S/c transmission line. Turkwel – Lodwar and Lodwar – Lokichogio sections are 140km and 190km long respectively as per route survey report.

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 Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

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

The following are the TOR for the ESIA process

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

- Prepare an Environmental and Social Impact Assessment Report

1.4: SCOPE OF THE STUDY

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the immediate environment as may be affected or may affect the proposed project. Any potential impacts (localized or delocalized) are also evaluated as guided by EMCA 1999 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 Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.5: ESIA APPROACH AND METHODOLOGY

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 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, local administration, opinion leaders and 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, 1999 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 10th and 20th September 2016 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 10th to 20th September 2016. 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 double circuit transmission line from Turkwel power generating substation through Lokichar, to Lodwar and further to Kakuma and terminate in Lokichoggio with substations at Lodwar, Lokichar, and Lokichoggio.

Detailed scope of work for the project is as follows:

1. **Transmission Line**
   a) Turkwel – Lodwar 220kV D/c line with ACSR Lynx Conductor (140km)
   b) Lodwar – Lokichoggio 220kV D/c line with ACSR Lynx Conductor (190 km)
2. **Substation**
   a) Extension of 220kV substation at Turkwel
   b) New 220/33kV substation at Lokichar
   c) New 220/33kV substation at Lodwar
   d) New 220/33kV substation at Lokichoggio

2.2: TRANSMISSION LINE DESIGN

2.2.1; Line Configuration

The 220 kV D/c transmission lines 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 upto 2 degree angle of deviation.
b) 'LA' type light angle tension towers for upto 15 degree angle of deviation.
c) 'MA' type light angle tension towers for upto 30 degree angle of deviation.
d) 'HA' type light angle tension towers for upto 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; Earthwire

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 joint for conductor/ earthwire

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

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/ earthwire

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 earthwire

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, railway 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

2.3: 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.

The Single Line Diagram for all the Substations considered present assignment i.e. Assignment IV has been enclosed with this document.

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 220kV 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 220kV Isolators and earth switches devices are assumed motor-operated.

For the 220kV system of the substation 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 equipments shall comply to IEC/equivalent international standards. The switchyard layout is considered with adequate space for road and accessibility for easy maintenance of bay equipments.

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. Continous 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 220kV 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 upto 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 SF6 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 to 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 to 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.

<u>The protection scheme shall include:</u>

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 and proposed substation sites are roughly defined by coordinates as follows;-

Table 2.3; Turkwel – Lodwar - Lokichoggio Coordinates (UTM Arc 1960)

Proposed Turkwel – Lodwar – Lokichoggio Transmission Line Route					
	UTM Arc 1960 36N		**Geographical**		**Description**
	E	N	Lat	Long	County
T-OFF	94599.699	212101.690	1.9152190	35.357279	West Pokot
AT1	97184.853	212354.974	1.9175560	35.3804720	Turkana
AT2	107921.666	230923.469	2.0854470	35.4764660	Turkana
AT3	108477.292	238900.673	2.1574990	35.4812900	Turkana
AT4	121653.569	261006.654	2.3574310	35.5991010	Turkana
AT5-SSTN	117353.924	343298.618	3.1005570	35.5583830	Turkana
AT6	83013.025	381776.179	3.4468910	35.2486460	Turkana
AT7	4114.117	414981.454	3.7433380	34.5387210	Turkana
SSTN	17589.333	464151.512	4.1857160	34.3414030	Turkana

Table 2.4; Turkwel Existing Substation and Proposed Extension

E	**N**	**Remarks**
94485.557	212130.431	Existing Substation
94498.776	211979.535	1.808 acres
94450.190	11976.524	
94437.623	212127.337	
94498.776	211979.535	Proposed site
94478.898	212196.922	5.86 acres

94587.906	212201.156	
94612.248	211995.839	

Table 2.5; Lodwar Proposed Substation Site

E	N	Remarks
116923.383	343249.033	Proposed Substation 90.8Acres
117714.401	343340.133	
117780.983	342882.938	
116974.683	342797.161	

Table2.6; Lokichoggio Proposed Substation Site

E	N	Remarks
7354.46	464239.97	Proposed substation site 27.24 Acres
7868.90	464046.22	
17940.17	464224.79	
17436.86	464433.94	
17354.46	464239.97	

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.

Turkana County since independence has never been connected to the national grid. It has depended on off-grid diesel generated power which is unreliable, unsecure and not able to meet the increasing demand. Further, the diesel generators are noisy and produce lots of exhaust emissions leading to deteriorating environmental health.

In the 1980s when the Turkwel Hydro Power Generating Station was constructed, the communities were apprehensive that some of the power would be channelled to Turkana. This did not happen and left a bitter

community. It contributed to the insecurity around the boundary with the Pokot community. The project is seen to heal this supposedly wrong doing.

2.6; PROJECT BUDGET

The estimated cost of the project is approximately **US$ fifty seven million four hundred and forty nine thousand, eight hundred and ninety (57,449,890).**

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.

2.8 ANALYSIS FOR ALTERNATIVES

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;

2.8.1 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 Turkana County 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.

2.8.2 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 Turkana County.

2.8.3 Line Routing and Substituting 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 follow sparsely populated areas and the need for land acquisition or resettlement is minimized. The new substations sites have been located to avoid areas of dense settlement and where impacts on environment and local are minimal.

2.8.4 Alternative Processes and Materials

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

CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA

3.1; BACKGROUND

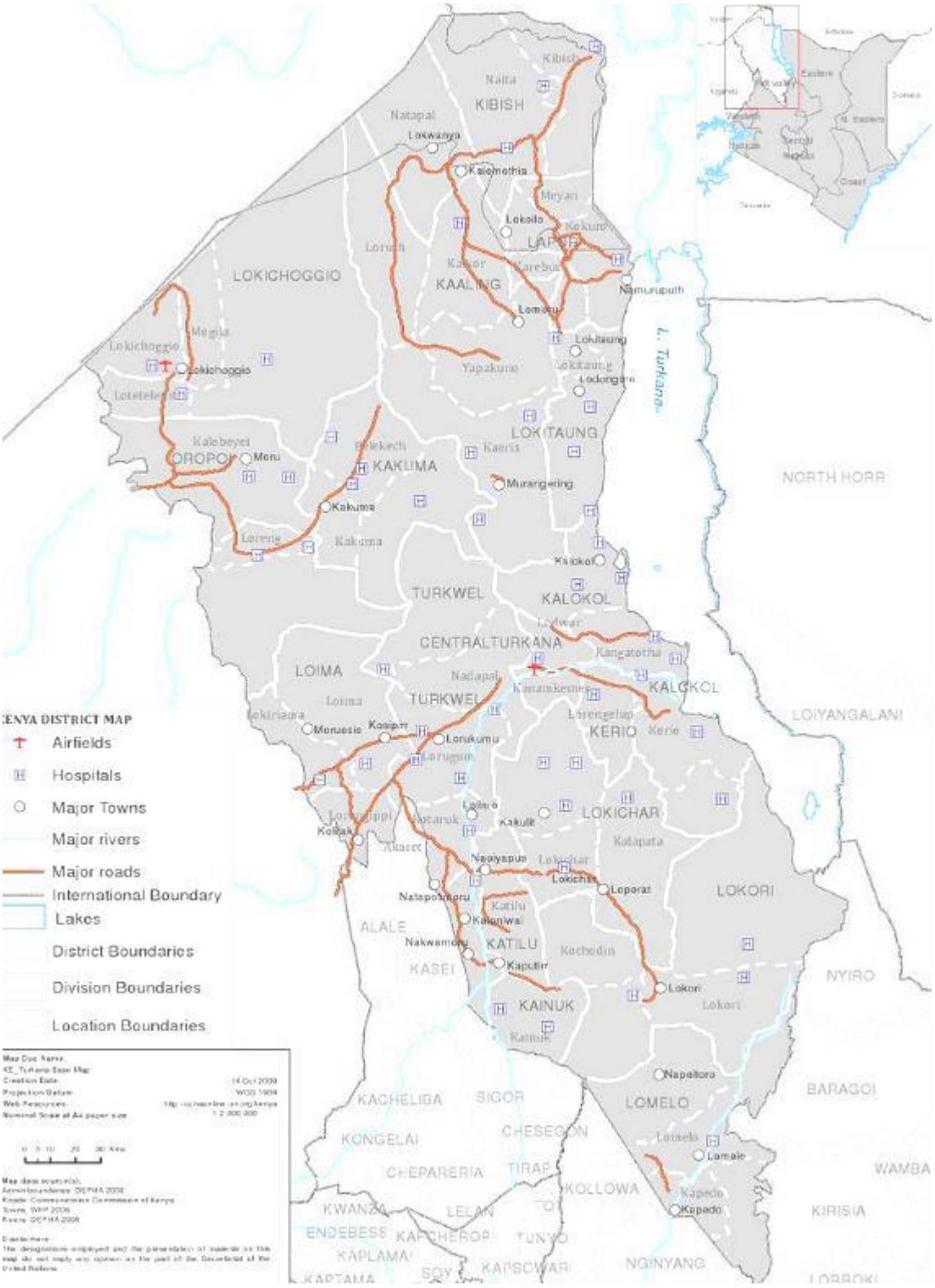
Turkana County is situated in North Western Kenya. It borders West Pokot and Baringo Counties to the south, Samburu County to the South East, and Marsabit County to the East. Internationally it borders South Sudan to the north, Uganda to the west and Ethiopia to the north east. The County shares Lake Turkana with Marsabit County. The total area of the county is 68,680.3 Km² and lies between Longitudes 340 30' and 360 40' East and between Latitudes 10 30' and 50 30' North. Turkana County constitutes six constituencies: Turkana North, Turkana East, Turkana West, Turkana South, Turkana Central and Loima.

Lodwar, the capital of Turkana County, is the biggest town in north-western Kenya. The town is a commercial centre whose principal activities are fish trade and basket weaving. Lodwar is the town where Kenya's first president, Mzee Jomo Kenyatta, and other political prisoners were detained for two years during the colonial period.

Lokichogio often called Loki, Lokichogio is situated about 30km from the Kenya-South Sudan border. Lokichoggio is basically a small commercial centre whose main activity is basket weaving. The town hosts UN offices and several non-governmental organizations (NGOs) such as World Vision, Oxfam-GB, among others.

Other major centres in Turkana County include Lokitaung, a remote outpost near the Ethiopian border; and Kakuma, which hosts the Kakuma Refugee Camp. The camp is home to over 100,000 refugees from neighboring countries, mainly Somalia and Sudan.

Map of Turkana County



Source; County Integrated Development Plan (CIDP)

3.2; PHYSIOGRAPHIC AND NATURAL CONDITIONS

3.2.1; Topographic Features

The physiographic features in the county include low lying open plains, mountain ranges and river drainage patterns. Lake Turkana is at an elevation of 360 meters while the surrounding basin is anywhere from 375-914 meters. The main mountain ranges of the county are Loima, Lorengippi, Mogila, Songot, Kalapata, Loriu, Kailong'kol and Silale mountains. The mountain ranges, because of their high elevation, are normally green, covered with dense bushes and high woody cover. The ranges support important economic activities like honey production, grazing during the dry season, wood production, and charcoal production. There are also water catchment sources thus supporting gum Arabica growing and small household *shambas*, The hills in the county consist of Tepes Hills in Kibish Division, Lokwanamoru Hills and Lorionotom Hills in Kaikor Division, Pelekech Hills in Kakuma Division and Loima Hills in Loima Division which are characterized by large forests.

The open lying plains consist of the Kalapata and Lotikipi Plains. The plains form part of the arid area in the County and receive the lowest amount of rainfall of around 180 mm per annum. These plains are dominated by dwarf shrub and grassland, which provide forage for livestock during and shortly after the rainy season. However, this forage dries rapidly at the onset of the dry season.

Rivers Tarach, Kerio, Kalapata, Malimalite and Turkwel are the major rivers in the county making them the most important with a potential of producing large amounts of food for the county, if properly utilized. Lake Turkana is the largest and most saline of the Rift Valley lakes. There is no outlet, and with reduced inflows and high evaporation this results into depositing of salt in the soil and capping on the surface. The water level is subject to three to four metres seasonal fluctuations. In total, the water level dropped 10m between 1975 and 1992. River Omo from Ethiopia which is permanent drains into Lake Turkana. The lake is situated on the eastern part of the county and has northern island and is endowed with a variety of wild animals namely: hippos, crocodiles and water fowls. Fishing is the major activity in the lake.

Soils in Turkana County are not well developed due to aridity and constant erosion by water and wind. Often they are capped by stone mantles. Colluvial soils tend to be reddish over the basement system and generally grey buff or white over the volcanoes. Aeolian soils are dune sands either active or fossil; Alluvial soils range from coarse sands to flash flood silts, while black or brown clays occur locally in areas of impended drainage.

3.2.2; Ecological Conditions

The county is endowed with the Lake which is a world heritage; it also has a number of rivers that flow into the lake. These include Rivers Turkwel and Kerio among others that are seasonal. The County also has several springs which are scattered across the county especially parts of the lake zones and the Turkana East.

There are insufficient details showing agro-ecological zones by Division but the zones in proportion can be estimated as below-

- Lower midland zone 5 (semi-arid) 3%
- Inner midland zone 4 (transition) 1%
- Inner lowland zone 5 (semi-arid) 16%
- Inner lowland zone 6 (arid) 42%
- Inner lowland zone 7 (very arid) 38%

The forest cover in the county is held in trust by the Local Government where communities utilize all natural resources without many restrictions. There is no gazetted or surveyed forest in the County.

Table 3.1 Land use Land Cover

LAND COVER	2015 Area (Ha)
Bare Area	205,284.30
Built Up	3,025.90
Cropland	3,274.40
Forestland	25,237.00
Grassland	2,634,989.00
Riverine	100,345.50
Shrubland	3,532,906.00
Water body	279,246.50
Wetland	251,095.50
	7,035,404.20

Source, Kaoga (2016)

3.2.3; Flora of Turkana County

The vegetation in this county is mainly scattered Acacia bush and a cover of annual herbaceous plants. The density of the woody plants increases on hilly ground. This vegetation pattern is repeated again and again until it becomes monotonous. However, it is punctuated by Maerua sp. and Acacia tortilis along the river-banks. Due to overgrazing the denuded area is dominated by Aristida mutabilis,Acacia refciens, Indigofera spinosa and Duosperma spp. Dwarf shrub land is also common in this area but it is also difficult to draw the boundary

line between these two types as the change is so gradual. Woody plants are hardly more than one meter in height except in depression areas where soil is deeper. This woody plants in this area is mainly *Acacia refciens,. A. horrida, Indigofera spinosa* and *Cadaba farinose.* These woody plants are a major source of food as they are heavily browsed. The grass species found in this county are *Chloris virgata, Eriochloa fatmensis, Eragrostis ciliaris, E. racemosa, Enneapogon cenchroides.* Grasslands in the northern part of this county are more palatable than those that are found on the southern side of this county.The area in the Lotikipi Plain and around Eliye Springs is extensively covered by grassland.

Along the Turkwel, Kerio and Tarach rivers the vegetation type is riverine. *Maerua crassifolia,* which is an evergreen shrub, marks the extent of the floods. *Acacia tortilis* dominates the vegetation and the third major species is *Ziziphus mucronata.* There are also *Acacia tortilis* which are sources of forage, especially for goats.There is also Bushland type vegetation which is found in the south of the county and along the border with Uganda. It is also found around Lokitaung and in an area north of Lokori in south Turkana.

Around Lake Turkana major flora are classified as dxeric shrub land. During moister times *Aristida adcensionis* and *A. mutabilis appears*. During drier times, the grass disappears. The shrub lands contain dwarf shrubs, such as *Duosperma eremophilum* and *Indigofera spinosa*. Near the lake are doum palms. A number of irrigation schemes have been proposed and some are being constructed, which are producing for the local people. Cash crops like cotton are also being considered. Other areas where forage crops could be grown are the proposed water spreading schemes (NORAD 1979). Forage plants that might be considered include alfalfa, *Chloris gayana, Panicum maximum* and *Cenchrus ciliaris.*

3.2.4; Fauna of Turkana County

Turkana County has a variety of large mammal that are common in Kenya's northern variety of plain games. All three species of the big cats are present in this county and can be seen hunting in the reserves with a good number of leopards always present in the wooded riverbanks areas and lions on both south and north of the river and always using shrubs and the small trees as their cover in their ambush. It is harder to spot cheetah in this region. Over the dry grasslands ranges a frail population of grazing mammals and predators. The grazers are chiefly Grevy zebra, Burchell's zebra, the beisa oryx, Grant's gazelle, the topi and the reticulated giraffe. Teleki reported seeing (and shooting) many. Closer to the dust is the cushioned gerbil (*Gerbillus pulvinatus*)
There is South Turkana National Reserve which houses elephant, leopard, oryx antelope, gazelle, warthog as well as an exceptionally high number of Kori bustard roam.There are also a variety of birds in this region but notably are the blues skinned Somali ostrich. Turkana ecosystem oasis of vegetation in this arid region supports a wide range of small birds. There are also helmeted and vulturine guinea fowl while among the many birds of prey are pygmy falcon and martial eagle from opposite ends of the raptor spectrum are both easily

seen, as are kori, Heuglin's and buff-crested bustards and also a lot of weavers, shikes, woodpeckers and flycatchers.

The Lake Turkana region is home to hundreds of species of birds native. The East African Rift System also serves as a flyway for migrating birds, bringing in hundreds more. The birds are essentially supported by plankton masses in the lake, which also feed the fish. Some birds more common to Turkana are the little stint, the wood sandpiper, and the common sandpiper. The African skimmer nests in the banks of Central Island. The white-breasted cormorant ranges over the lake, as do many other water birds. The greater flamingo wades in its shallows. Heuglin's bustard is found in the east of the lake region.

There are many Nile crocodiles in Lake Turkana which is also a home to many large water turtles, particularly in the area of Central Island. There are not many fish species particularly in Lake Turkana which is found in this county. Some of the fish species in this county are cichlids, robber tetras, Nile tilapia, bichirs, the elephantfish *Mormyrus kannume*, African arowana, African knifefish, *Distichodus niloticus*, the Nile perch, and others.

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3.2.5; Climatic Conditions

The County is arid and semi-arid and characterized by hot climate with mean temperature of 30.5 0C. The rainfall pattern and distribution is erratic and unreliable. Turkana receives two rainfall seasons with the long rains occurring between April and July while short rains fall between October and November with a range of 52 mm to 480 mm and an annual mean of 200 mm. The County is prone to frequent rain failure leading to massive loss of livestock and pasture. (Ministry of Interior and Coordination of National Government, 2014)

3.2.6; Population Characteristics

Turkana County has 855,399 people (male - 52.03% and female - 47.97%), according to the 2009 National Census. The Turkana people are the dominant community in the county, although several other tribes such as El Molo have settled there over the years.

The Turkana are nomadic pastoralists who mainly keep cattle, donkeys, camels and goats. The animals are their main source of food and wealth. The Turkana are the second largest pastoral community in Kenya after the Maasai people. On the other hand, the Elmoro people - who live on the southern shores of Lake Turkana, are the smallest ethnic group in Kenya with a population of about 300 people. They are said to have originated from either Somalia or Ethiopia and are renowned for their fishing and basket weaving skills.

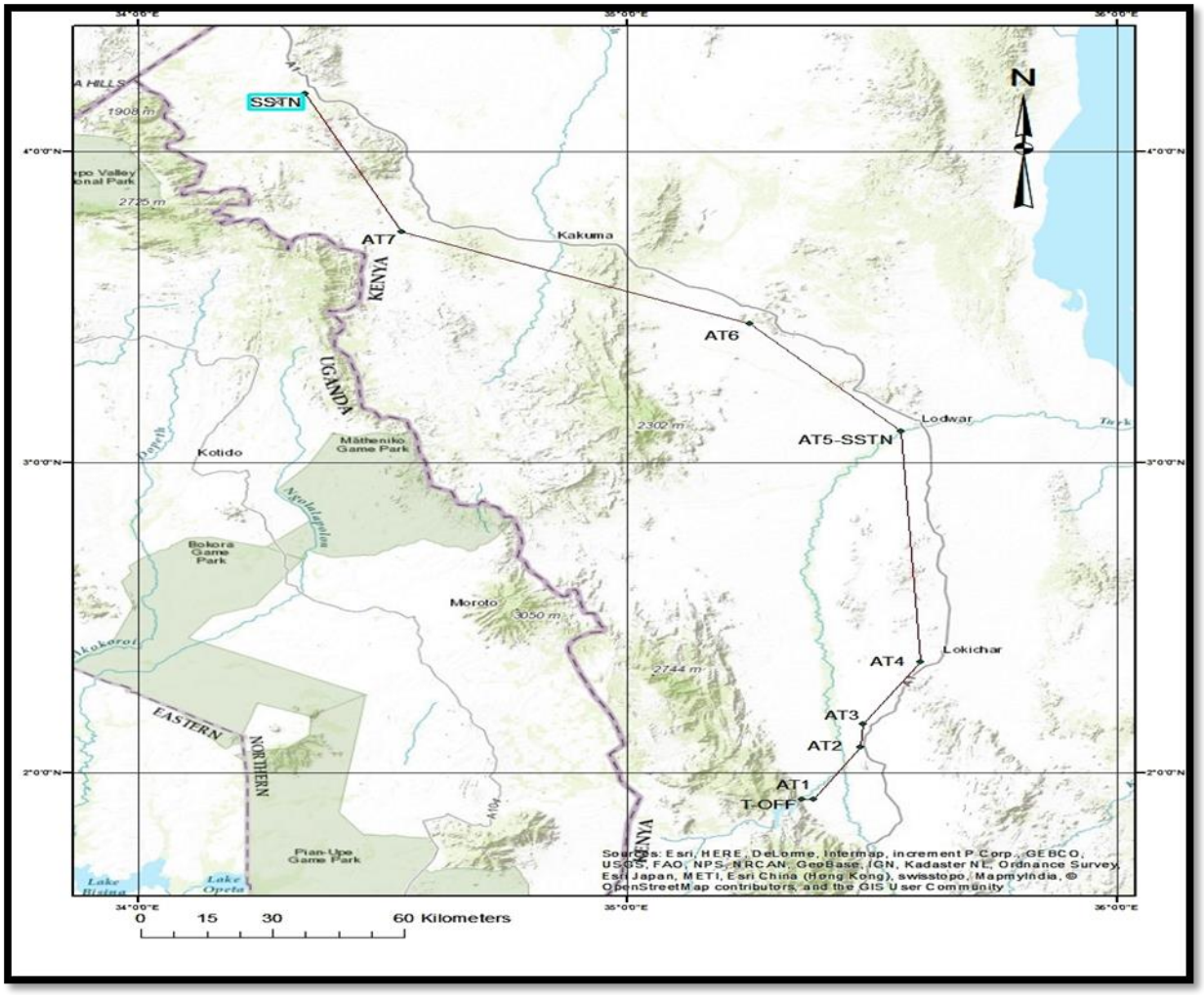
3.2.7; Economic Activities

Life in Turkana County revolves around livestock, Cattle, camels, donkeys, sheep and goats are a major source of income for the Turkana residents. Most farmers sell their animals to the Kenya Meat Commission particularly during severe drought.

Fishing is practiced in Lake Turkana, mainly by the El Molo people, with Nile perch and Tilapia being the main fish species found in the lake. Most fish are dried in the sun before being sold to brokers who come to the lake shores from Kalokol and Lodwar. Basket weaving is also a major income generating activity in the county, especially among women in Lodwar and other urban centers

3.3; PROJECT DESCRIPTION

The proposed transmission line starts in West Pokot County and runs Northward into Turkana County, power will be drawn from Turkwel Gorge Power station located off the A1 road, 2 km before Kaiunuk, and about 24 km off the road and terminates at Lokichogio about 310 km from take off. It runs along the Kainuk-Lokchar-Lodwar-Lokichogio road. The proposed line is a double circuit line (220Kv) that traverses Turkana County. The line will connect Turkana to the National Grid therefore improving reliability, cost of electricity among other benefits.



Transmission Line Route

3.3.1; Landscape and Visual Impacts

An environmental scoping exercise for the proposed project was initially carried out and key issues and impacts to be considered during the project cycle were identified, these included potential impacts on natural habitat, physical cultural resources, indigenous people and involuntary settlement. Significant impacts on the landscape were analyzed to bring out issues of concern during the construction and operation stages of the project. The transmission line traverses through a relatively untouched landscape and may result in negative impacts on the landscape through the introduction of new features or loss/modification of existing features, including clearing of vegetation. The proposed line may also create visual impacts as a result of changes in scenery of the landscape.

The visual impact of the power line is an effect on a socio-cultural level. From the perspective of a tourist seeking pristine natural environments, any infrastructure reminding of industrial society is disturbing. However,

from the perspective of rural populations, it may be seen as a sign of development, of hope that things will change for the better. Both these views are present in the development of infrastructure in Africa. Which of them shall prevail depends on political decisions, and on economic reasoning.

In summary, proposed development will also have minimal effects on the landscape. The Transmission route was established so as to meet the co-inhabitance requirements imposed by the natural landscape, objects, buildings, and facilities in the neighborhood, assuring it's framing into the existing landscape and with an impact on as limited land areas as possible.

Significant impacts on landscape during construction and operation of the proposed project were identified near scenic sites during the initial environmental scoping exercise. The scoping report thereafter recommended a landscape survey to be carried out along with other specialist studies which comprised of socioeconomic and flora /fauna surveys. The main objective of this specialist study is to therefore identify the impacts of this project on the landscape and propose mitigation measures to reduce visual impacts. The study also identifies monitoring and capacity requirements for implementing the suggested mitigation measure.

Substation at Turkwel

Proposed location for the substation at Lodwar

3.3.2 Review Results of Landscape Visual Impact within the Project Site

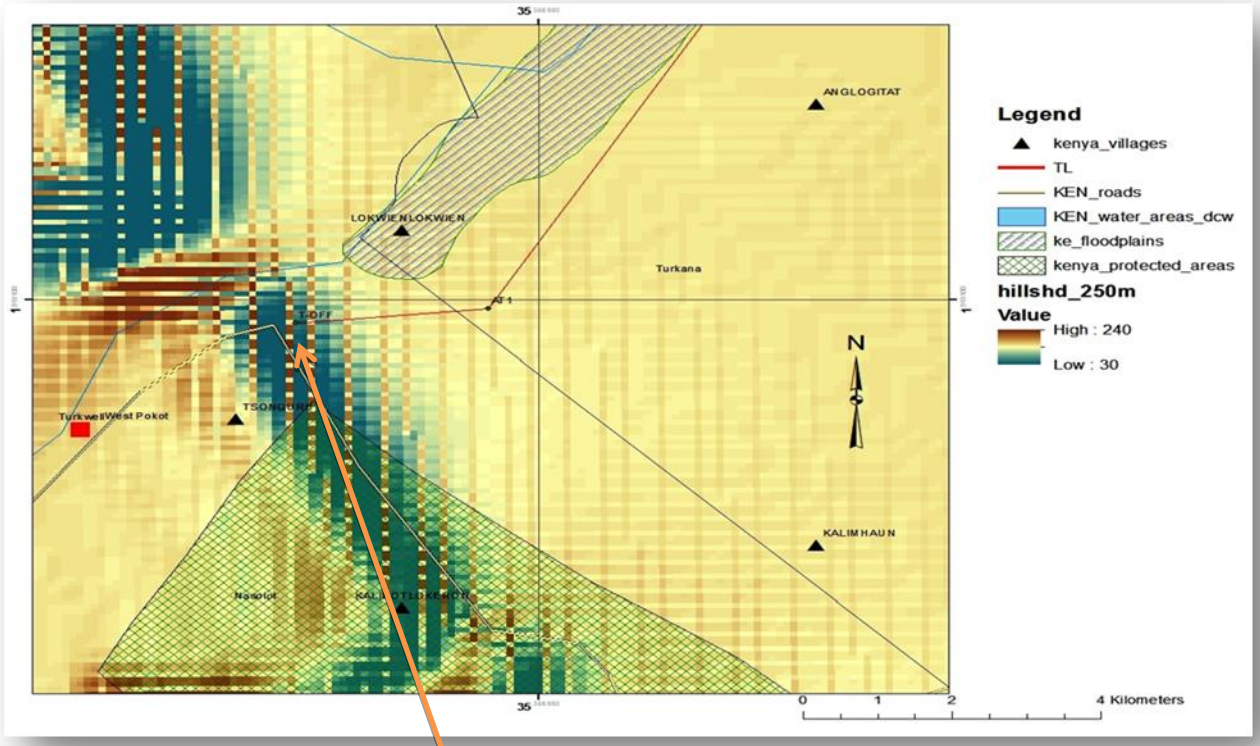
Landscape impacts have been described according to their significance (severity). The significance of the impact is determined through the magnitude of landscape change/impact by visual sensitivity. These impacts have been assessed using the matrix below. Only impacts judged to be of major significance (adverse) or highly significant (adverse) have been considered

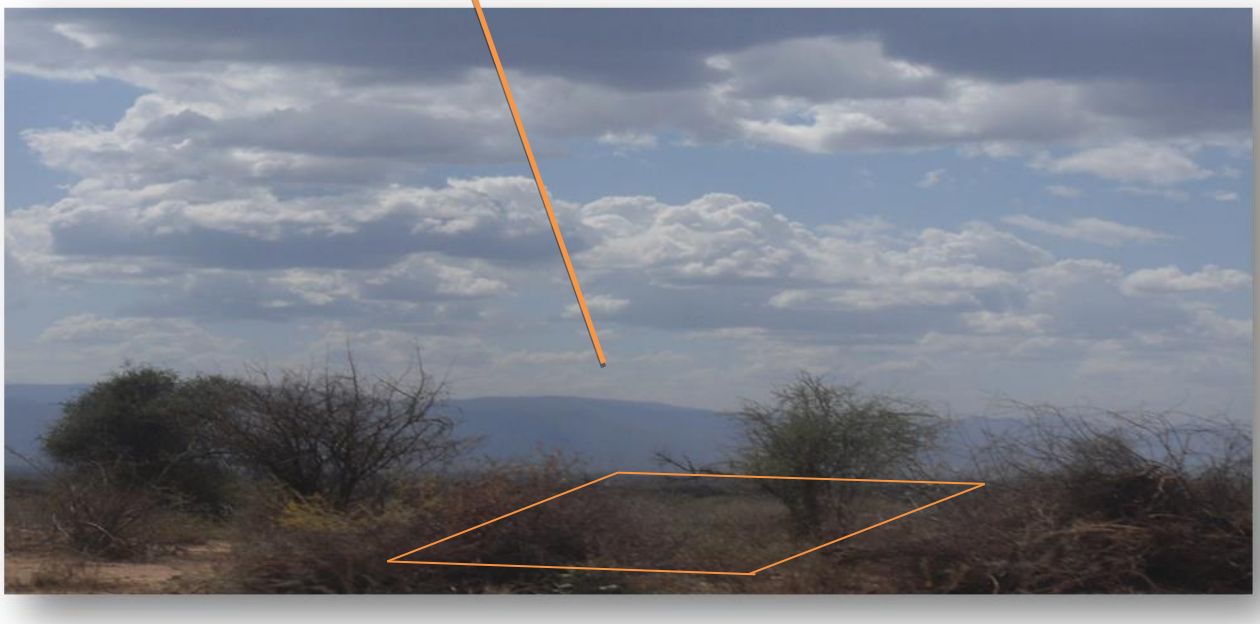
Table 3.2; Landscape Impact Matrix

		LANDSCAPE IMPACT			
		Large	Moderate	Small	Negligible
VISUAL SENSITIVITY	High	Major Significance	Highly significant	Moderately significant	Minor significance
	Medium	Highly Significant	Moderately significant	Minor significance	Not significant
	Low	Moderately significant	Minor significance	Not significant	Not significant
	Negligible	Minor significance	Not significant	Not significant	Not significant

3.3.3; Areas within and around Turkwel Gorge

Project Elements	The proposed transmission line will run in a north-eastern direction from Turkwel Gorge Plant within an area dominated by bushy shrubs. It is a few km from Nasolot Game Reserve (approx. 1.3 km from the Take Off). The landscape is where the Gorge is located elevated but rolls out into a plain northwards. Settlement is sparse as the area is a security sensitive zone since it is the ground where cattle rustling and tribal wars between the Pokot and the Turkana people have historically taken root with Kainuk Town being the major settlement next to the TL.
Landscape Impact	The TL will be a prominent feature to the landscape since there is no significant development in the area. There will be minimal loss of vegetation cover since the proposed Bay Extension substation will not result in the significant clearing of vegetation, mainly scattered shrubs. Clearance between the conductors and the vegetation will not be necessary within the shrub s dominated landscape. The impacts will be of moderately significant.
Visual Impact	The impact will be of medium sensitivity since this is a new power line. The landscape will have significant visual intrusion as a result of the visible TL.
Significance	Moderately significant.





Proposed take-off point near Anglogitat, Lokwein and Tsonguru villages the area is sparsely populated and the point lies within Turkwel Power station, visual sensitivity will not be significant as the point lies 1.37km from Nasolot Game Reserve to the North.

An ongoing TL project south of Turkwel Gorge. There is no High voltage TL in Turkana County, the proposed development will link Turkana to the National Grid.

Villages located near the Transmission line

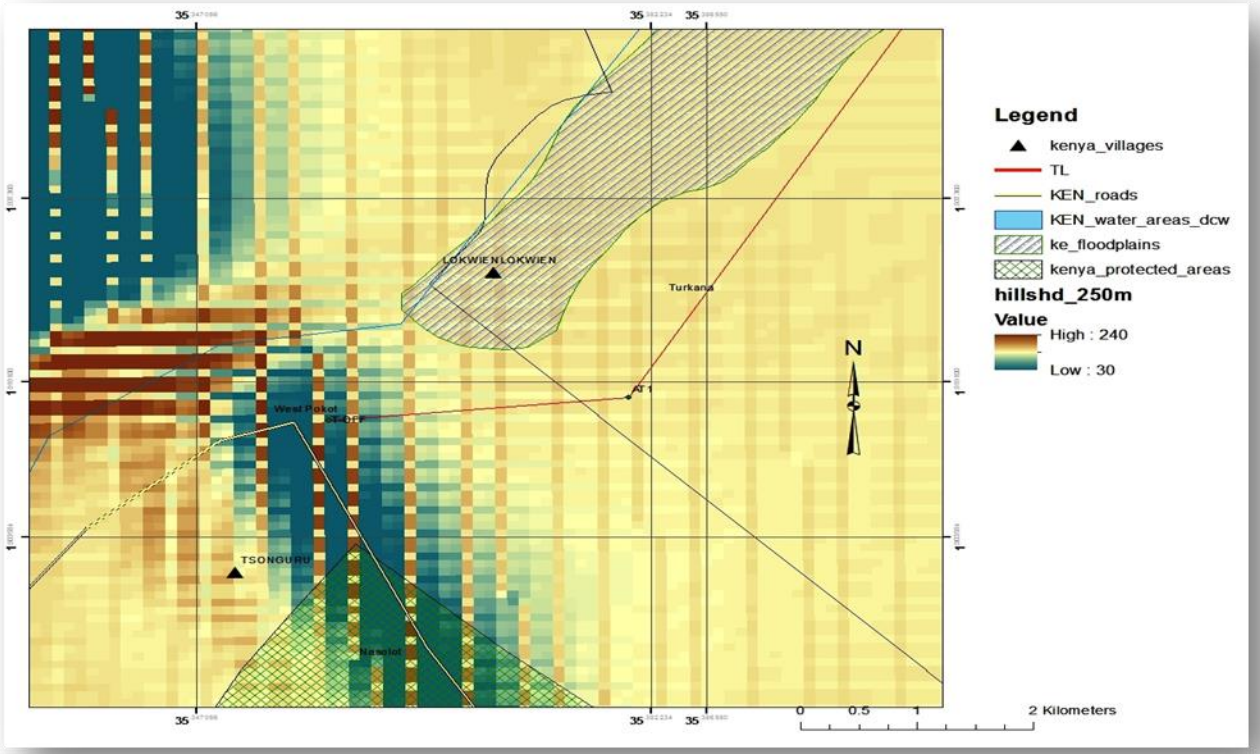
The introduction of the transmission line will have an impact on the visual sensitivity. However the take-off point is located far from the road (Kitale-Lodwar). It is about 20km from Kitale-Lodwar road.

Kakoongu Area: The area is dominated by woodland, the visual impact of the TL would not be significant as there is already existing power line (33kv) with a Rural Electrification Substation located at (36N, 0776631; 0235122) about 800m from the main road.

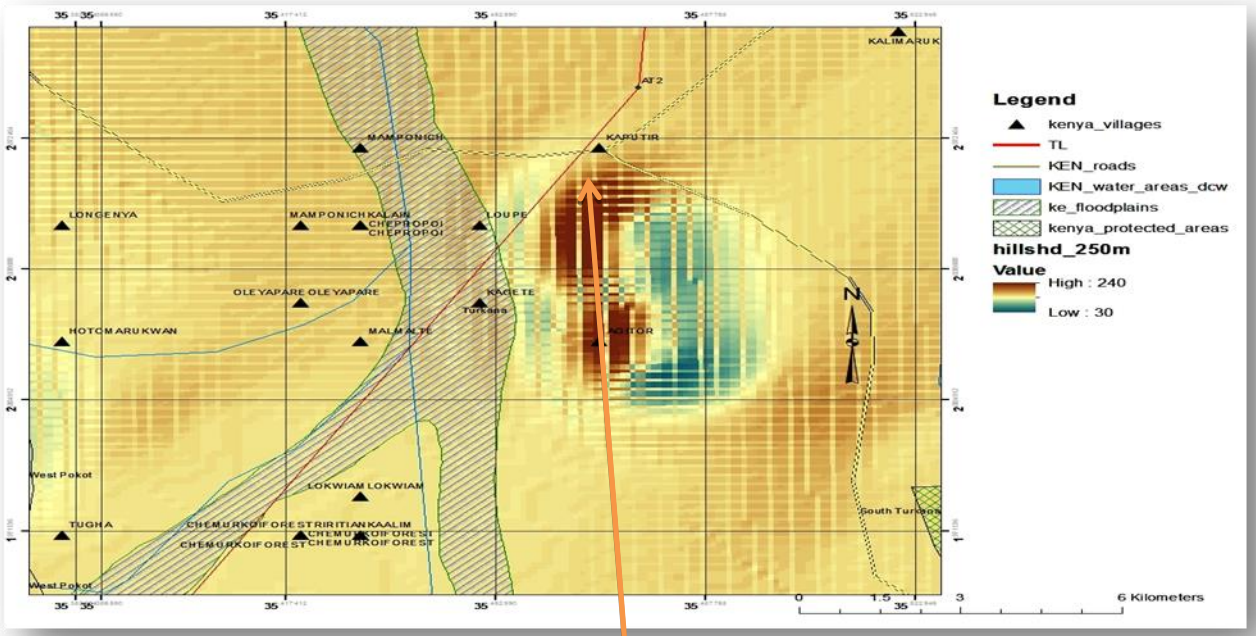
The landscape is characterized by short trees (2-3m). There is no undergrowth and the soil are poorly developed (Sandy)

3.3.4; Nasolot Game Reserve

Project Elements	The transmission line will pass Northern part of Nasolot Game Reserve, but it does not pass through the reserve, the nearest section (Take-off point) is 1.3 km away from the far most Northern boundary. The landscape is characterized by scatter shrubs and short trees. Settlement is sparse in this area.
Landscape Impact	The transmission line will not be a prominent feature since it is located away from the confines of the reserve therefore key ecological features will be intact.
Visual Impact	The impact will be of low sensitivity since there is an existing power line. The proposed project will not have any significant visual intrusion on the landscape in the reserve.
Significance	Not significant.



The transmission line is located some considerable distance from the park i.e. 1.3 km therefore having no impact on the landscape.



The area is sparsely populated and the proposed TL will come to view. At this point i.e. off the junction to Kaputir, the TL is 400m away. The visual impact is moderate as there is a 33 Kv line passing by the road, landscape impact will be moderately significant as the area is characterized by swath of shrubland with Acacia trees having a mximum of 3m height. Some of the villages that may be affected by the proposed development

include: Malnate, 800m from TL;Kagete, 500m from TL; Kaputir, 200m from the TL, Lowaim 1.3 km from the TL and Chemurkoiforest, 900m from the TL.

The TL passes over this spot, the area is sparsely populated and there were no settlement noted within (35.467E 2.069N). Simulation of the visual impact of the proposed line on the landscape

The junction heading to Kaputir, there is a distribution line by the roadside (33 Kv)

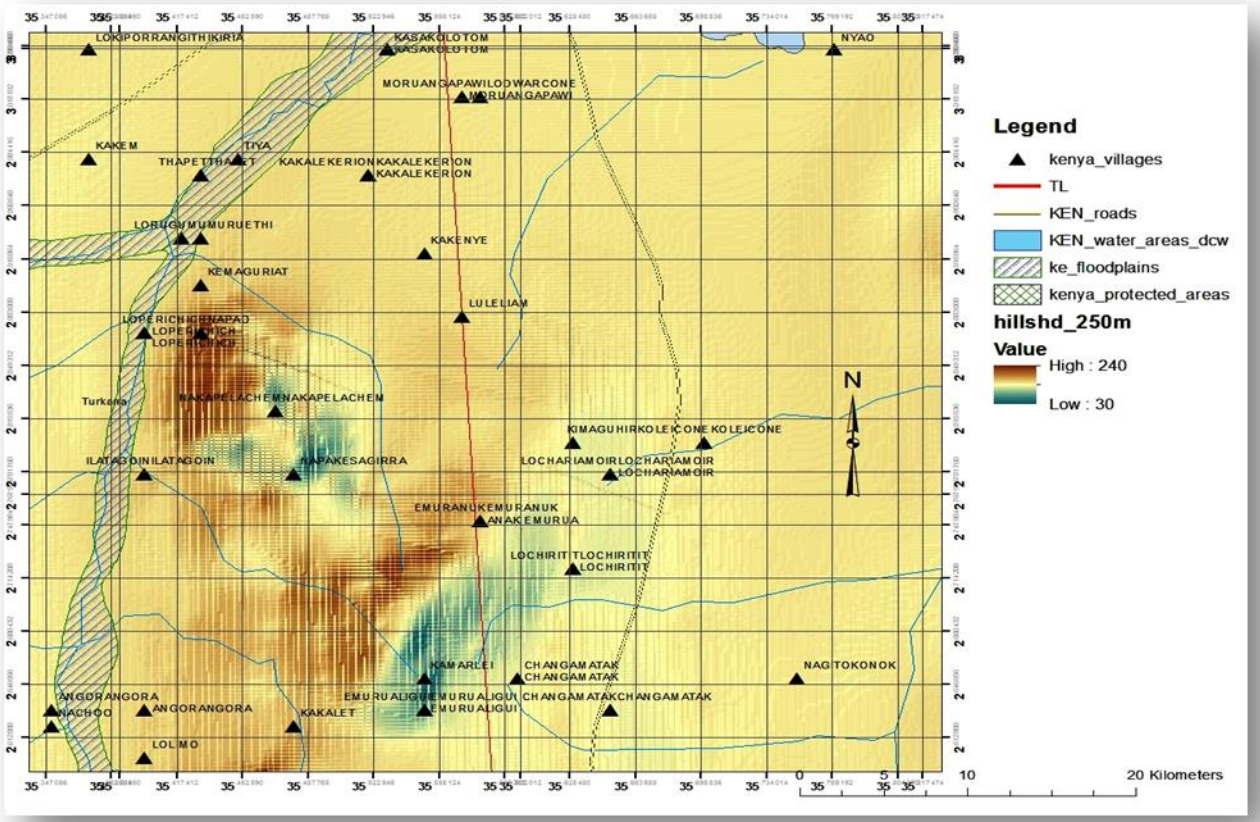
Road to Kaputir, the land is plain with no major settlements. The key socio-economic feature noted in this area was pastoralism.

Rural Electrification Authority Substation (36N, 0776631, 0235122) located by the road side. It is 900m from the TL

3.2.5 Areas between Kaputir junction and Lokichar

Project Elements	The transmission line passes on the left side of the principal line of sight; however, it will not be visible from the main road since it is quite far
Landscape Impact	The transmission line will not have a significant impact on the landscape since it passes through a plain characterized by scrubland. There will be no need for

	clearing of bushes as most vegetation is less than 3m tall
Visual Impact	The impact will be of low sensitivity since there is an existing power line by the road side and also, it is located far away from the line of sight.
Significance	Not significant.



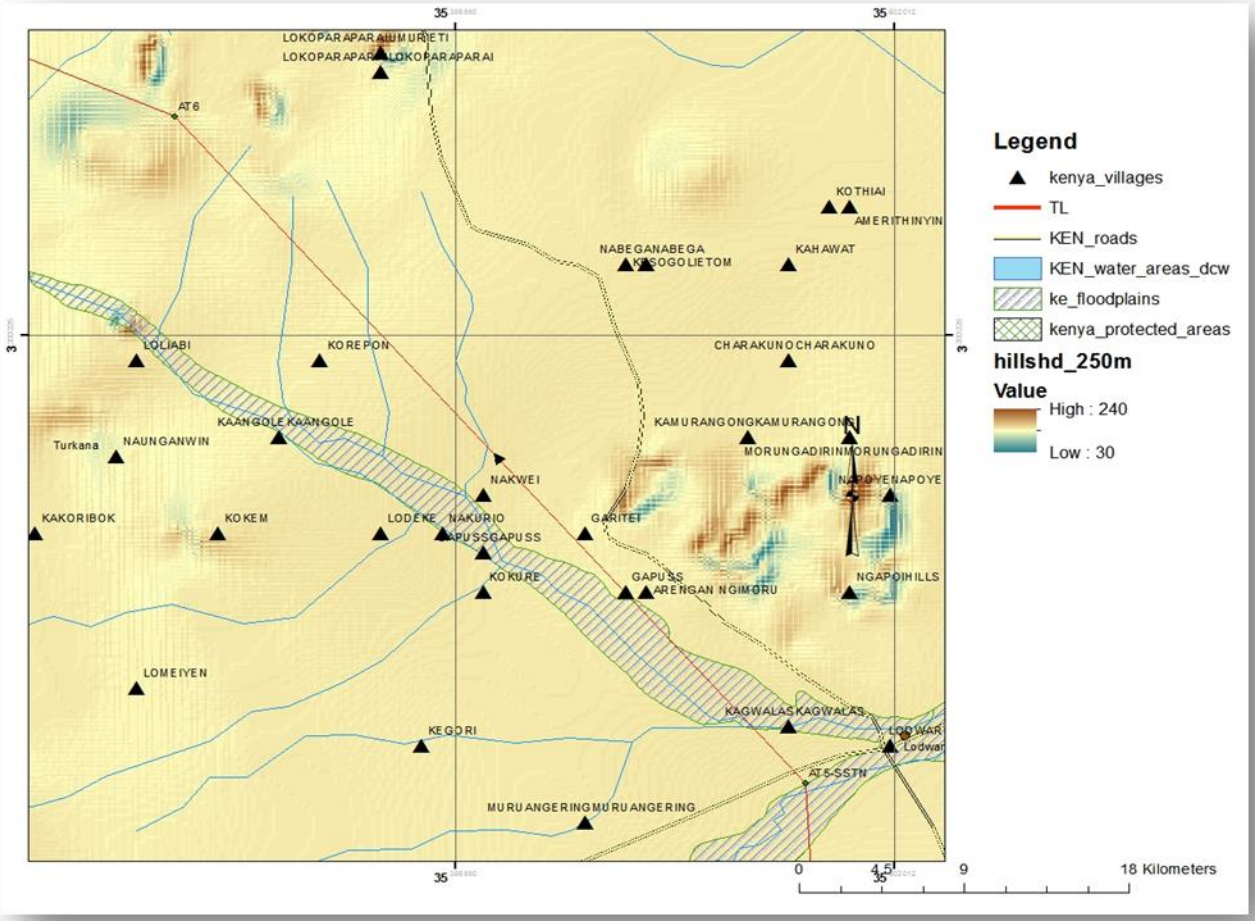
Some parts of the plain are rocky, scrubland with no undergrowth (Lokichar to Kasuroi). The area is sparsely populated with few of the villages lying very close to the TL, for instance, Luleliam is 5m from the TL; Anak Emurua is 27m from the TL and Moruangapawi is 80m from the TL.

There is no major development along the TL, key features that may be affected were few villages (about 3 villages)

Some of the villages along the TL

3.3.6; Lodwar Environs

Project Elements	From Lodwar, the transmission line goes North West towards Lokichogio, it will not be visible from the road. The distance of the TL from the road increases as it heads towards Kakuma.
Landscape Impact	The impact will not be significant on the landscape since it passes through a plain characterized by scrubland and some grassland. There are no forests on this section. Therefore, impact is minimal as there is no need for clearing of vegetation for RoW.
Visual Impact	The impact will be of low sensitivity since it is located far away from the line of sight.
Significance	Not significant.



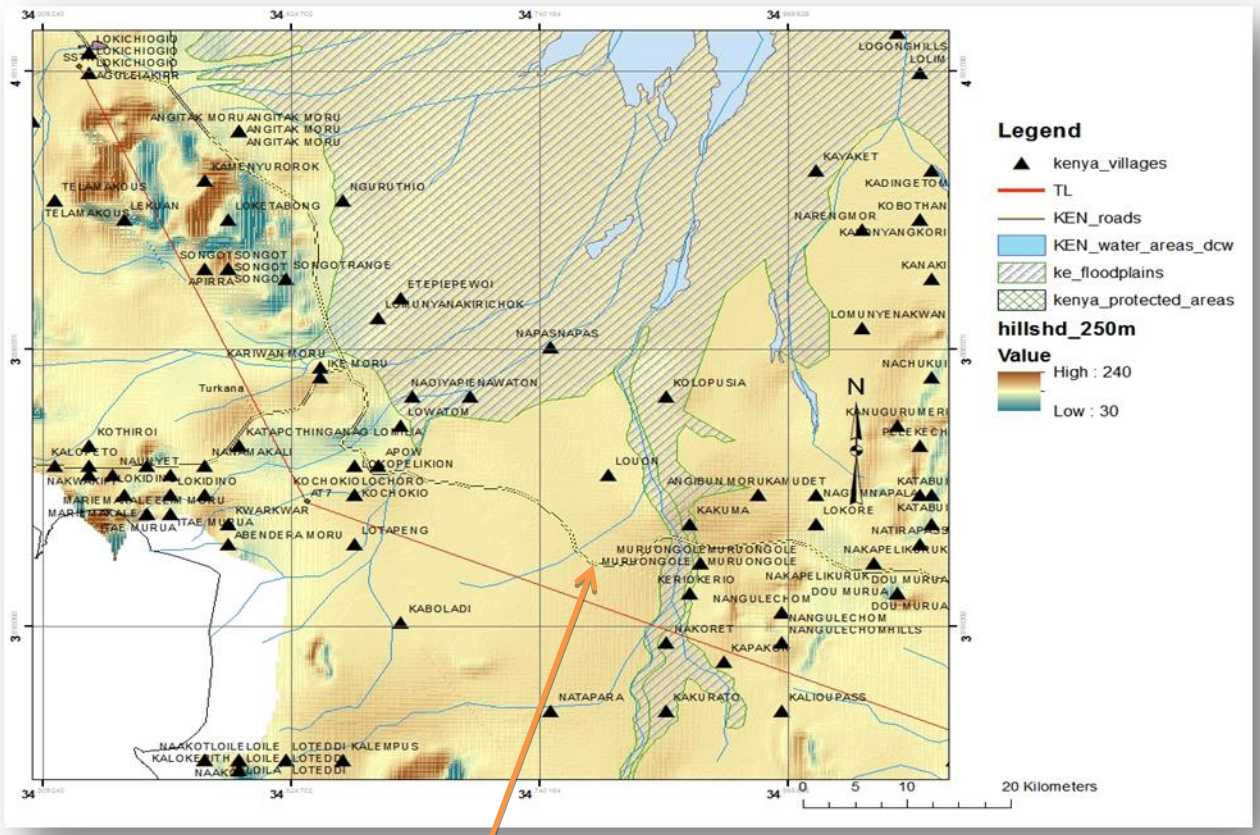
The terrain is characteristically flat with sparse vegetation. Villages that would be adversely affected by the project are Arenga Ngimoru, 700m from the TL and Gapuss located on the path of the TL

Sections characterized by no undergrowth. The soils are not well developed and the landscape was noted to have a number of laggas (dry river beds

Dry river bed, a common feature on the route to Lokichogio. Other Laggas were seen at 36N 0700526, 0411066; 36N 0705418, 0410561; and 36N 0671929, 0440856.

3.3.7; Areas between Kakuma and Lokichogio

Project Elements	The proposed TL will be 5km from Kakuma (around Kalobeyei junction), there are transmission lines from are REA substation (36N 0675416, 042583) where the offices are located Natira Centre therefore the TL will not be a new feature on the landscape. At Lokichogio, the proposed substation will be located approximately 2km from the junction heading to Lokichogio Airport.
Landscape Impact	The TL and the sub-station will not be new feature to the landscape, and therefore not a prominent new feature to the landscape. The landscape impact will be insignificant since the existing T/L sub-station has already changed the landscape character (Kakuma and Lokichogio) and it will be localised at one place. It is anticipated that the project will result in negligible landscape impact.
Visual Impact	The receptors sensitivity will be low. The T/L bay sub-station will not be a new feature in the landscape. The significance of the visual intrusion will be low.
Significance	Not significant.



The road to Kakuma and Lokichogio, the landscape is undulating with scrubland being prominent on the terrain. There is sparse settlement and the line has avoided passing through major settlements, on average, the line is more than 5km from the road and only comes close while approaching Lokichogio town (2km from the TL)

Undulating plain covered with rocks in some sections, the highest hill rise to about 4000ft on your way to Lokichogio. Settlement in this area is cat the main centres such as Gold, Kakuma (hosts refugee camps) and lokichogio. The rural community has settled in villages/kraals that are far from another.

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 Act 1999, 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 Act 1999 prevails.

4.4.1 The Environment Management and Co-ordination Act, 1999

Provides for the establishment of appropriate legal and institutional framework for the management of the environment and related matters. Part II of the Environment Management & Coordination Act, 1999 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 1999 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 o 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. The Act has the following functions among others:

- Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapours, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.
- 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 materials 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 expected to become the main policy maker and enforcer in the energy sector. This commission among other things shall be responsible for issuing all the different licenses in the energy sector.

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

4.4.15 Land Acquisition Act (Cap. 295)

This Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

- Area of land acquired,
- The value of the property in the opinion of the Commissioner of land (after valuation),
- Amount of the compensation payable,
- Market value of the property,
- Damages sustained from the severance of the land parcel from the land,
- Damages to other property in the process of acquiring the said land parcel,
- Consequences of changing residence or place of business by the land owners,
- Damages from diminution of profits of the land acquired.

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

4.4.16 The Registered Land Act Chapter 300 Laws of Kenya:

This Act provides for the absolute proprietorship over land (exclusive rights). Such land can be acquired by the state under the Land Acquisition Act in the project area.

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

4.4.17 The Land Adjudication Act Chapter 95 Laws of Kenya

This Act provides for ascertainment of interests prior to land registrations under the Registered Land Act.

The Proponent has undertaken a survey and commissioned a study which complies with the provisions of the Act. Public consultations have also been undertaken extensively in the affected project area.

4.4.18 The Antiquities and Monuments Act, 1983 Cap 215

The Act aim to preserve Kenya's national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums of Kenya is the custodian of the country's cultural heritage, its principal mission being to collect, document, preserve and enhance knowledge, appreciation, management and the use of these resources for the benefit of Kenya and the world. Through the National Museums of Kenya many of these sites are protected by law by having them gazetted under the Act.

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

4.4.19 The Civil Aviation Act, Cap 394

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.

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.

4.5 INTERNATIONAL OBLIGATIONS

4.5.1 World Bank's Safeguard Policies

Relevant World Bank Safeguard policies for this project include;

1. OP 4.01; Environmental Assessment
2. OP 4.04 - Natural Habitats
3. OP 4.10 - Indigenous Peoples
4. OP 4.11 - Physical Cultural Resources
5. OP 4.12 - Involuntary Resettlement

The Proponent shall comply with the provisions of the safeguard policies

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.

The Proponent shall comply with the provisions of this convention

4.5.3 United Nations Convention on Biological Diversity, 2000

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

The Proponent shall comply with the provisions of this convention

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

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

The Proponent shall comply with the provisions of this convention

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1; INTRODUCTION

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

The specific objectives for consultation process were to:

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

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

5.2: IDENTIFICATION OF STAKEHOLDERS

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

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

5.3: APPROACH TO STAKEHOLDER CONSULTATIONS

A detailed stakeholder's consultation for this study was undertaken from the 10th to 20th September 2016. These consultations were conducted in the form of:

5.3.1 Key Informant oral Interviews:

The following people were consulted:

KAKUMA

- Human Resource Officer, Windle Trust
- Assistant Program Officer, Refugee Consortium of Kenya
- Area Manager, Danish Refugee Council
- Area Coordinator, National Council of Churches of Kenya
- Film Training Program Coordinator, FilmAid
- Programme Support Officer, Action Africa Help International
- Water Officer, Turkana West Sub-County County Ministry of Water, Irrigation and agriculture
- Chief, Kakuma Sub-location
- Assistant Chief, Kakuma Sub-loaction
- Village Elders, Kakuma Sub-loaction

LOKICHOGGIO

- Public Health Officer, Lokichoggio, Turkana West Sub-County
- Assistant County Commissioner, Lokichoggio, Turkana West Sub-County
- Chief, Lokichoggio Location
- Assistant Chiefs, Lokichoggio and Lokariwuon Sub-locations
- Village Elders, Lokichoggio and Lokariwuon Sub-locations

LODWAR

- Senior Warden, Kenya Wildlife Service, Lodwar
- Sub-county Ecosystem Coordinator, Kenya Forest Service
- Physical Planner, County Ministry of Lands
- Director of Livestock, County Ministry of Pastoral Economy and Fisheries
- Chief Officer, County Ministry of Pastoral Economy and Fisheries
- Director of Water, County Ministry of Water, Irrigation and Agriculture

- Technical Services Manager, Lodwar Water and Sanitation Company
- Ground Water Officer, Water Resources Management Authority
- Water Resource Officer, Water Resources Management Authority
- Programme Officer, Feed the Children, Lodwar
- Administration Officer, MercyCorps
- County Programme Coordinator, German Firm GIZ
- Assistant Programme Officer, Refugee Consortium of Kenya
- Human Resource Manager, Oxfam
- EIA Expert, County Ministry of Energy and Environment
- Administration Officer, Office of the Governor
- Special Programs Officer, Disaster Management
- Deputy County Commissioner, Turkana Central
- Assistant County Commissioner, Turkana Central
- Chief, Lodwar Township
- Assistant Chiefs, Township, Nakwamekwi and Kanamkemer
- Village Elders, Township, Nakwamekwi and Kanamkemer

LOCHEREMOIT (GOLD)

- Retired Senior Chief, Lochwaa Location
- Village Elders, Locheremoit Sub-location

LOKICHAR

- Tullow Oil Officials
- Assistant County Commissioner, Turkana East Sub-county
- Chief, Lokichar Location
- Village elders, Lokichar Location

KAINUK

- Chief, Kainuk Location
- Village Elder, Kainuk Location

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 17 respondents were received.

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 200 respondents were received.

5.3.4 Public Baraza

Public barazas were held in Kakuma, Lokichoggio, Lodwar, Locheremoit (Gold), Lokichar and Kainuk 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.

The issues and benefits as identified by the participants are highlighted below;

KAKUMA; at Chief's Office on 14TH September, 2016; at 10:00 pm)

QUESTIONS/ ISSUES	BENEFITS/ REMARKS
The project installation should be hastened	It will promote business activities
Civic education about the power should be given to area residents	It will reduce insecurity in the county through efficient lighting
The project should be implemented as soon as a license is issued	It will reduce high cost of existing diesel-power
Presence of the ESIA team seen as an advertisement of the company	Employment opportunities will be created
Difference between the diesel-power and hydropower	There will be available power
Connection process and how they will use the power	There will be efficient and reliable power

Turkwel power station was constructed in 80s but power was not transmitted to Turkana County; why it took so long to transmit power to Turkana County.	Improve the living standards of community members
Elimination of the existing diesel-generated power.	There will be improved communication in the region
	Improved water supply
	Increased times spent in schools to study
	There will be reduced power outages




LOKICHOGGIO; at the Market Ground; on 14th September, 2016; at 2:00pm)

ISSUES RAISED	BENEFITS
The proposed project should be considerate	The proposed project is part of development

of people's livelihoods (homes, grazing lands, water sources, etc)	in the county
The project should reduce the cost of power charges	The proposed project will boost the economy of Lokichoggio since most households will be able to connect to the available and affordable power
Need for another power source while the county already has some	Environmental conservation will be improved
Efficiency of the transmission line.	There will be increased businesses in the area
High connection charges.	It will be efficient than the generator-powered
Project duration.	The town's economic status will be uplifted
Road construction to come before power transmission.	Improved security in the area through efficient lighting.
Difference between REA, KETRACO and Kenya Power.	Increase in employment opportunities
Powering interior villages apart from towns.	Heavy industries can be set up in the area
	It will boost the already existing diesel-generated power
	The proposed project will strengthen the network activities within the county
	Communication in the county will be enhanced

LODWAR; at Town Center; on 19th September, 2016; at 9:00am)

ISSUES	BENEFITS
Some of the qualified skilled youth should be employed by KETRACO	The proposed project will open up Turkana County
The proposed project should start immediately after a license is issued.	Enhance security in the county through efficient street lighting
The properties of the community members that will be negatively affected by the proposed project should be compensated	Increase in business opportunities
Duration of the project to completion.	It will create employment opportunities in the region
There is power currently but people are still not connected to it.	Enhance water supply and availability due to reliable power to pump water within the area
National Government project or county government project?	It will increase time spent in schools during studies
How the power will be distributed.	The cost of power related opportunities will reduce
Assurance that the power will reach Lodwar.	Communication in the county will be enhanced
	The hydro-power will be more affordable than the existing diesel-power

LOKICHAR; at Chief's Office; on 19th September, 2016; at 9:00am)

QUESTIONS/ ISSUES	BENEFITS/ REMARKS
The proposed project should kick off immediately after implementation	Enhance security in the county through efficient street lighting
Properties of the community that will be negatively affected by the proposed project should be compensated	Increase in business opportunities
Create awareness to the community to evaluate the impacts of electricity and its importance to the user or consumer	Enhance water supply and availability due to reliable power to pump water within the area
Difference between KENGEN, KETRACO and Kenya Power.	It will create employment opportunities in the region
	It will increase time spent in schools during studies
	The cost of power related opportunities will reduce
	Communication in the county will be enhanced
	The proposed project will improve the living standards of the people of Turkana County
	The hydro-power will be more affordable than the existing diesel-power


LOCHEREMOIT (GOLD); at the Village Playing Ground; on 19th September, 2016; at 9:00am)

ISSUES	BENEFITS
The properties of community members who shall be negatively impacted by the proposed project should be compensated	Employment opportunities will be created
Residents of the areas where the transmission line will pass should be employed equally	Increase in business opportunities
Whether the Transmission path is along the roads or interior.	More study times in schools due to efficient and reliable power for lighting
Turkwel power station was constructed in 1986 but power was not transmitted to Turkana County; why it took so long to transmit power to Turkana County.	Improved security due to efficient lighting



KAINUK, at Chief's Office; on 20th September, 2016; at 10:00am)

ISSUES	BENEFITS
Subsidising the connection rates to the residents of Turkana County	It will enhance security through efficient lighting
The project should start immediately after being implemented	It will improve the livelihoods of the people of Turkana
Compensation of property traversed by the transmission line.	Human-wildlife conflict will be managed
Payment rate for those who will be employed.	The times spent in school will increase due to longer times to study
KETRACO, REA, KENGEN and Kenya power working relationship.	Job opportunities will be created
Where to apply for electricity connection.	It will be efficient and reliable unlike the diesel-powered generators
	It will open up major towns in Turkana County and make them 24 hour economy
	It will be more affordable than the diesel-power




5.4: OUTCOME OF THE STAKEHOLDER CONSULTATIONS:

5.4.1: Important Issues as raised by key informant

- The aesthetic value of the environment will be affected.
- The proposed project ought to be implemented in an environmentally appropriate way with minimal damage and a soft footprint.
- The residents have been exploited for a long time by private suppliers of power who own diesel-powered generators in various towns. There is need to bring all stakeholders on board.
- Residents of the county should be made aware about trespassing to the project sites.
- Proper management of hazardous substances, especially by community members who are not aware.
- Erratic rainfall patterns (too much rain) may lead to flooding and possible electrocution.
- Power lines should be high enough to minimize accessibility to community members.
- Heighten security of the sub-stations through live fences and qualified security personnel.
- Conserve grazing lands that belong to community members.

- KETRACO should educate members of the community about the dangers of the transmission line since there are high illiteracy levels in the county.
- KETRACO should come up with a rational waste management plan when the project kicks off.
- The power should serve the communities as well and not just the major towns in order for the impact to be felt across the entire county.
- The results of the ESIA should be shared with the relevant stakeholders in Turkana County.
- There is need to sensitize the community on the project so that they own the process and avoid conflicts of the natural reserves, for example, trees that may be removed on the way-leave.
- The power line should avoid community water points for example, water pans, boreholes and laggas.
- The proposed project will affect migratory birds.

5.4.2: Some of the benefits as identified by key informants

- The project will increase power availability hence development of the county and job creation and upgrading of diesel-powered boreholes.
- The proposed project will enable efficient and reliable water supplies due to constant power supply.
- There will be reduced power outages.
- The proposed project will connect Turkana County to the rest of Kenya and businesses and other economic activities will thrive.
- Energy cost will reduce as compared to the current energy cost.
- Electrification is one of the first steps towards modernizing Turkana County and it will promote economic growth and increase living standards.
- The proposed project will be a lifeline for the residents of the county in terms of attracting investment in new businesses and social amenities.
- It will also reduce cost of doing business in the county.

5.4.3: Important Issues as raised by the community

- The proposed project should be considerate of people's livelihoods (homes, grazing lands, water sources, etc)
- The properties of community members who shall be negatively impacted by the proposed project should be compensated
- Local residents of the areas where the transmission line pass should be employed
- The project should start immediately after being implemented
- Subsidising the connection rates to the residents of Turkana County

- Create awareness to the community to evaluate the impacts of electricity and its importance to the user or consumer.

5.4.4: Some of the benefits as identified by the community

- Employment opportunities will be created
- Increase in business opportunities
- More study times in schools due to efficient and reliable power for lighting
- Improved security due to efficient lighting
- It will improve the livelihoods of the people of Turkana
- Human-wildlife conflict will be managed
- It will be efficient and reliable unlike the diesel-powered generators
- It will be more affordable than the diesel-power
- It will open up major towns in Turkana County and make them 24 hour economy
- Communication in the county will be enhanced
- The cost of power related opportunities will reduce
- Enhance water supply and availability due to reliable power to pump water within the area
- There will be reduced power outages
- It will boost the already existing diesel-generated power
- Heavy industries can be set up in the area
- The proposed project will boost the economy of Turkana County since most households will be able to connect to the available and affordable power
- The economic status of related towns will be uplifted.

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 resettled due to the project) or an appointee of the project proponent, specifying the procedures to be followed and the actions to be taken to properly resettle and compensate affected people and communities.

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

The Turkwel – Lokichar – Lodwar – Likichoggio 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 RAP, a census survey was carried out to identify the 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 census was, however, limited to the 40m way – leave corridor.

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

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

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

This RAP report, therefore, is an indicative Resettlement Action Plan and should form a guide to a more elaborate RAP to be conducted by the project proponent immediately before project construction phase. It 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). The report 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 structures. The report also contains a comprehensive Terms of Reference (TOR) to be used by the project proponent for an elaborate RAP immediately before the construction phase.

6.5: RESULTS

From the census results, the 40m corridor over the distance of 330km of the transmission line will affect a total of 172 households with a total of 370 PAPs. A total of 209 different types of structures will have to be relocated and this will cost KETRACO approximately Ksh. 119,580,000

The table below gives detail of the census.

Table 6.1; RAP census results

Location	PAPs		Structures		Valuation (Ksh.)
	Households	Total PAPs	Type	Number	
T-OFF – AT1	4	13	Manyatta	3	150,000
			Small structure[1]	1	50,000
			Temporary structure[2]	2	500,000
			Permanent structure[3]	0	0
AT1 – AT2	10	41	Manyatta	12	600,000
			Small structure[1]	6	930,000
			Temporary structure[2]	0	0
			Permanent structure[3]	0	0
AT2 – AT3	0	0	Manyatta	0	0

			Small structure[1]	0	0
			Temporary structure[2]	0	0
			Permanent structure[3]	0	0
AT3 – AT4	4	11	Manyatta	4	200,000
			Small structure[1]	0	0
			Temporary structure[2]	0	0
			Permanent structure[3]	0	0
AT4 – AT5	6	21	Manyatta	5	250,000
			Small structure[1]	1	50,000
			Temporary structure[2]	2	1,200,000
			Permanent structure[3]	0	0
AT5 – SSTN	16	42	Manyatta	4	600,000
			Small structure[1]	9	1,050,000
			Temporary structure[2]	3	1,500,000
			Permanent structure[3]	1	7,000,000
SSTN	0	0	None	0	0
SSTN – AT6	117	205	Manyatta	93	4,650,000
			Small structure[1]	21	10,500,000
			Temporary structure[2]	13	10,400,000
			Permanent	10	60,000,000

			structure[3]		
AT6 – AT7	4	9	Manyatta	0	0
			Small structure[1]	3	150,000
			Temporary structure[2]	4	2,800,000
			Permanent structure[3]	0	0
AT7 - SSTN	11	28	Manyatta	3	150,000
			Small structure[1]	7	850,000
			Temporary structure[2]	0	0
			Permanent structure[3]	2	16,000,000
SSTN	0	0	None	0	0
Total	172	370		209	119,580,000

Small structure[1] - include; huts, toilets, animal sheds, stores/granaries etc

Temporary structure[2] - include; mud and timber walled houses with iron-sheet roofing, etc

Permanent structure[3] – include stone, brick, and block walled structures

6.6: TERMS OF REFERENCE (TORS)

KETRACO will be required to conduct an elaborate RAP immediately before the project construction phase. The following Terms of Reference (TORs) will be useful to ensure the RAP is elaborate enough, effective, and contain all important components in line with local legislations and the World Bank Safeguard policies.

6.6.1; Objective of the Study

The objective of the study is to carry out a detailed Resettlement Action Plan (RAP).

6.6.2; Scope of Study

The Project Scope will include carrying out a baseline Socio-Economic Survey on the people affected, valuation of structures, land, crops and trees, Compensation Mechanism, Conflict Redress Mechanism and a report detailing all these variables.

The valuation of structures and land must be done by a registered and licensed valuer.

6.6.3; Study Tasks

Task 1: Carry out a detailed survey on the actual number of people to be affected by the proposed line

- A concise description of project area including location of the project area and the number of people to be affected by the project in each location or district
- Undertake a socio-economic baseline survey of the people affected by the project
- Description of categories of people to be affected; partially or wholly taking into account gender, vulnerability and other diversity concerns.
- Identify all the people to be affected (PAPs) on the entire trace of the line providing their names with their official identification as in the National Identity card, phone contacts and physical contacts (street/estate, village, sub-location, location, District and County).

Task 2: Carry out a detailed evaluation of the amount of land to affected by the project

- Description of the total land that will be affected by the way leave access
- Baseline description of land tenure, land use patterns and transfer systems
- Evaluation of farmland; commercial and subsistence farm land that will be affected by the proposed line and give a rough estimate of land values
- Provide a report on the type of effect for every parcel of land affected in terms of partial or entire parcel.
- For each PAP whose land is affected, provide 1)actual acreage of land to be taken by the transmission line way leave 2)total acreage of PAPs land
- For each PAP whose land is affected, conduct valuation of the affected strip and compute compensation values. Provide type and methodology of compensation, preferred method of valuation with justification and the compensation framework including country laws and regulations.
- Provide details of the land affected in terms of type of tenure and land use patterns
- For each PAP whose land is affected, provide the following information on the status of land ownership documents 1)title deed LR No. and name of the registered owner 2)information on whether the current land occupant is the registered land owner 3)placed caveats 4)disputes involving the land parcel
- Provide actual values of the percentage parts of the parcels affected basing the values between a scale of 30 – 95% of the total market value of land ,where : 30% or less is for the large parcels with very minimal impact /effect while up to 95% being for the parcels that are severely or totally affected. (The valuation estimates should be based on locational registration areas)
- Provide maps of affected areas showing strips of affected areas.
- For each parcel of land affected, plot the transmission line wayleave on its cadastral map.

Note that eligibility of affected land must be confirmed by legal documents of ownership (squatters are not eligible for land compensation, but will be compensated for structures they may have put up and /or crops and trees they may have planted)

Task 3: Carry out a detailed survey on the structures to be affected by the proposed line

- Total number of structures to be affected by the proposed line
- Baseline description of structures affected including permanent and semi-permanent structures
- For each parcel of land affected, provide the total number and type of structures to be affected by the proposed transmission line
- Provide total number of public institutions/community structures to be affected by the proposed line
- Provide description of structures affected – Plinth area and construction materials
- Provide detailed values/estimation of structures to be affected accompanied by pictures of the affected structures and measurements
- Provide detailed values/estimation of structures to be affected accompanied by pictures, measurements and geographical positions (inscribed as a foot note of the pictures) of the structures affected. (using coordinates)
- Establish names of true owners of structures and include the names in each caption of picture taken for each structure
- Provide type and methodology of compensation, preferred method of valuation with justification and the compensation framework including country laws and regulations.
- Prepare an inventory of loses and a detailed Entitlement Matrix that will be used for compensation

  Note that all owners of structures are considered eligible including squatters

Task 4: Carry out a detailed census/count of trees affected by the proposed line

- Provide the 1) number 2)type 3)breast-height diameter of mature trees affected per each parcel affected
- Provide assessment of trees /crop damage estimate values of the trees/crops affected

  Note that the rates of computation should be based current rates as guided by Kenya Forestry Service and Ministry of Agriculture

Task 5: Prepare an inventory of losses and a detailed Entitlement Matrix that will be used for compensation

Task 6: Prepare livelihood restoration strategies and measures necessary to assist people affected by the project improve or restore their living standards

Task 7: Prepare a detailed organizational arrangement for delivery of entitlements, including; Livelihood restoration measures, preparation and review of cost estimates, the flow of funds; and contingency arrangements

Task 8: Prepare a detailed description of the implementation process, linking resettlement implementation to civil works

- Initiate stakeholder involvement and come up with specific stakeholder committees either locational or sub-locational in areas affected that will ensure smooth implementation of the RAP

Task 9: Prepare a detailed grievance redress mechanism including concise procedures for dispute resolution taking into account traditional dispute settlement measures and judicial recourse

Task 10: Prepare a detailed description of mechanisms for consulting with, and participation of, displaced persons in planning, implementation and monitoring

Task 11: Prepare a detailed description of arrangements for monitoring by the implementing agency and if required, by independent monitors

Task 12: Prepare a detailed estimated budget cost for the whole resettlement action plan inclusive of costs of structures, land, contingencies and monitoring of the project

6.6.4; Staffing

The team proposed for the assignment shall comprise of the following key experts but not limited to:

Team leader
Socio-Economist
Valuation expert
Environmental Expert
GIS Expert/Surveyor

The consultant shall also submit the list of any other staff proposed for the assignment; with their CV's as follows:

Team Leader

General Qualification

Minimum requirement:

- Master's degree in Sociology/Social Sciences or any related field
- 10 years' experience in studies of this nature
- 5 years in inter-disciplinary team management
- Experience of at least two projects of similar scope and nature

Socio-Economist

General Qualification
Minimum requirements

- MA Degree in Sociology/Community Development or any social science discipline
- 5 years' experience in socio-economic surveys in similar scope and nature.
- Experience of at least two projects of similar scope and nature

Land Economist

General Qualification
Minimum requirement:

- Degree in land economy/valuation from a recognized University
- 10 years' experience in valuation
- Certificate of registration/professional certificate
- Registration and/or membership of professional field and valid annual operating licence will be an added advantage

Environmental Expert

General Qualification
Minimum requirements

- B.Sc. Degree in Environmental Studies/Planning and Management/Science/ or Natural Resource Management
- 5 years' experience in ESIA studies
- Experience of at least two projects of similar scope and nature
- Registration and/or membership of professional field and valid annual operating licence will be an added advantage

GIS Expert/Surveyor

General Qualification

Minimum requirements

- B.SC Degree Survey
- At least 5 years' experience in survey works / mapping exercises.
- Registration and/or membership of professional field and valid annual operating licence will be an added advantage

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 Turkana County. The County at the moment can not host heavy industries that are power intensive. With the oil discovery, plans to create an oil pipeline, the refugee camps, and the potential for heavy industries in the county, the need for adequate, reliable, and secure power can not be overemphasized. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages.

7.2.2; Contribute towards reduction in Greenhouse Gas emission

Current electricity power transmission mode in Turkana is through 33kV distribution lines. Studies show that, the 33kV distribution lines lose upto 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 losses which translates to reduced generation of excess power (lost during transmission) and therefore a reduction in the generation of greenhouse gases. 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 gases.

7.2.3; 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.

7.2.4; Contribution towards reduction of environmental pollution

Turkana County is not connected to the national grid and relies on diesel generated electric power supply. The diesel generators are not only noisy but produce lots of exhaust fumes into the environment. The fumes are known to contain greenhouse gases, heavy metals and particulate matter. With the project providing green energy to the county, there will be no need for the diesel generators and therefore, the project will immensely contribute towards a reduction in green house gases and particulate matter in the atmosphere and a more quiet and serene environment.

Further, studies show that, the dominant energy source in the county is fuel-wood. This is exacerbated by the presence of a number of refugee camps. 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

7.2.5; 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.

7.2.6; 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.

7.2.7; 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.

7.2.8; Security

With increased lighting in the 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 (mixers, tippers, drilling etc) and incoming vehicles to deliver construction materials to site or take away debris.

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

7.3.3; Dust Emissions

Dust emission is likely to occur during the site clearance, excavation and spreading of the topsoil during construction of the substations and excavation of foundation for steel towers. They are also likely to occur during the decommissioning phase. Motor vehicles accessing the site may also lead to dust emissions.

7.3.4; Solid and Liquid Waste Generation

It is expected that solid waste will be generated in all phases of the project. The generated waste will include; drums, paper, plastic, cables, metal, transformers, capacitors, drywall, wood, glass, paints, adhesives, sealants, fasteners, wastewater etc

7.3.5; Oil Spill Hazards

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. There is also a potential for oil spills and accidents during oil transportation, storage and operations of the transformers and batteries.

7.3.6; Destruction of Existing Vegetation and Habitats

The project will require a way-leave of 40 meters width for the 310km. 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.

7.3.7; Avifauna Mortalities

Lake Turkana is an important Bird Area and is a host of a wide variety of avifauna. According to the Senior Warden KWS, various species of birds from Lake Turkana are known to seasonally migrate to other parts of the world including Europe, America and Asia. The transmission line therefore, is quite likely to be on an avifauna migration corridor. Avifauna mortality by power lines can either be due to bird electrocution or bird strikes by the conductors. The separation between the conductors of the transmission line shall be a minimum of 3m and therefore, bird electrocution will be highly unlikely. Bird strike by the conductors is however, likely and in a few circumstances may lead to mortality.

7.3.8; Impacts on Workers' and Community Health and Safety

Workers and community members in the project area may be exposed to various risks and hazards including falling from height during construction of towers (may lead to fatality), falling objects, collapsing of excavations, road accidents, slips and trips, flammable and explosive substance, electrical shocks, dust, noise and vibrations, poor hygiene, fire, bruises and cuts, etc

7.3.9; Soil Erosion

There are possibilities of soil erosion occurring during the construction stage of the project especially during rainy and windy seasons. Where the transmission line pass near wetlands, soil erosion may lead to deposition in the watercourses and other wetlands causing siltation.

7.3.10; Visual and Aesthetic Impacts

The physical presence and profile of the proposed project will alter the visual and aesthetic effects of the surrounding area.

7.3.11; Incidences of Electrocution

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 40m 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.

7.3.12; 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 40 m corridor.

7.3.13; 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.

7.3.14; Cultural Heritage and Archaeological Finds

Turkana County is considered to be the origin of man-kind. The County has a rich culture and is believed to hold vast wealth in 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.

7.3.15; 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. Resettlement for this particular project will not be extensive since the project area is sparsely populated and the way of life in this region is nomadic pastoralism.

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. 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.

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 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;
- 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;
- 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, the proponent will;

- 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.
- specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage;
- 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; Avifauna Mortalities

To minimize bird collisions leading to their mortality, 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

7.4.8; Impacts on Workers' and Community Health and Safety

The proponent will implement all necessary measures to ensure health and safety of the substations workers and the general public during construction, operation and decommissioning of the proposed substations as stipulated in the Occupational Safety and Health Act, 2007

7.4.9; 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.

7.4.10; 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.

7.4.11; Incidences of Electrocution

To reduce incidences of electrocution, the proponent will;

- ensure strict adherence to the safety designs established;
- 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.

7.4.12; 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

7.4.13; 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.

7.4.14; 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.

7.4.15; 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 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
	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

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
7. 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	
	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	20,000
	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	
	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
8. Visual and aesthetic impacts				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
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
9. 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
	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
10. Cultural Heritage and Archaeological Finds				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Cultural Heritage and Archaeological Finds	Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.	Contractor and KETRACO	Entire construction period	0
11. 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 substations workers and the general public during operation of the proposed substations 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				
Increase 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. Avifauna mortalities		Quarterly		Reports on wire marking and raptor platforms build; incidents of bird strikes	KETRACO and Contractor
7. 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		
8. 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
9. Visual and aesthetic impacts	Quarterly			Reports on public consultation held; landscaping programme designed and implemented	KETRACO and Contractor
10. 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		
11. Perceived danger of Electrostatic and Magnetic force		Quarterly		Reports on education and awareness campaigns held	KETRACO and Contractor
12. 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
13. Cultural Heritage and Archaeological Finds	Monthly			Reports on heritage areas and archaeological finds found	KETRACO
14. Land take - Resettlement and Loss of use	Monthly			Reports on RAP implementation including compensation for land, structures and crop/trees damage	KETRACO
15. Rehabilitation of project site			Monthly	Reports on re-vegetation programme developed and implemented; number and species of trees planted	KETRACO and Contractor

CHAPTER 10: RECOMMENDATIONS AND CONCLUSION

10.1: 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 132Kv transmission line and 132/33 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.

10.2: 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

10.3: 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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