



**Ministry of Energy and Petroleum**

**Kenya Electricity Transmission Company (KETRACO)**

**UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT for  
95 KM, 132/33kV Kabarnet-Rumuruti double circuit Transmission Line**

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**EMC Consultants**  
ENVIRONMENTAL KNOWLEDGE IN PRACTICE

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## GENERAL INFORMATION

<b>Project</b>	<b>Environmental and Social Impact Assessment for Kabarnet-Rumuruti 95 Km double circuit 132kV Transmission Line</b>
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## ABBREVIATIONS

AAAC	- All Aluminum Alloy Conductor
AfDB	- African Development Bank
AIDS	- acquired immunodeficiency syndrome
BFD	- Bird Flight Diverter
BOD	- Biochemical Oxygen Demand
C-ESMP	- Construction Environment and Social Management Plan
CBD	- Convention on Biological Diversity
CEC	- County Executive Committee
CEDAW	- Convention on the Elimination of All Forms of Discrimination Against Women
CIA	- Cumulative Impact Assessment
CIDP	- County Integrated Development Plan
CLOs	- Community Liaison Officers
EBA	- Endemic Bird Area
ECD	- Early Childhood Development
EE	- Energy Efficiency
EHS	- Environmental Health and Safety
EMCA	- Environmental Management and Coordination Act Cap 387
EPRP	- Emergency Prevention and Response Plan
ESIA	- Environmental and Social Impact Assessment
ESMP	- Environmental and Social Management Plan
FGDs	- Focus Group Discussions
GBV	- Gender-Based Violence
GDP	- Gross Domestic Product
GHG	- Greenhouse Gas
GoK	- Government of Kenya
GWP	- Global Warming Potential
HIV	- Human Immuno Virus
HVDC	- High-Voltage Direct Current
IBA	- Important Bird Area
IFC	- International Finance Corporation
ILO	- International Labor Organization
KETRACO	- Kenya Electricity Transmission Company
KFS	- Kenya Forest Service
KNBS	- Kenya National Bureau of Statistics
KPLC	- Kenya Power and Lighting Company
LCPDP	- Least Cost Power Development Plan
LDV	- Light Duty Vehicles
LPG	- Liquid Petroleum Gas
MIR	- Minimum Internal Requirements
MW	- Megawatts
NBSAP	- National Biodiversity Strategy and Action Plan
NEMA	- National Environment Management Authority
NGOs	- Non-Governmental Organizations



NOX	- Oxides of Nitrogen
OHTL	- Overhead Transmission Line
OPGW	- Optical Ground Wire
OS	-Operational Safeguards
OSRP	- Oil Spill Response Plan
PAHs	- Project Affected Households
PAPs	- Project Affected Persons
PDO	- Project Development Objective
PM	- Particulate Matter
PPE	- Personal Protective Equipment
RoW	- Right of Way
RPM	- Respirable Particulate Matter
RTI	- Respiratory Tract Infections
SEA	- Sexual Exploitation and Abuse
SEP	- Stakeholder Engagement Plan
SF6	- Sulfur Hexafluoride
SGR	- Standard Gauge Railway
SOX	- Sulphur Oxides
STDs	- Sexually Transmitted Diseases
TL	- Transmission Line
VAC	- Violence against Children
VEC	- Valued Environmental and Social Components
WHO	- World Health Organization

## EXECUTIVE SUMMARY

### Introduction

The country's long-term development blueprint, the Vision 2030, aims at transforming Kenya into a globally competitive, newly industrialized, middle income and prosperous country. The electricity sub-sector has adopted a 20-year rolling plan that will align the sector with the Vision targets. Under the Least Cost Power Development Planning process and through feasibility studies, Kenya Electricity Transmission Company - KETRACO (the Proponent) has identified priority projects for implementation. The transmission projects will provide reliability, enhance security of power supply to the existing demand hubs in the country; expand electricity transmission capacity necessary to enhance electrification initiatives and reduce technical losses in areas currently served by long medium voltage lines.

To achieve this target the Government of the Republic of Kenya is seeking the financial support of Korea Exim Bank (KEXIM) and African Development Bank ( AfDB) to finance three electricity transmission infrastructure projects under the Kenya Transmission Network Improvement project (KTRNIP). The proposed Kabarnet – Rumuruti 132 kV transmission line forms part of this project, which aims to improve the power systems, electricity access and reliability in Baringo and Laikipia counties in line with the Kenya Growth and Development Strategy. The Project will be coordinated by The Ministry of Energy (MoE) and implemented by Kenya Electricity Transmission Company (KETRACO).

This Environmental and Social Impact Assessment (ESIA) study was undertaken by EMC Consultants. Projects screening, collection of baseline information, and public consultation activities were carried out by EMC Consultants between the months of May and August 2019.

The need for an update to the ESIA report was triggered due to the lapse of 2 years. As a result, in December 2021, KETRACO carried out a site visit, with the aim of updating the ESIA. Particular emphasis was made on baseline information, public consultation and sensitization within the areas traversed by the proposed transmission line, namely Baringo Central, Baringo South and Laikipia East sub- counties.

### Objective of the Environmental and Social Impact Assessment

The main objective of the Environmental and Social Impact Assessment (ESIA) was to highlight the potential positive and negative environmental and social impacts expected during the establishment and operation of the proposed 95 km, 132kv Kabarnet-Rumuruti transmission line and installation of a transformer at the existing Kabarnet and Rumuruti substations, with the aim of proposing appropriate mitigation measures. This was in line with ensuring that such a development does not negatively impact the environment and social aspects such as; human health and safety and physical (land, water, plants and animals) state of the project area.

The study identified the possible environmental and social impacts during the implementation, operational and decommissioning phases of the project. The exercise was carried out in accordance with the African Development bank's Environmental and Social Assessment

Procedures, Korea Exim Bank's EDCF Safeguard policy, and together with relevant Kenyan environmental legislation and regulations that includes Environmental Management and Coordination Act (EMCA) Cap 387, and the Constitution of Kenya, 2010. The KETRACO Environmental and Social Management Framework (ESMF) was vital in undertaking the environmental and social assessment whereas the KETRACO Resettlement Policy Framework (RPF) was key in the resettlement action plan (RAP).

### **Overall Scope of the Work**

The Consultant undertook investigations on social aspects, economic activities, and conservation of natural resources, historical and anthropological heritages, public consultations, and disclosures. The "Integrated Environmental Assessment," which is a more holistic approach to the evaluation of the proposed project was used by encompassing: Environmental Impact Assessment; Archaeological Assessment; Social Impact Assessment; Biodiversity Impact Assessment; Health Impact Assessment; Cultural Impact Assessment; Visual Impact Assessment and Cumulative Impact Assessment. Given the scale and the complexity of the proposed project, a full environmental and social impact assessment study was undertaken to ensure comprehensiveness and completeness of the assessment process. The general steps followed during the assessment included:

- Environmental screening, in which the project was identified as a high-risk project requiring Environmental Impact Assessment study under Amendment of the Second Schedule of EMCA 1999 (30th April 2019), and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. As per AfDB, the project was categorized as a Category 1 project Environmental scoping that provided the key environmental issues, desktop studies and interviews
- Physical inspection of the proposed route and surrounding areas
- Public participation using public meetings, participant observations, questionnaires, and interviews.

### **Project description**

The proposed project involves the construction of approximately 95Km of a 132KV transmission line from the existing 132/33KV Kabarnet substation to the existing 132/33KV Rumuruti substation. The 95 km 132kV transmission line stretch from Kabarnet to Rumuruti will be double circuit. A wayleave of 30 meters – 15 meters will be established on both sides from the Centre line. The components of the proposed project will include the following:

1. At Existing Kabarnet Substation the scope will include:
  - Installation of an additional 132/33kV, 1x23MVA transformer
  - Establishment of a new 132KV line bay to accommodate the incoming line from Rumuruti
2. At Rumuruti substation the scope will include
  - A new line bay for the circuit to Kabarnet

### **Baseline information**

The proposed high voltage transmission line ('the Project') traverses two counties i.e., Baringo County starting at the existing Kabarnet sub-station with geographic coordinates 0°28'34.92"N

35°46'1.47"E and terminating in Laikipia County at Rumuruti at an existing sub-station at geographic coordinates 0°14'44.78"N 36°30'23.60"E. It is expected that upon completion, the 132kV Transmission Line of approximately 111Km will be energized and become part of the national grid. **Figure 0-1** below highlights the transmission line route including the project Area of Influence (AoI) which is a corridor of 2 km on both side of the transmission line.

The proposed Right of Way (RoW) for the transmission line will be a 30 metres wide corridor with a total length of 111km running from Kabarnet sub-station in Baringo County and terminating at the existing Rumuruti substation in Laikipia County. As a result of the 30metre wide corridor, physical and economic displacement of Project Affected Households (PAHs) in this ESIA study has been identified as an impact likely to occur along the transmission route. The approximate acreage of land to be affected is **632.39** acres based on the Resettlement Action Plan (RAP) report prepared for this line and informed and recommended during the ESIA scoping phase. The RAP has been prepared in accordance with the KESIP Resettlement Policy Framework (RPF) which is the overall framework document that guides preparation of RAP for sub projects under KESIP.

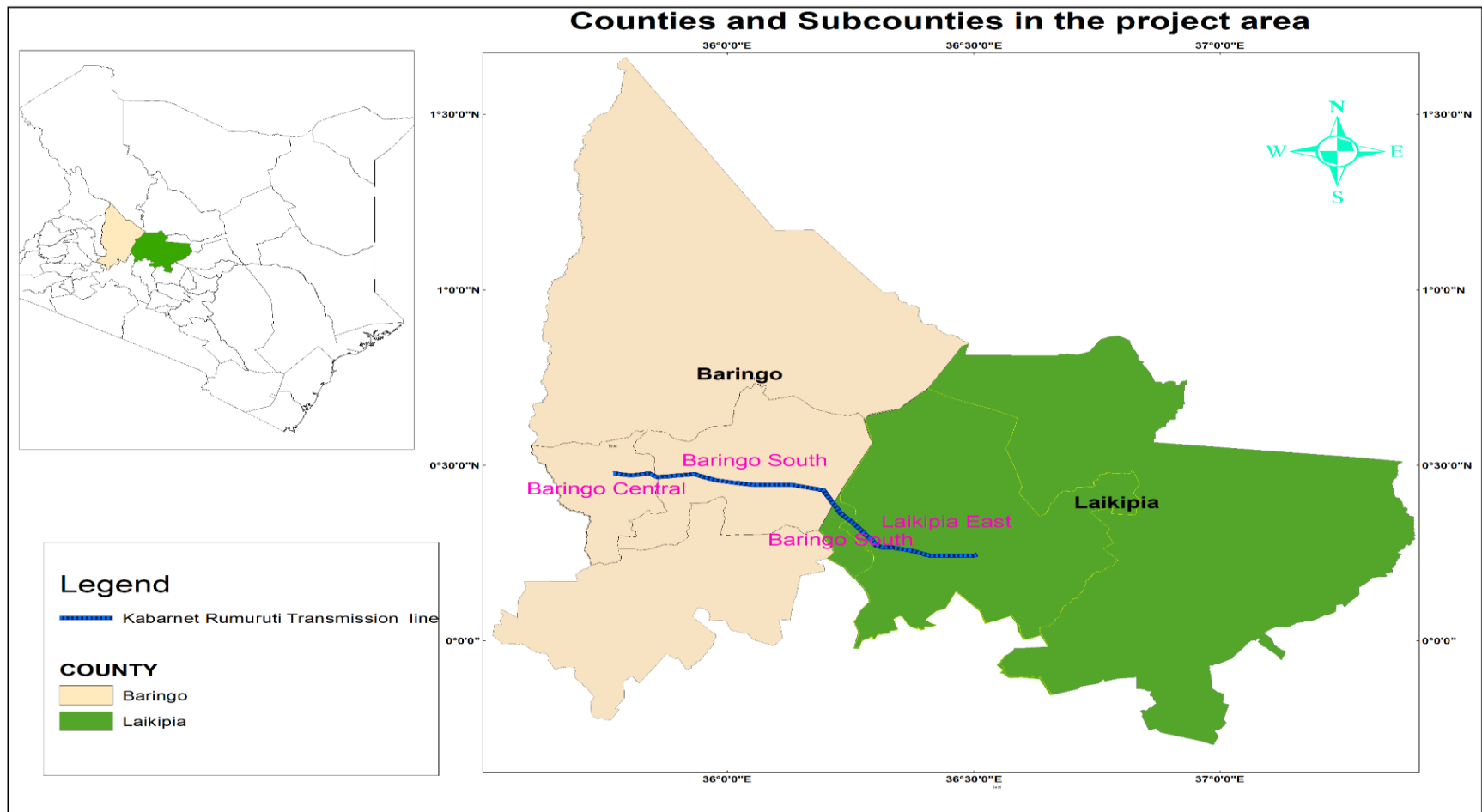


Figure -0-1: Project Transmission Line Routing Area  
Source: EMC Consultants, 2019



### **Policy, Legal and Institutional Frameworks**

Key documents for the assessment were reviewed, these included; the nature of the proposed activities, project documents, designs policy and legislative framework as well as the environmental setting of Kilifi County among others. Some of the key documents that were reviewed included: -

- AfDB's Environmental and Social Assessment procedures ( ESAP)
- KETRACO's Environmental and Socio Management Framework (ESMF); Resettlement Policy Framework (RPF);
- Applicable Multilateral Environment Agreements (MEAs);
- Project designs.

The Consultant reviewed key policies, plans, legislation, and institutions relevant to the energy sector in Kenya. Some of these are:

#### **Policies:**

- Big four Agenda, 2017
- Kenya Vision 2030
- The National Land Use Policy (Sessional Paper No.1 of 2017)
- National Environment Policy, 2013
- National Water Policy, 2012
- The National Climate Change Response Strategy (NCCRS), 2010
- Kenya National Policy on Gender and Development (NPGD), 2019
- The National Biodiversity Strategy and Action Plan (NBSAP) 2000
- National Forest Policy, 2014
- HIV/AIDS Policy of 2009

#### **Plans:**

- Baringo County Integrated Development Plan, 2018-2022
- Least Cost Power Development Plan, 2021-2030

The Consultant reviewed the following key pieces of legislation in Kenya relevant to the proposed project: -

- The Constitution of Kenya, 2010;
- Environmental Management and Coordination Act (EMCA, Cap 387) and relevant subsidiary legislation;
- Environmental Impact Assessment and Audit Regulations, 2003, amended 2019
- Water Quality Regulations, 2006
- Waste Management Regulations, 2006
- Air Quality Regulations, 2009
- Biodiversity Regulations,
- Noise Regulations, 2009
- Building Code, 2000;
- Civil Aviation Act No. 21 of 2013;
- Energy Act, 2019;
- Forest Conservation and Management Act, No. 34 of 2016;
- Kenya Roads Act, 2007;
- Land Act, 2012;
- Land Registration Act, 2012;
- National Museums and Heritage Act, No. 6 of 2006;
- National Land Commission Act, No. 5 of 2012;
- Occupational Safety and Health Act, No. 15 of 2007;
- Penal Code Act (Cap 63);
- Climate Change Act, 2016;
- County Governments Act, No. 17 of 2012 together with its Amended Act, 2016
- Employment Act, No 11, 2007;
- Water Act, 2016;
- HIV and AIDS Prevention and Control Act, 2006
- National Authority for the Campaign Against Alcohol and Drug Abuse Act, 2012;
- Occupiers' Liability Act (Cap 34);
- Persons with Disabilities Act, 2003;
- Protection of Traditional Knowledge and Cultural Expressions Act, 2016;
- Sexual Offences Act, 2006;
- Standards Act (Cap 496);
- Work Injury Benefits Act, 2007;
- Way-leaves Act (Cap 292);
- Wildlife Conservation and Management Act, No. 47 of 2013.
- Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act, 2012,
- Public Health Act (Cap 242);
- Public Roads and Roads of Access Act (Cap 399)
- Physical and Land Use Planning Act, 2019;

### **Data Analysis, Reporting and Documentation**

The Environmental and Social Impact Assessment (ESIA) Study Report was compiled from the field work findings in accordance with the AfDB's Environmental and Social Assessment procedures, World Bank Environmental and Social Safeguards guidelines, KETRACO Environmental and Social Management Framework, Resettlement Policy Framework, and guidelines issued by NEMA for such works and; be prepared and submitted by the proponent for consideration and approval.

### **Consultation and Public Participation**

The Consultation and Public Participation (CPP) process is a key requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA (Cap 387) section 58, on ESIA for achieving the fundamental principles of sustainable development. The AfDB's Environmental and Social Assessment (ESA) process seeks to ensure that access to benefits is sufficiently broad, that information in a suitable form is disclosed in a timely manner and that the borrower engages in meaningful consultation (i.e. consultation that is free, prior and informed) with local stakeholders and potentially affected communities; in particular, with vulnerable groups, to enable them to participate actively in decisions about avoiding or managing environmental and social impacts.

To ensure effective stakeholders' consultation and public participation, stakeholders' mapping was conducted, and a database created consisting of likely interested, affected

individuals and relevant Institutions. The key stakeholders were mapped based on the legal mandates of various institutions and assessment of the different interests of the stakeholders. The database was later divided into key stakeholders based on their interests in the project. Various methods and instruments have been identified for effective and efficient public consultation and participation. These methods include;

- Use of questionnaires- Various stakeholders were engaged through in-person consultations and interviews. A total of One hundred and seventy (170) ESIA questionnaires were administered during the initial consultative public participation exercise done by EMC Consultants . A further One hundred and ninety five (195) questionnaires were administered and analysed during the update exercise carried out by KETRACO in December 2021. Questionnaires administered and analysed are attached as appendices to this report. Among the stakeholders who were consulted during the ESIA study included project affected persons (PAPs), relevant government ministries, and local community members neighbouring the proposed transmission line and substation.
- ESIA Public Meetings-

Stakeholders were identified, mapped, and consulted as part of the ESIA study in accordance with the National Environment Management Authority (NEMA's) EIA/EA regulations (2003) which require public consultations during ESIA preparation.

The consultations targeted communities who were in the project Area of Influence (AoI) and hence likely to be directly or indirectly affected adversely by the project. Consultations also targeted key institutions in the national and county governments as well as civil society organizations who were identified to have a stake or interest in the project. **Tables 1-4 below** shows the dates, venues and number of stakeholders consulted by county.

**Table 1: Baringo County Stakeholder Consultations Venues, Dates and Number of Participants 2019**

DATE	VENUE	PARTICIPANTS
19 <sup>th</sup> June 2019	Kabarnet Deputy County Commissioner's Office	5
20 <sup>th</sup> June 2019	Marigat Deputy County Commissioner's Office	3
	Chief Officer Land's Office	3
	Kituro Location Chief's Office	6
	Kapropita Location Chief's Office	5
	Land Adjudication Officer's Office	3
21 <sup>st</sup> June 2019	Kimalel Location Chief's Office	3
24 <sup>th</sup> June 2019	Kenya Forest Service (KFS) Office-Kabarnet	3
	NEMA Office-Kabarnet	4
25 <sup>th</sup> June 2019	Logumgum Location Chief's Office	4
	Ilngarua Location Chief's Office	4
	Eldume Location's Chief's Office	4
<b>Total</b>		<b>50</b>

**Source: EMC Consultants RAP Survey data, 2019**

Table 2: Baringo County Stakeholder Consultations Venues, Dates and Number of Participants\_2021

Date	Venue	Participants
30 <sup>th</sup> November, 2021	PA to Baringo County Commissioner, Baringo County	6
30 <sup>th</sup> November, 2021	County Environmental Officer, NEMA	6
1 <sup>st</sup> December, 2021	Baringo DCC's Office	6
1 <sup>st</sup> December, 2021	Kenya Forest Service (KFS)	6
1 <sup>st</sup> December, 2021	Kenya Wildlife Service (KWS)	6
14 <sup>th</sup> December, 2021	CECM (County Executive Committee Member)- Lands, Housing, Physical Planning and Urban Development	4
14 <sup>th</sup> December, 2021	CECM- Water, Energy, Forestry and Natural Resources	4
<b>Total</b>		<b>38</b>

**Source: KETRACO RAP Survey data, 2021**

Table 3: Baringo County Public Consultations, Dates and Number of Participants\_2019

DATE	VENUE	PARTICIPANTS
14 <sup>th</sup> August 2019	Arabal Location, Chemorongon Center	29
16 <sup>th</sup> August 2019	Kapkechir Location, Lomoiwe Dispensary Grounds	27
16 <sup>th</sup> August 2019	Karandi Locations, Ol Ngarua Primary School	34
7 <sup>th</sup> August 2019	Kasoiyo Location, Kasoiyo Dispensary	19
9 <sup>th</sup> August 2019	Kituro Location, Chief's Office/Dispensary	25
5 <sup>th</sup> August 2019	Marigat Location, Rabai Primary School	45
8 <sup>th</sup> August 2019	Logumgum Location, Logumgum Primary School	33
<b>Total</b>		<b>212</b>

**Source: EMC Consultants RAP Survey data, 2019**

Table 4: Baringo County Public Consultations, Dates and Number of Participants\_2021

Date	Venue	Participants
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7 <sup>th</sup> December, 2021	Arabal Location, Chief's office	41
10 <sup>th</sup> December, 2021	Kiserian Location, Area church	37
10 <sup>th</sup> December, 2021	Ilngarua & Elchamis locations, Chief's office- Ilngarua	37
11 <sup>th</sup> December, 2021	Marigat Location, Chief's office	23
11 <sup>th</sup> December, 2021	Kimalel Location, Chief's office	44
13 <sup>th</sup> December, 2021	Kituro Location, Chief's office	42
14 <sup>th</sup> December, 2021	Kapropita Location, Kasoyo Dispensary	20
15 <sup>th</sup> December, 2021	Chebininy Location, Chief's office	40
<b>Total</b>		<b>284</b>

**Source: KETRACO RAP Survey data, 2021**

Table 5: Laikipia County Stakeholder Consultations Venues, Dates and Number of Participants\_2019

<b>DATE</b>	<b>VENUE</b>	<b>PARTICIPANTS</b>
26 <sup>th</sup> June 2019	County Commissioner's Office – Laikipia County	03
26 <sup>th</sup> June 2019	Deputy County Commissioner's Office- Nyahururu	03
25 <sup>th</sup> June 2019	Deputy County Commissioner's Office- Rumuruti	03
20 <sup>th</sup> June 2019	Deputy County Commissioner's Office– Laikipia West Sub County	03
<b>Total</b>		<b>12</b>

**Source: EMC Consultants RAP Survey data, 2019**

Table 6: Laikipia County Stakeholder Consultations Venues, Dates and Number of Participants\_2021

<b>Date</b>	<b>Venue</b>	<b>Participants</b>
1 <sup>st</sup> December, 2021	Deputy County Commissioner- Laikipia County	5

**Source: KETRACO RAP Survey data, 2021**

Table 7: Laikipia County Public Consultations Venues, Dates and Number of Participants\_2019

<b>Date</b>	<b>Venue</b>	<b>Participants</b>
15 <sup>th</sup> August 2019	Public Consultation – Melwa Chiefs Camp –Melwa Location	32
15 <sup>th</sup> August 2019	Public Consultation–Mohotetu Chiefs Camp–Mohotetu Location	34



<b>Total</b>	<b>66</b>
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**Source: EMC Consultants RAP Survey data, 2019**

**Table 8: Laikipia County Public Consultations Venues, Dates and Number of Participants\_ 2021**

<b>Date</b>	<b>Venue</b>	<b>Participants</b>
7 <sup>th</sup> December, 2021	Kiambogo location, Chief's office	12
8 <sup>th</sup> December, 2021	Gituamba Location, Chief's office	23
8 <sup>th</sup> December, 2021	Rumuruti Location, Chief's Office	20
9 <sup>th</sup> December, 2021	Melwa location, Chief's office	41
9 <sup>th</sup> December, 2021	Muhotetu Location, Chief's office	38
<b>Total</b>		<b>134</b>

**Source: KETRACO RAP Survey data, 2021**

#### **Issues raised during the Public consultation meetings and PAP's Baraza's:**

The key issues and concerns emanating from the consultations are highlighted below and were incorporated in the ESIA in relation to mitigation measures.

<b>S/NO.</b>	<b>ISSUE RAISED</b>	<b>RESPONSE</b>
	<ul style="list-style-type: none"> <li>Waste management during construction</li> </ul>	<ul style="list-style-type: none"> <li>NEMA waste transporters will be contracted to collect waste and dispose in NEMA licensed sites</li> </ul>
	<ul style="list-style-type: none"> <li>Community health and safety during construction and operation</li> </ul>	<ul style="list-style-type: none"> <li>Sensitise community on potential dangers</li> <li>Place danger signs</li> <li>Design towers to international standards</li> </ul>
	<ul style="list-style-type: none"> <li>Noise pollution during construction</li> </ul>	<ul style="list-style-type: none"> <li>Construction work to be strictly during the day between 8:00am-5:00pm</li> <li>Regular servicing/maintenance of machines and equipment</li> </ul>
	<ul style="list-style-type: none"> <li>Air pollutants emission impacts during construction</li> </ul>	<ul style="list-style-type: none"> <li>Sprinkle water on access roads daily</li> </ul>

	<ul style="list-style-type: none"> <li>▪</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provision of dust masks to workers</li> <li>▪ Control speed of construction vehicles</li> <li>▪ Put off idle vehicles</li> <li>▪ Regular maintenance of plants and equipment</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Land acquisition impacts</li> <li>▪</li> </ul>	Affected land owners will be compensated for land acquired for ROW and other associated facilities i.e campsites, access road etc

Locations, dates, stakeholders who participated, risks/impacts presented, main concerns raised by participants, responses and commitments of the developer have been comprehensively discussed in chapter six (6).

## Potential Beneficial Impacts

The major beneficial long-term impact of the project will be during the operational phase from: -

**Table 9: Summary Beneficial Impacts**

<b>Beneficial Impacts</b>	
Expected Impact on Poverty Alleviation	With the implementation of the project across the 3 Counties, the power supply will be stable and reliable hence more customers will be connected to the system. The communities under power supply will engage in income generating activities in order to improve their economic status.
Local Material Supplies	It is expected that the project will generate new income revenues for the local population across the Country in harvesting and transportation of sands, ballast, stones, concrete/wooden poles and gravel. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy.
Up Scaling Electricity Access to the Poor	According to Kenya Power's annual report of 2012/2013, electricity access stood at 4.8million customers as at June 2016. This translates to about 60% of the total population accessing electricity. In the project area, over 70% of the communities do not have access to electricity.
Health benefits of the project	The project will result in many households replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government. Kerosene emits PM which do not disperse, so burning a lamp for four hours can result in concentrations several times the World Health Organization standard. The health risks posed by indoor air pollution mainly include acute lower respiratory infections, but also low birth weight, infant mortality, and pulmonary tuberculosis. According to the socio-economic survey, households in the project areas used lantern lamps and using tin lamps for lighting.
Benefits to education	Access to constant and reliable electricity supply at the household level and schools will create opportunities for children to study.
Improved standard of living	Access to stable and reliable electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridges, television sets, washing machines etc.

Security	There will be enhanced security arising from well-lit social, commercial, individual premises and use of electrical surveillance gadgets that use broadband data services. With the implementation of the project, the level of security will improve.
Communications	Access to reliable electricity will lead to improved communication. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for people to access a wide range of information which is useful for decision making.
Gender Considerations	Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. Lighting and television will improve access to information, the ability to study, and extend the effective working day.

**Source: EMC Consultants, 2019**

### **Potential Negative Impacts and Mitigation Measures**

The potential negative impacts during construction, operation and decommissioning are generally short-term, reversible impacts which can be reduced or eliminated by appropriate construction mitigation and application of best practice in construction and operation of transmission lines. Many of the adverse impacts will only occur within the construction site footprint (along the transmission line route) and therefore move with the works such that many locations will only be impacted for a few days at a time rather than the duration of the project. . The table illustrates the potential adverse impacts along with what the impact significance of the impact is before and after proposed mitigation measures. Mitigation measures that are included in this report are commitments which will be implemented by KETRACO (including sub-contractors).

The Environmental and Social Management Plan (ESMP) details roles and responsibilities that will be assumed by all the responsible agencies during project implementation phase. KETRACO has already acknowledged its commitments in this regard and have indicated that they also understand their responsibilities in this regard given their prior involvement with World Bank funded projects. Assessment of potential risks, impacts and mitigation measures have been discussed comprehensively in Chapter eight (8).



### **Environmental and Social Management and Monitoring Plan**

The proponent of the proposed project acknowledges that the proposed project activities will have some impacts on the biophysical environment, health and safety of its employees and members of the public, and socio-economic wellbeing of the residents.

Thus, the focus was on reducing the negative impacts and maximizing the positive impacts associated with the project activities through a continuous improvement programme. Continuous observations and assessments have been essential for identification of impacts unforeseen during the ESIA exercise. Monitoring parameters/indicators were identified, and programs developed for their observation and action. When developing the monitoring program the following were considered:

- Frequency of monitoring
- Required personnel -monitoring should be conducted by trained personnel
- Methods of record keeping
- Availability of calibrated and maintained equipment
- Existence of baseline information
- Data analysis and review

A detailed environmental monitoring matrix is captured in table 11-1 of the ESIA study report, enumerating the following variables:

- Key component/ activity to monitor
- Specific parameter to be monitored
- Frequency of monitoring
- Sampling points
- Total samples required
- Cost per sample and total cost
- Materials/ lab equipment/ other requirements
- Responsible entity

Some of the key ESMP indicators to be monitored during project implementation include:

1. Air and Water quality
2. Noise and Vibration
3. Solid waste generation
4. Community health issues and spread of communicable diseases such as HIV/AIDS, Covid-19
5. Occupational health and safety
6. Gender based violence ( GBV); Sexual exploitation and Abuse ( SEA)/ Sexual harassment (SH) and gender equality issues

### **Conclusions and Recommendations**

The anticipated benefits of the construction and operation of the Project are immense. The project will provide a reliable supply electricity to the region and national grid, which will go along with many benefits including bringing stability in the national grid. All negative impacts can be mitigated following the ESMP. Based on the immense project benefits of the clean energy generation/harvesting and transmission, which have been stated above,

and the identified negative impacts which can be mitigated in the proposed ESMP, we strongly contend that NEMA will find this ESIA study satisfactory and the project environmentally and socially viable to be permitted to take off.

The costs of incorporating the recommended mitigation measures are defined in the ESMP matrix, and overseen by the KETRACO Project Manager. The environmental and social department – social safeguards team, valuation, and survey department along with assistance from the KETRACO Technical department will oversee and manage the cost and recommended mitigation measures within the field of expertise including compensation for property, crops and relocation activities. These costs are presented in the proposed project Resettlement Action Plan (RAP).

KETRACO has established a dedicated Project Implementation Team (PIT) to implement the Project. The PIT will include a project engineer, three site managers, one civil engineer, one accountant, one procurement expert, two socio-economists and two environmentalists. The PIT will be assisted by a consultant with experience in undertaking similar projects in the region. The PIT reports to the KETRACO Board Committee that will oversee project implementation, including the review of annual work plans and budgets. The consultant will prepare the technical specification and draft bid documents for transmission lines and substations. KETRACO will at all times remain responsible for the overall performance of all ESMPs. The Environmental and Social safeguard's department of KETRACO will monitor compliance of the project to applicable environmental and social standards whereas the KETRACO safety unit ensure safe work management and support the E&S unit to carry out contractor inductions.

Its worth, noting that the KETRACO E&S department is well trained and capable to ensure monitoring of the project. From the consultant perspective KETRACO has the capacity to monitor implementation of the Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMnP) developed for the project. The department also has the capacity to undertake training and build the capacity of the contractor to implement both the ESMP and ESMoP.

An approximate budget to implement the ESMP and ESMMoP has been calculated at Ksh **651,998,861.51**

### **A COMPREHENSIVE ESMP and ESMoP are in section 9.3.**

A budget overview of implementing the RAP, ESMP & ESMMP has been summarized below:

#### ***RAP, ESMP & ESMmp Implementation estimate costs***

<b>Item</b>	<b>Cost</b>
<b><i>RAP costs</i></b>	<b>568,944,570.11</b>
<b><i>Environmental and social management costs</i></b>	<b>20,030,000.00</b>

<i>Environmental and social monitoring costs</i>	11,000,000.00
<i>Costs to be included in contractor's Boq</i>	27,600,000.00
<i>Costs that should be part of routine or periodic maintenance</i>	11,640,000.00
<b><i>Total</i></b>	<b>639,214,570.11</b>
<i>Training/institutional costs 2% of total cost</i>	<b>12,784,291.40</b>
<b><i>Grand total</i></b>	<b>651,998,861.51</b>

The proponent is committed to putting in place the proposed measures to mitigate the potential negative environmental, safety, health and social impacts associated with the life cycle of the proposed project. Considering the anticipated project benefits to the Country on power stability, reliability, and spur on economy; and the adequate mitigation measures provided for the impacts, it is within our expert opinion that the project be approved and NEMA license issued, with full implementation of the established ESMP, ESMmP and respective management plans.



# 1 INTRODUCTION

## 1.1 BACKGROUND OF THE PROJECT

The proposed construction of the Kabarnet-Rumuruti 132kV double circuit transmission line (the “Project”) is to be jointly financed by the African Development Bank (AfDB) and Korea Exim bank. This transmission line is part of the larger Kenya Transmission Network Improvement Project which also includes the proposed Kilifi – Malindi and Narok – Bomet 132Kv transmission lines. The project aims to improve the power systems and electricity access and reliability, in line with the Kenya Growth and Development Strategy. The Project Development Objectives (PDO) are to: (i) increase the capacity, of transmission system; and (ii) increase access to electricity in Kenya.

This ESIA report has been prepared for the construction and operation of the Kabarnet-Rumuruti 132kV transmission line (the “Project”) The project involves the construction of a power transmission line traversing through two counties i.e., Baringo and Laikipia in Kenya. The Project will be energized upon completion as part of the national grid. The 95Km transmission Line (TL) will traverse land and structures belonging to private landowners, land owned communally as community land and group ranch and a section of forest land such as Kinyo Conservancy Forest, Kapkechir forest and Lariak Forest. The proposed Right of Way (RoW) for the transmission Line will be 30 metres wide. The project consists of the following component:

Construction of a 95km, 132/33kV double circuit overhead transmission line.

## 1.2 PROJECT PROPONENT

Kenya Electricity Transmission Company Limited was incorporated on 2<sup>nd</sup> December 2008 and registered under the Companies Act, Cap 486 pursuant to Sessional Paper No. 4 of 2004 on Energy. KETRACO is 100% Government owned and being a state corporation, it is regulated under the State Corporations Act, Cap 446.

The Company was established to develop new high voltage electricity transmission infrastructure that will form the backbone of the National Transmission Grid, in line with Kenya Vision 2030. Its core business is to plan, design, construct, own, operate and maintain high voltage electricity transmission lines and associated substations. The voltage rating of the transmission lines includes 132kV, 220kV, 400kV and 500kV High Voltage Direct Current (HVDC). Arising from KETRACO’s mandate, the company’s core functions include:

- Planning the national electricity transmission grid.
- Financial resource mobilization for operations and financial sustainability;
- Design of power transmission infrastructure;
- Construction of power transmission infrastructure;
- Operation of the transmission system;
- Maintenance of high voltage power transmission infrastructure;
- Maintenance of power transmission infrastructure;
- Power management and trade.

KETRACO's mandate is to plan, design, construct, own, operate and maintain high voltage electricity transmission grid and regional power interconnectors that will form the backbone of the national transmission grid. In carrying out this mandate, the Company is expected to develop a new and robust grid system in order to:

1. Improve quality and reliability of electricity supply throughout the country
2. Transmit electricity to areas that are currently not supplied from the national grid
3. Evacuate power from planned generation plants
4. Provide a link with the neighbouring countries in order to facilitate power exchange and develop electricity trade in the region
5. Reduce transmission losses that currently cost the country heavily every year and
6. Reduce the cost of electricity to the consumer by absorbing the capital cost of transmission infrastructure.

### **1.3 PROJECT JUSTIFICATION**

Access to electricity has a wide range of social and economic benefits. For example, access to electricity can increase quality of life as well as spur economic development. The proposed project is in line with Vision 2030, which identifies energy and electricity as a key element of Kenya's sustained economic growth and transformation. The country aims at enhancing and diversifying national power generation and supply by improving and expanding the transmission network to match up the rising demand hence the development of the proposed transmission line.

The country is seeing large scale expansion in many infrastructure sectors including energy. In year 2007, the Government of Kenya unveiled "Vision 2030". Vision 2030 is the country's economic blueprint that aspires to transform the country from a low income, agrarian economy into a newly industrialized middle-income country, providing a high quality of life to all its citizens by the year 2030. The vision identifies energy as one of the enablers for sustained economic growth and a key foundation of Kenya's envisaged national transformation. Expansion of Energy Sector is critical in order to achieve the Gross Domestic Product (GDP) growth target of 10% by year 2015.

Accordingly, the Government of Kenya formulated Least Cost Power Development Plan (LCPDP) in 2011 and updated further in year 2013. As per LCPDP transmission development plan indicates the need to develop approximately 21000 km of new high voltage transmission lines. This Plan encapsulates three key areas viz. load forecasting, generation planning and transmission planning.

As per LCPDP, the peak load demand is projected to rise to 21075 MW by 2033 from existing 1606 MW during 2013. For this, addition in generation capacity to the tune of 22000 MW has been planned. In the present scenario of power supply arrangement in Kenya, the electrification has been achieved up to approximately 30% of its population. The Government of Kenya is aiming to achieve electrification on rural area up to 40% by 2020. Some of the components of this program include establishment of 400kV, 220kV and 132kV lines and construction of associated substations which will be implemented by KETRACO. KETRACO, responsible for implementing and maintaining the high voltage transmission system in the country, endeavors to support the country's objectives and is aggressively working towards implementing various grid expansion and reinforcement projects. KETRACO has deliberated efforts towards the said objectives and has prioritized the transmission line and substation projects to be undertaken in the country.

The growth in electricity demand in Kenya increased from 3.2% in 2009/10 to 8.9% in 2010/11 and then decreased to 3.6%. It is observed that the electricity demand closely follows the economic growth patterns. The unusual growth rate in 2010/2011 could be linked to the high GDP growth for that particular year along with other contributing factors viz. An accelerated customer connection program, improved hydrology translating to low tariffs and increased rural electrification through Rural Electrification Program (REP). The Peak load forecast of 2013 is projected to be 1,606 MW while the projection for 2033 is forecast close to 21,075 MW.

#### **1.4 LEGAL FRAMEWORK AND APPLICABLE AFRICAN DEVELOPMENT BANK POLICIES**

The African Development Bank is a recognized international leader in the sphere of development and implementation of environmental and social sustainability policies. In accordance with its safeguards policies and procedures, AfDB uses a set of 5 operational safeguards (OS) policies to assess proposed projects. Operational safeguard policy 1 (OS1) sets out the Bank's overarching requirements for borrowers or clients to identify, assess, and manage the potential environmental and social risks and impacts of a project, including climate change issues. OSs 2-5 support the implementation of OS1 and set out specific requirements relating to different environmental and social issues, including gender and vulnerability issues, that are triggered if the assessment process reveals that the project may present certain risks. These OSs are:

- Operational safeguard 1 – Environmental and social assessment.
- OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation
- OS 3: Biodiversity and Ecosystem Services
- OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency
- OS 5: Labour Conditions, Health and Safety

In line with AfDB policy, this project falls under category one (1) because it is likely to induce important adverse and irreversible environmental and/or social impacts, such as the displacement of more than 200 people. A full ESIA and an ESMP are required, and a RAP will apply.

#### **Kenyan Legal Framework**

The principal National legislation governing issues of environmental concern in Kenya is the Environmental Management and Coordination (Amended) Act Cap 387 typically referred to as EMCA Cap 387. EMCA calls for Environmental Impact assessment (EIA) (under Section 58) to guide the implementation of environmentally sound decisions and empowers stakeholders to participate in sustainable management of the natural resources. In line with **Legal Notice No.31**. The Environmental Management and Co-. Ordination Act. (No. 8 of 1999). Amendment Of The Second Schedule, power and infrastructure projects, including high voltage transmission lines are categorized as high risk projects and require comprehensive project report (CPR). It is under this provision that the current study has been undertaken. Other legislation adhered to during this study are the Environmental Impact Assessment and Audit Regulations 2003; Waste Management Regulations 2006; Water Quality Regulations 2006; Noise and Excessive Vibration Pollution Control Regulations 2009 (Legal Notice 61), Air quality Regulations 2009, Water Act (2016), Constitution of Kenya

(2010), Public Health Act (CAP. 242), Employment Act (2007), Children's Act (2012), Sexual Offences Act (2006), Traffic Act (Chapter 403) among others.

## **1.5 OBJECTIVE AND SCOPE OF ESIA**

The purpose of this study was to undertake an Environmental and Social Impact Assessment study for the 132kV double circuit transmission line. The ESIA study has been developed in compliance with the Environmental Impact Assessment/Audit Regulation, 2003 and relevant AfDB environmental and social assessment procedures. The purpose of an EIA is to:

- Ascertain, describe and assess direct and indirect impacts of the proposed activity and its change on the environment, including transboundary impacts
- Explain and compare the advantages and disadvantages of the proposed activity and its modifications
- Identify measures which prevent pollution of the environment, mitigate the environmental pollution or prevent damaging the environment
- Acquire expert supporting documentation for issuing a decision on the permit of activity and its modification under special regulations.

The objectives of an EIA are to:

- Define the scope of the project and the potential interactions of project activities with the environment (natural and social).
- Identify relevant national and international legislation, standards, and guidelines and to ensure that they are considered at all stages of project development.
- Provide a description of the proposed project activities and the existing environmental and social conditions that the project activities may interact with.
- Predict, describe, and assess impacts that may result from project activities and identify mitigation measures and management actions to avoid, reduce, remedy or compensate for significant adverse effects and, where practicable, to maximize potential positive impacts and opportunities.
- Provide a plan for implementation of mitigation measures and management of residual impacts as well as methods for monitoring the effectiveness of the plan.

## **1.6 ESIA REPORT TARGET GROUP**

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.

## 1.7 REPORT STRUCTURE

In order to provide clear presentation of the ESIA procedures including their results, conclusions and recommendations, this report is structured as follows:

1. **Chapter 1. Project Overview** (this chapter). The chapter introduces the Project by providing details of its location, scope, owner, and developer.
2. **Chapter 2. ESIA Methodology**. This chapter provides an overview of the overall process of environmental and social impact assessment and applicability of the international methodology for the ESIA procedure. The chapter further addresses definitions of key terms; identification of potential environmental and social impacts (through consultation and scoping process); description of the criteria used to determine the significance of impacts for various environmental and social topics; and how mitigation measures are considered within the assessment process.
3. **Chapter 3. Project Description**. This chapter describes the background and phasing of the Project, including descriptions of the main and auxiliary facilities, infrastructure, associated facilities, as well as definition of the Project boundaries in the form of the Project area of influence.
4. **Chapter 4. Policy Legal and Institutional Framework**. This chapter provides an overview of the national and international legal framework, within which the Project is to be developed and implemented. Environmental and social legal requirements of the Republic of Kenya is considered together with the applicable African Development Bank Environmental and Social Assessment procedures.
5. **Chapter 5. Baseline Environmental and Socio-Economic Conditions**. The existing environmental and socio-economic baseline is described and characterized in this chapter.
6. **Chapter 6. Stakeholder Engagement**. This chapter describes the stakeholder engagement process adopted by the Project. It describes the results of consultation activities undertaken earlier and as part of the ESIA process. It also provides stakeholder identification.
7. **Chapter 7. Analysis of Project Alternatives**. The key process solutions are presented as they are seen at the current stage of planning, alongside with considered alternatives and justification of the preferred alternative.
8. **Chapter 8. Assessment of Potential Risks and Impacts**. This chapter presents the assessment of potential environmental and socio-economic impacts, including identification of mitigation measures and monitoring requirements. Impacts of the Project are assessed for each component of the environment. Impacts during the Project implementation are assessed on a topic-by-topic basis. This chapter addresses potential cumulative impacts of the Project.
9. **Chapter 9. Environmental and Social Management**. This chapter describes the approaches to environmental and social management across all Project activities and recommends the management procedures and plans to be adopted to ensure compliance with the applicable international requirements throughout the life of the Project.
10. **Chapter 10. Grievance Redress**
11. **Chapter 11. Conclusion** provides summary of the key significant impacts, mitigations and monitoring, as well as recommendations for further studies to remove uncertainties.

## 2 ESIA APPROACH AND METHODOLOGY

### 2.1 Introduction

The methodology of the ESIA study for the proposed Kabarnet- Rumuruti 132Kv transmission line was divided into four phases as follows:

- Desk Top Study and scoping
- Detailed site assessment survey
- Public Consultation meetings and Questionnaire administration and
- Environmental and Social Impact Assessment Study Report preparation

### 2.2 Desk Top Study and Scoping Study

The scoping study phase of the project involved the following activities:

- Desk Top Study of feasibility study report and other literature materials related to the project
- Project area reconnaissance survey to identify biological and physical features that will be affected by the transmission line project
- Preparation of ESIA project report and ESIA study ToR

#### 2.2.1 Desk Top Study

Literature reviews pertaining to the project development and operation activities were done. This included the review of the EMCA Cap 3876 and relevant studies and reports on the construction of the transmission line infrastructure. This included the project's feasibility study report. Other national legislative references consulted during the study include the following:

Table 1- List of Applicable Kenyan Law

- |   |   |
|---|---|
| • The Constitution of Kenya, 2010:  | • The Standards Act Cap 496                                       |
| • Regulations under EMCA  | • Penal Code Act (Cap.63)   |
| • Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101                       | • The Wildlife Conservation and Management Act, 2013              |
| • Environmental Management and Coordination (Water Quality) Regulation 2006                               | • The Lakes and Rivers Act Chapter 409 Laws of Kenya:             |
| • Environmental Management and Coordination (Waste Management) Regulation 2006                            | • The Forestry Services Act, 2005                                 |
| • Environmental Management and Coordination, (Conservation of Biological Diversity) (BD) Regulations 2006 | • Occupational Safety and Health Act, 2007                        |
| • Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations 2006              | • Work Injury and Benefits Act, 2007                              |
|   | • The Radiation Protection Act (cap 243), 2014                    |
|   | • The Traffic Act Chapter 295 Laws of Kenya                       |
|   | • The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya) |
|   | • The Agriculture Act, Cap 318 of 1980 (revised 1986)             |



- Environmental Management and Coordination, (Wetlands, Riverbanks, Lake Shores and Sea Shore Management)
- Regulations 2009
- Environmental Management and Coordination, (Noise and Excessive Vibration 4.3.10 Pollution) Regulations 2009
- Public Health Act (Cap. 242)
- County Government Act, 2012
- Water Act, 2002
- Energy Act of 2006
- Climate change Act 2006
- Explosives Act 2012
- National Museums and Heritage Act, 2006
- Land in the Kenyan Constitution 2010
- The Land Act 2012
- The land and Environment Court Act 2011
- The National Land Commission Act 2012
- The Civil Aviation Act Cap 394
- Sexual Offences Act, 2006
- Children's Act 2012
- Counter Trafficking in persons Act 2010
- HIV and AIDS Prevention and Control Act, 2011
- Labour relations Act, 2012
- Employment Act, Cap 226

International frameworks consulted include:

- International Environmental Guidelines
- Environmental Conventions and Treaties
- World Bank /International Finance Corporation (IFC) Environment and Social Safeguards Policies
- The African Development Bank Environmental and social Assessment Procedures (ESAP)
- Korea Exim bank EDCF Safeguard Policy

Reports and reference materials associated with the project area were reviewed. These included the project scoping report, feasibility study report and preliminary design reports.

### 2.2.2 Scoping Study

The scoping site assessment survey was carried out, preliminary baseline data on the biophysical environment of the project areas and its environment was collected.

During scoping study, the assessment team made observations and collected preliminary data on various aspects including human settlements and urban development infrastructure (health centres, shopping centres, schools etc) landscape, geology, soils and presence of nearby sensitive receptors (like water bodies), flora and fauna. All the parameters and information were recorded and photographs taken.

During scoping, the following were done:

- Identification of all relevant issues and factors, including cumulative effects, social impacts and health risks
- Facilitation of meaningful public engagement and review
- Determination of appropriate time and space boundaries of the ESIA

Preliminary visit to the project site to appreciate the area covered by the proposed project. The purpose of the reconnaissance survey was to have a run through of the project area to collect first-hand information and data on the transmission line route between Kabarnet and Rumuruti to assist the team to identify key physical and biological features likely to be affected by the project so as to assist in planning for the detailed ESIA fieldwork study that was scheduled to follow.

### **2.2.3 ESIA ToR and ESIA Study Report**

ESIA ToR was prepared, submitted to NEMA and duly approved. This gave way for the preparation of ESIA study report.

### **2.3 Detailed Site Assessment Survey**

The detailed site assessment and field baseline data collection was done by the team to collect information on the biophysical and socioeconomic environment of the proposed site area and its environs. The detailed site assessment survey carried out by the ESIA team comprised lead EIA expert, socio-economist, land economist, land surveyor, civil and electrical engineer.

The survey team made observations and collected data on various aspects including human settlements and urban development infrastructure (health centres, shopping centres, schools etc ) landscape, geology, soils and presence of nearby sensitive receptors (like water bodies), flora and fauna. All the parameters and information were recorded

Photography was used to capture salient features and baseline conditions in the project site and its neighbourhood. The photos were used to define existing features in the project area and identify soils and floral species in the area.

### **2.4 Baseline Ambient Environmental Measurements**

Baseline environmental measurements were conducted by Lab Works East Africa and have been annexed. Refer to Annex I . The measurements were to enable EMC Consultants understand the baseline situation of the project area specifically in areas with sensitive receptors that may be affected by the project construction activities. The annex shows the locations of the baseline environmental measurements.

#### **2.4.1 Equipment and Method Used for Air Quality Measurement**

Measurement of the air quality parameters were achieved using the *AQM-09* air quality monitor for Henan Oceanus. The AQM-09 Air Quality Monitoring Station can measure outdoor air pollutants in real-time, measuring data quickly and accurately.





Figure 2-2: Air Quality Monitoring Station

**Source: EMC Consultants, 2019**

**Source: QC Pass /EMC Consultants**

It can be customized for different applications demands, the measurement parameters can be chosen from the following: the gas type Ozone( $O_3$ ), Nitrogen Dioxide ( $NO_2$ ), Sulphur Dioxide ( $SO_2$ ), Carbon Monoxide (CO), Volatile Organic Compounds (VOCs), Ammonia ( $NH_3$ ), Hydrogen Sulphide ( $H_2S$ ), Particulate Matter  $PM_{2.5}$  and  $PM_{10}$ , and Meteorological parameters (including of Temperature, Humidity, Wind speed, Wind direction, Barometric pressure).

The monitor was set up in an obstruction free area and operated to log in data every 5 minutes for the parameters tested

## **2.5 Stakeholder Engagement and Public Consultation**

As part of the ESIA study, relevant stakeholders and all affected and interested persons were contacted at different times before and during the detailed field baseline data collection and invited for public consultation meetings within their locations to discuss the transmission line project to seek their view and opinions on the proposed development.

### **2.5.1: Purpose of Public Consultation Meetings**

The main purpose of carrying out the consultation was to obtain their views and concerns on the upcoming project and incorporate their contribution into the project development to safeguard the environment and the interest of the local communities who form a section of the stakeholders.

Secondly, consultations were conducted to take the opportunity to elaborate the essence of the project, to inform them of any potential negative impacts and elaborate on the positive aspects so that all stakeholders can make informed decisions.

## 2.5.2 Mode of stakeholder consultations

Stakeholders were consulted in four main ways namely:

1. Through meetings with key stakeholders that include officials from the county and national Government. Officials
2. Through public barazas where members of the community were called to a meeting with the agenda of discussing the proposed Project
3. Through Focus Group Discussions (FGDs), where different groups were isolated and interviewed in a culturally appropriate setting. The FGD groups included women, youth, and men.
4. Through administration of questionnaires

A summary of the consultations held are as follows

**Table 2- 1: Public Consultations held in Baringo and Laikipia County**

Mode of consultation	Year	No of meetings held	Total no of participants	Male	Female	Reference table in the ESIA report
<b>Baringo County</b>						
Key stakeholders' meetings	2019	12	50	45	5	Table 35
	2021	9	48	34	12	Table 36
Public barazas	2019	7	212	144	69	Table 37
	2021	8	284	234	50	Table 38
FGDs	2019	21	72	36	36	Table 37
<b>Laikipia County</b>						
Key stakeholders' meetings	2019	4	12	12	0	Table 39
	2021	1	5	4	1	Table 39
Public barazas	2019	2	66	49	17	Table 41
	2021	5	134	87	47	Table 42
FGDs	2019	6	72	36	36	Table 42

**Key stakeholders meetings** focused on the national government officials in both counties including the county commissioners; deputy county commissioners; chiefs and assistant chiefs; KFS; KWS; WRA; NEMA; and CECs related to water, planning, environment, lands and housing. These key stakeholders were issued with structured questionnaires after the meetings for documenting their views and opinions on the project (refer to annex D). In total, in 2019, 170 questionnaires were filled and returned while in 2021 195 questionnaires were filled and returned.

**Public consultation meetings** were organised by chiefs and assistant chief's within the various locations traversed by the transmission line. In Baringo County were conducted in chiefs' offices in the following locations: Arabal location; Kiserian location; Ilngarua and Ilchamus locations; Marigat location; Kimalel location; Kituro location; Kapropita location and Chebininy location.

Public consultation meetings in Laikipia county were conducted in chief's offices in the following locations: Kiambogo location; Gituamba location; Melwa location; Muhotetu location. Members of the public were also issued with structured questionnaires after the meetings to document their views (refer to annex E)

Minutes for all meetings were taken and signed (refer to annex B) and the attendance list for all participants in the consultation meetings were taken (refer to annex A). Sample questionnaires have been provided in annex E.

## **2.6 Environmental and Social Impact Assessment Study Report**

After reviewing all the existing reports comprising of the feasibility and project design reports, reviewing the local legislation and AfDB safeguard policies, conducting the field scoping exercise and writing the project report, conducting the detailed field ESIA study and data analysis, the consultant has prepared this ESIA study report.

All the information and data collected during all stages of the study were evaluated and formed the basis of compiling this ESIA study.

### 3 PROJECT DESCRIPTION

#### 3.1 PROJECT DESCRIPTION

The project will essentially involve the construction of a 132kV transmission line from Kabarnet substation in Baringo County, and terminate at Rumuruti substation in Laikipia County. The proposed Kabarnet – Rumuruti 132/33KV transmission line is part of Kenya Transmission Network Improvement Project (KTRNIP).

Detailed scope of work for the project is as follows:

1. Transmission Line
  - a) Kabarnet – Rumuruti 132kV Overhead Power Line (95km).
2. Substation
  - a) Bay Extension at Kabarnet and Rumuruti Substations

#### 3.2 TRANSMISSION LINE ROUTE

The transmission line will take off from Kabarnet substation in Baringo and terminate at Rumuruti substation. The below section provides the transmission route coordinates while detailed description of the transmission line route is in chapter 5 section including affected flora and fauna, drainage, geology and ecology and other sensitive ecosystems.

##### 3.2.1 Transmission line Coordinates

The transmission line co-ordinates are presented in the table below.

**Table 2- Proposed 132kv Kabarnet - Rumuruti transmission line coordinates CRS: Arc 1960 UTM zone 37°N**

<b>PROPOSED 132kV KABARNET - RUMURUTI TRANSMISSION LINE COORDINATES</b> <b>CRS: ARC 1960 UTM ZONE 37°N</b>						
<b>Point_Name</b>	<b>Eastings (m)</b>	<b>Northings(m)</b>	<b>Length</b>	<b>Total Length</b>	<b>Heading</b>	<b>Remarks</b>
KABARNET SS	140016.730	53016.343	52.371 m	---	244° 58' 06.059"	
TT	139969.211	52994.179	24.968 m	52.371 m	188° 56' 29.052"	New Angle points into Kabarnet Substation
AP26	139965.314	52969.487	31.423 m	77.339 m	125° 32' 00.615"	
AP25	139990.907	52951.191	103.02 m	108.76 m	76° 26' 00.987"	
AP24	140091.183	52975.338	117.23 m	211.78 m	114° 32' 29.478"	
AP23	140197.927	52926.537	450.85 m	329.01 m	71° 38' 28.916"	

AP22	140626.408	53068.506	220.54 m	779.86 m	87° 51.885"	16'	
AP21	140846.968	53078.876	1.476 km	1 km	102° 37.483"	51'	Adjusted from the road reserve
AP20	142287.487	52749.288	1.783 km	2.476 km	98° 28.328"	41'	
AP19	144052.359	52478.661	4.154 km	4.26 km	80° 29.944"	40'	
AP18	148156.932	53150.690	2.103 km	8.414 km	125° 49.688"	04'	
AP17	149879.030	51940.079	8.436 km	10.517 km	83° 20.420"	19'	
AP16	158267.020	52918.264	5.221 km	18.953 km	111° 24.017"	20'	
AP15	163134.150	51014.268	5.458 km	24.174 km	100° 32.299"	36'	
AP14	168503.997	50006.117	4.127 km	29.632 km	97° 48.395"	32'	
AP13	172598.825	49461.921	7.951 km	33.759 km	89° 30.618"	54'	
AP12	180557.126	49471.440	7.117 km	41.71 km	103° 43.834"	13'	
AP11	187490.500	47838.734	8.389 km	48.827 km	151° 59.399"	40'	
AP10	191470.646	40445.954	3.547 km	57.216 km	135° 30.143"	20'	
AP9	193965.201	37919.955	6.727 km	60.764 km	142° 30.913"	39'	
AP8	198046.895	32567.029	505.93 m	67.49 km	122° 25.794"	51'	
AP7	198472.135	32292.233	1.965 km	67.996 km	155° 07.363"	10'	
AP6	199297.460	30507.527	2.001 km	69.961 km	114° 17.856"	29'	
AP5	201119.182	29677.278	1.988 km	71.962 km	88° 17.601"	58'	
AP4	203108.440	29712.551	4.1 km	73.95 km	102° 46.347"	11'	
AP3	207118.435	28844.934	4.712 km	78.05 km	110° 44.442"	21'	
AP2	211538.237	27203.508	2.386 km	82.762 km	89° 28.992"	56'	
AP1D	213925.878	27205.487	614.44 m	85.148 km	95° 06.311"	13'	

AP1C	214538.135	27149.450	1.809 km	85.762 km	88° 45.510"	11'	New Angle points to avoid a settled area
AP1B	216347.137	27206.080	4.479 km	87.571 km	89° 00.085"	52'	
AP1 A	220828.695	27215.651	1.26 km	92.05 km	69° 38.254"	52'	New Angle points into Rumuruti Substation
AP1	222012.490	27649.136	320.66 m	93.31 km	120° 56.803"	28'	
TT	222288.955	27486.329	19.133 m	93.631 km	145° 21.198"	45'	
RUMURUTI SS	222299.725	27470.502	---	93.65 km	---		

**Source: KETRACO Field Survey data, 2021**

### 3.2.2 Areas traversed by the proposed transmission line

The proposed transmission line exits Kabarnet substation at Kasoiyo and traverses Kituro, Kapropita, Chebininy, Koriema, Kimalel, Marigat, Ilchamus, Ingarua, Logumgum, Kiserian, Arabal, Kasiela, Kapkechir areas in Baringo County and Kiambogo, Karandi, Gituamba, Muhotetu, Melwa and terminates at Rumuruti substation in Laikipia County.

KETRACO ESIA team during ESIA update in 2021 largely retained the route which was used in preparation of the initial ESIA by the hired consultants during ESIA/RAP/VMGP study in 2019 but adopted slight changes at the exit of Kabarnet substation and entry to Rumuruti substation due to the positioning of the bays within the two substations. At Kabarnet, the direct exit of transmission line to the road is prevented by the 33 kV switchyard which requires the line to turn and approach the substation from the rear in the same orientation as the Lessos line. The preferred solution will require the relocation of the Lessos line to a new constructed bay and terminating the Rumuruti line in the existing Lessos bay.

At Rumuruti, the approach of the line to the gantry will be the same as that of the Nanyuki line i.e. from the rear end of the substation and not along the main road. The orientation of the line will be such that there is minimal crossings of future Menengai and Maralal circuits.

The ESIA team noted that the exit from the Kabarnet Substation will be more challenging given the developments that prior existed and those currently coming up.

### 3.2.3 Sensitive Receptors

The transmission line route will traverse Kinyo Forest Conservancy which is managed by Kenya Forest Service. In compliance with ESIA conditions, KETRACO will obtain authorization from KFS before commencement of construction. The transmission line will also traverse Kapkechir forest and Baringo County and Lariak forest in Laikipia County. After NEMA issues ESIA license, similarly formal authorization will be obtained from Kenya Forest Service and County Government environment department.

The transmission line traverses Perkerra River, the riparian reserve will be avoided in locating the towers. The proposed transmission line is 2kms from Lake Baringo and 40kms from Lake Bogoria. The proposed transmission line has also avoided the riparian reserve of Lake 94. The proposed transmission line has also avoided:

- Marigat Livestock market
- Chief's house within the wayleave in Marigat area
- Latio livestock market



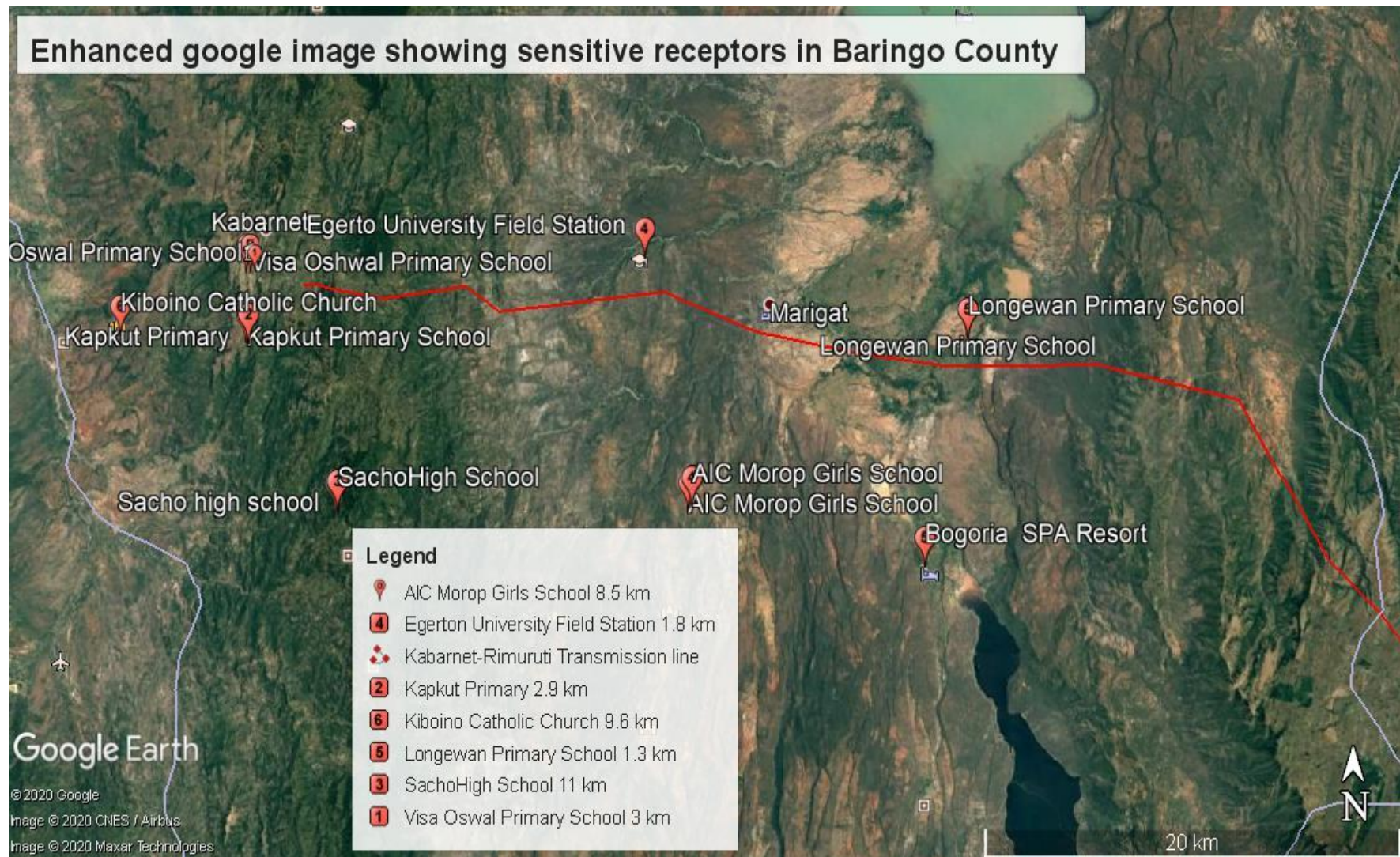


Figure 3-3- Google image of sensitive receptors in Baringo County

Source: Google Maps/EMC Consultants, 2019



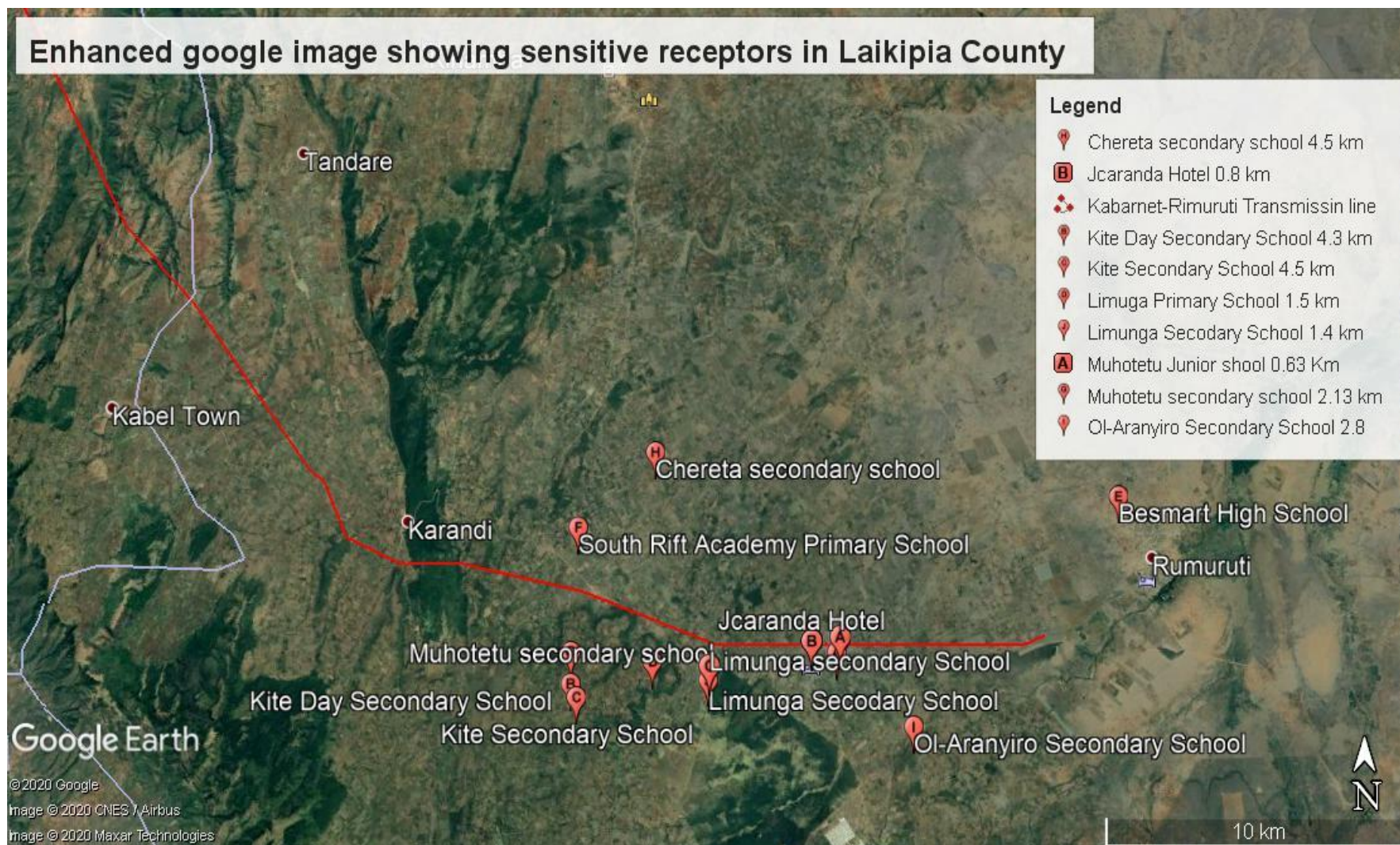


Figure 3-4- Google image of sensitive receptors in Laikipia County

Source: Google Maps/EMC Consultants, 2019

The ESIA team took note of the following:

- Areas inhabited by indigenous communities who are considered vulnerable and marginalised i.e., the Ilichumus
- Informal subdivisions within Eldume area which will be compensated as per Community Land Act, 2016.

### 3.3 TRANSMISSION LINE DESIGN

The transmission line design is a detailed design; which highlights all the design criteria and philosophy which are sufficient to guide the contractor during the project bidding process and which essentially forms the basis for the ESIA. The designs are detailed and as such, no new ESIA shall be required.

#### 3.3.1 Right-of-Way Requirements

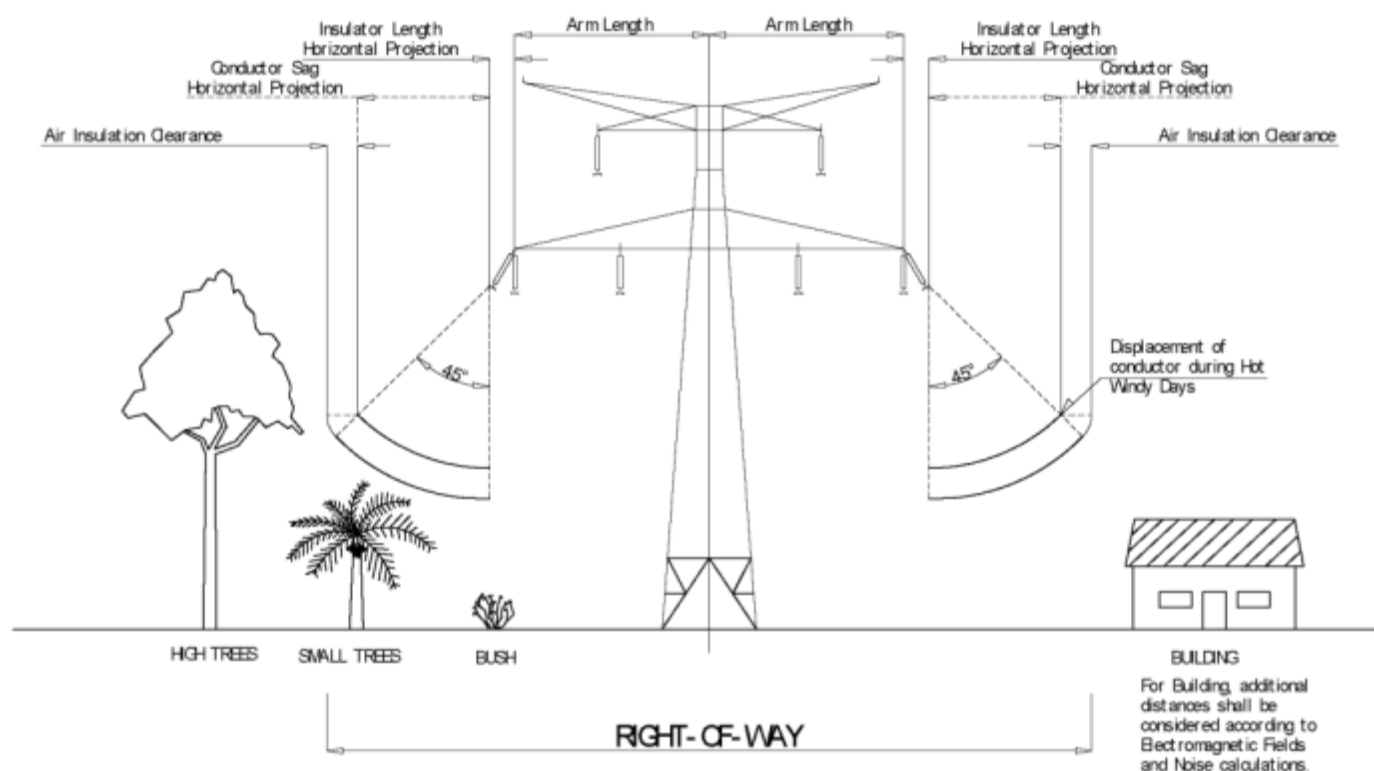


Figure 3-5- Right of Way Requirements

Source: KETRACO ESIA team, 2021

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

vides for the safety of lives and allows access to routine maintenance work. The width of this corridor is dependent on the reference voltage and should be maintained clear, to ensure safety in the event that a power line conductor snaps. The proposed width for this line being a 132kV transmission line, is 30m

### 3.3.2 Air Space Protection

Where it is likely that the power line is hazardous to aviation and avi-fauna safety because of its height and location, spherical markers will be used to identify overhead wires. The Kenya Civil Aviation Authority (KCAA) regulations, establish standards for determining obstructions in navigable airspace. Issues such as size and height of tower/poles, right-of-way needs, maintenance access, and impacts to the approach zone, clear zone, or safety zone has to be evaluated and approved by KCAA to utilize property near airports and airstrips. KCAA approval for the project had been obtained on 6/7/2021 and annexed in this report. (see annex M)

### 3.3.3 Conductor Clearances

#### Conductor Vertical Clearances

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

**Table 3-Vertical Clearance**

Above terrain in general, including minor roads/tracks	7.0
Above main (paved) roads	8.0
Above secondary (unpaved) roads	8.0
Above railways	8.5
Above steep or swampy ground, inaccessible to vehicles < 3.0m, and above water at max. flood level, except navigable rivers	6.5

Source: KETRACO ESIA team, 2021

#### Design Factors of Safety

The following design factors are for steel lattice towers and are true for 132 kV lines

**Table 4- Design factors**

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



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

Source: KETRACO ESIA team, 2021

### 3.3.4 Tower Layout

Figure 4: TL tower



Transmission line tower; courtesy of KETRACO ESIA team

#### Possible Tower Configurations

With regard to line design, there are three (3) different variants, which are technical feasible:

Conventional overhead line (Steel lattice towers with individual foundations)

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

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

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

Tubular steel pylons / Pre-stressed concrete poles.

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

Conventional overhead line (Steel lattice towers with individual foundations) will be used for this project.

### 3.3.5 Tower Type Family Recommendation

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

Corrosion protection shall be of hot dip galvanization (minimum 610 g/m<sup>2</sup>).

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

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

#### *Tower dimensions*

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

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

#### *Tower Height*

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

- h1 - Minimum permissible ground clearance
- h2 - Maximum sag (at highest conductor temperature)
- h3 - Vertical spacing between conductors
- h4 - Vertical clearance between ground wire and top conductor

$$H = h1 + h2 + h3 + h4$$

The towers will be of a height of forty (40) meters that was approved by the KCAA (refer to appendix M).

### 3.3.6 Definition of Spans

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

Those typical spans are:

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

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

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

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

### 3.3.7 Selection of Conductors

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

:

Table 5-Conductor types

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

Source: KETRACO ESIA team, 2021

### 3.3.8 Selection of Shield Wires

#### Conventional Earth Wire – Type ACS

The earth wire fulfils two functions:

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

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

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

### 3.3.9 OPGW Shield Wire

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

The most common method for this is to install an **Optical Ground Wire (OPGW)**, which contains optical fibres, as a substitution of an existing ground wire.

The main characteristics of an OPGW are:

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

The fibres OPGW shall follow the following specifications and recommendations:

**Table 6-Fibre OPGW Specifications**

Optical fibre:	CCITT (recently ITU-T) recommendation, IEEE 1138, Annexure A for short circuit tests
IEC 60794	Optical Fibre Cables
IEC 61395	Creep test for stranded conductors
EN 187 000	Optical Fibre Cables (Generic specification)
EN 187 100	Optical Telecommunication Cables (Sectional specification)
EN 187 200	Sectional Specification: Optical Cables to be used along Electrical Power Lines (OCEPL)
EN 187 201	Family specification OPGW
EN 187 204	Family specification OPFC
EN 188 000	Optical Fibres (Generic specification)
IEC 60104	Aluminium-magnesium-silicon Alloy Wire for Overhead Line Conductors
IEC 60304	Fibres and binders colours
IEC 60865-1	Short-circuit Currents - Calculation of Effects.
IEC 60889	Hard Drawn Aluminium Wire for Overhead Line Conductors
IEC 60949	Calculation of Thermally Permissible Short-circuit Currents, taking into Account Non-adiabatic Heating Effects.
IEC 61089	Round Wire Concentric Lay Overhead Electrical Stranded Conductors.
IEC 61232	Aluminium-clad Steel Wires for Electrical Purposes
IEC 61597	Overhead Electrical Conductors – Calculation Methods for Stranded Bare Conductors
ITU G.652	Characteristics of a Single-mode Optical fibre

Source: KETRACO ESIA team, 2021

### 3.3.10 Foundation Design

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

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

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

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

**Table 7-Soil Types**

<b>Soil Type</b>	<b>Soil Conditions</b>
<b>S1</b>	Rock such as granite (with different levels of different minerals included), lightly weathered
<b>S2</b>	Very good soil such as hard clay, dense sand, very weathered rock
<b>S3</b>	Good/Normal soil such as medium-dense or loose soils, such as firm clay and medium sands
<b>S4</b>	Poor soft soil / backfill material
<b>S5</b>	Very poor soil such as waterlogged soils, swamps, soils below water table for a significant period of the year

Source: KETRACO ESIA team, 2021

### 3.3.11 Tower Footing Resistance

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

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

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



**Table 8-Footing Resistance**

<b>Voltage (kV)</b>	<b>Footing Resistance <math>\Omega</math></b>
132	10
225	10
275	10
400	10

Source: KETRACO ESIA team, 2021

It is propose the use of ground rods of a 35 x 35 x 4 mm diameter cruciform and 30 metre long steel rods. Ground rods shall be hot-dip galvanised. The ground rods shall be buried or driven at the base of the tower leg foundation. In order to avoid vandalism of the earthing material it is propose to connect the foundation steel and tower leg to the earth conductors beneath the soil surface; this is a proven practice at ESKOM South Africa.

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

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

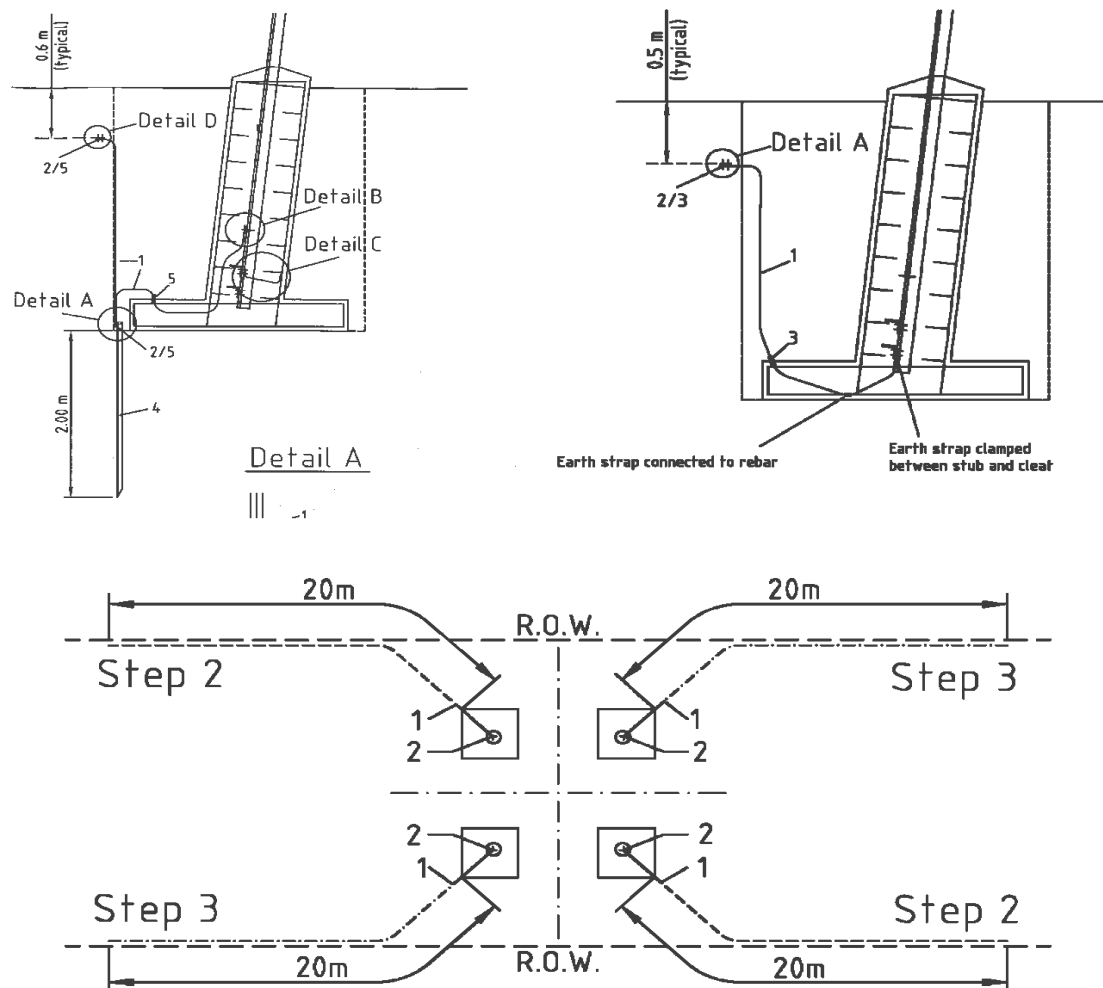


Figure 3-6-Tower Footing

Source: KETRACO ESIA team

### 3.3.12 Other Accessories

The following equipment must be included:

- Tower number plates, phase plates, warning plates;
- Anti-climbing devices; Spacers for bundled conductors;
- Anti-theft protection bolts.

## 3.4 HIGH VOLTAGE TRANSMISSION LINE COMPONENTS

The main components of high-voltage electric transmission lines and associated facilities include:

- Transmission Towers. Transmission towers are the most visible component of the power transmission system.
- Conductors (Power lines)
- Substations.

- Rights of Way (ROWs)
- Access Roads.
- Insulator
- Cross arms
- Spacer
- Power line markers
- Vibration damper

### 3.5 PROJECT PHASE ACTIVITIES

#### 3.5.1 Planning (Pre-Construction Phase)

Activities during the planning (pre-construction) phase will include:

- Design of towers type
- Design of foundations
- Plant and line profile
- Design of access routes
- Operational design
- Land acquisition (compensation and resettlement)

#### 3.5.2 Construction Phase Activities

There will be several activities during the construction of the transmission line as outlined below Site Preparation Activities

KETRACO will set a number of method statements in order to safely construct and install the overhead transmission lines. The construction phase involves a number of activities, which will be undertaken sequentially by simultaneous different construction crews. During this preliminary phase, path vertices and singular path points, identification and ground staking and clearance will be undertaken within a 30m corridor. The site preparation phase will include a number of activities as described below.

##### 3.5.2.1 Setting Out

The construction teams will position the intermediate towers based on the approved profile. Where required, basic access tracks will be established to each structure position by moving obstacles such as rocks, levelling high points and filling in holes. Existing tracks will be used where possible and new tracks will be made to pole positions where existing access is not available.

##### 3.5.2.2 Pulling and Tensioning Sites

Pulling and tensioning sites are those areas from which the conductor and fiber optic cable are pulled and tightened to the correct tension once they are mounted on the transmission towers. Conductor is packaged and transported on reels that can hold up to 9,500 feet of conductor. Depending on the size of the reel, pulling and tensioning sites (or reel sites or conductor tensioning sites) can be from 1.75 to 3.5 miles apart. These sites are also dependent on the topography and typically disturb about 0.7

acre each (about 300 feet long by 100 feet wide). A flat area is needed at each pulling site for the large flatbed trailer with the reels of conductor and tensioning machine. Pulling sites are generally placed within the right-of-way; however, where the line takes a turn (at angle points), sites are often outside of the right-of-way. Depending on conditions, the site could be graded, graveled with crushed rock, reseeded, or a combination of these activities.

### **3.5.2.3 Transmission Corridor Clearing**

Construction crews will begin clearing or trimming the transmission corridor where necessary. This includes clearing trees and structures to provide construction crews and their equipment safe access to the work site and enough clearance for the reliable operation of the line. Tree clearing will be minimized and only removed as necessary. Where structures and crops are required to be removed, the Project Affected Households (PAHs) as identified in the Resettlement Action Plan (RAP) report, will first and foremost be compensated before clearing commences.

Placement of transmission line structures will be undertaken on every tower site defined plot which is an area of 30 meters on average. Within the plot, the tower structure would be assembled before erection. To meet electric industry vegetation clearance standards, species of trees deemed non-compatible for transmission corridors must be permanently removed. These are trees that could become tall enough to grow or fall into the high-voltage transmission lines (the maximum height is 1.8m). Any tree (stable or unstable) outside of the acquired transmission line right-of-way deemed a present or future hazard to the transmission line is considered a danger tree and is removed prior to construction of the line. A tree would be identified as a danger tree if it could fall into, bend into, or grow into the conductor or be close enough to the conductor as it swings to cause a flashover of current from the conductor. When construction is complete, disturbed areas will be restored. Native shrubs and ground cover will be allowed to regrow.

For safe and uninterrupted operation of a transmission line, vegetation within a right-of-way is not allowed to grow above a certain height. If vegetation grows or falls close to a transmission line it can cause an electrical arc, which can start a fire, cause an outage of the line, and or injure or kill someone. Management of right-of-way vegetation varies depending on many factors, including vegetation species, height, and growth rates; ground slope and topography; conductor elevation above ground and conductor swing; clearance distance required between the conductors and other objects; and electrical loading on the line.

### **3.5.2.4 Excavations**

Foundation sizes are dependent on the soil conditions, tower type and height; with the biggest foundation footprint for steel lattice towers being 15.4 x 15.4 m. In this project, only steel lattice towers will be considered. Typical foundations for this project will be “Pila foundation type” using drillers. The drilling is the best solution to reduce the amount of ground as it consists of the extraction of a cylinder of 1 meter diameter and 6 meters high, on average per leg. Excavations using drillers will be made for the foundations as well as to install the anchors of the towers. In some cases, the foundation is to be “Pad Chimney”. It needs excavators to open the ground to prepare the foundation solution. Typical excavation depths for lattice towers is six meters. Excess soil will be spoiled around the structure and excess dump rock will be uplifted and removed as required. Each excavation will be inspected and tested to confirm its suitability. The foundations are ultimately filled with concrete.

Contractors are required to safeguard excavations; this may include erecting a temporary fence or warning solution around the excavation to protect the safety of people and animals. Concrete will be sourced from a 'ready-mix' truck which will access the site, or concrete will be mixed on site. Once the excavations have been filled, the concrete requires 28 days for total curing. Meanwhile, after eight days, 80% of the final concrete mechanical resistance is achieved and tower erection could begin after this 8-day period if needed. Typical vehicles on site at all transmission lines include trucks for material and tools transportation, pick-ups for the crews, driller machine and retro excavators as well as light duty vehicles (LDV). The crews will be different depending on the activity to be performed, e.g., for foundations, tower erection or cable stringing.

### **3.5.2.5 Structure Foundation Installation**

The next step in the construction process is to drill foundations for the new transmission structures. The workers will carefully set aside the topsoil, which will be reused. This involves drilling holes, which are then typically filled with concrete for structure foundations. Drilling operations occur for a few days at each new structure location. Once drilling is complete, a steel rebar cage is placed in each hole and concrete is poured to create a secure foundation for the new steel or lattice structure. Concrete trucks are used to deliver the concrete mix for the foundations. During excavation for the foundations that will stabilize the tower, pumping may be required to remove the water and dry the site (if done during rainy season). The size of the excavation site depend will depend on the type of soil and the type of tower and anchors will depend on the type of towers installed.

### **3.5.2.6 Structure Installation**

Once the foundation is cured, transmission structure installation will begin. Steel poles often come in sections that are assembled on or near the foundation. Cranes and/or bucket trucks will be used to lift the poles and set them into position on the foundations. Construction crews will assemble or "lace" lattice structures at the site. The structure components will be delivered to the transmission corridor well in advance of this installation process. Generally, it takes one to three days to assemble and erect each new structure. After installation, the structure is grounded for safety purposes.

### **3.5.2.7 Cable Stringing and Levelling**

Conventional stringing will be used throughout using custom built equipment. There are three kinds of cable: conductors, ground wire and OPGW. Cable drums carrying approximately 2000 to 4000 m of cable will be delivered to site. The conductors are made of full aluminium alloy (AAAC) or aluminium with a steel core for strength (ACSR). Power transfer is determined by the line voltage and the current. The area of aluminium in the conductors will define the conductivity. Conductors are used singularly, in pairs or in bundles of three, four or six per phase dependent on factors such as audible noise, corona and EMF mitigation. Large diameter running out blocks (pullers and brakes) will be fitted to all the conductor attachment points of the section to be strung and a pilot wire passed through the running out blocks.

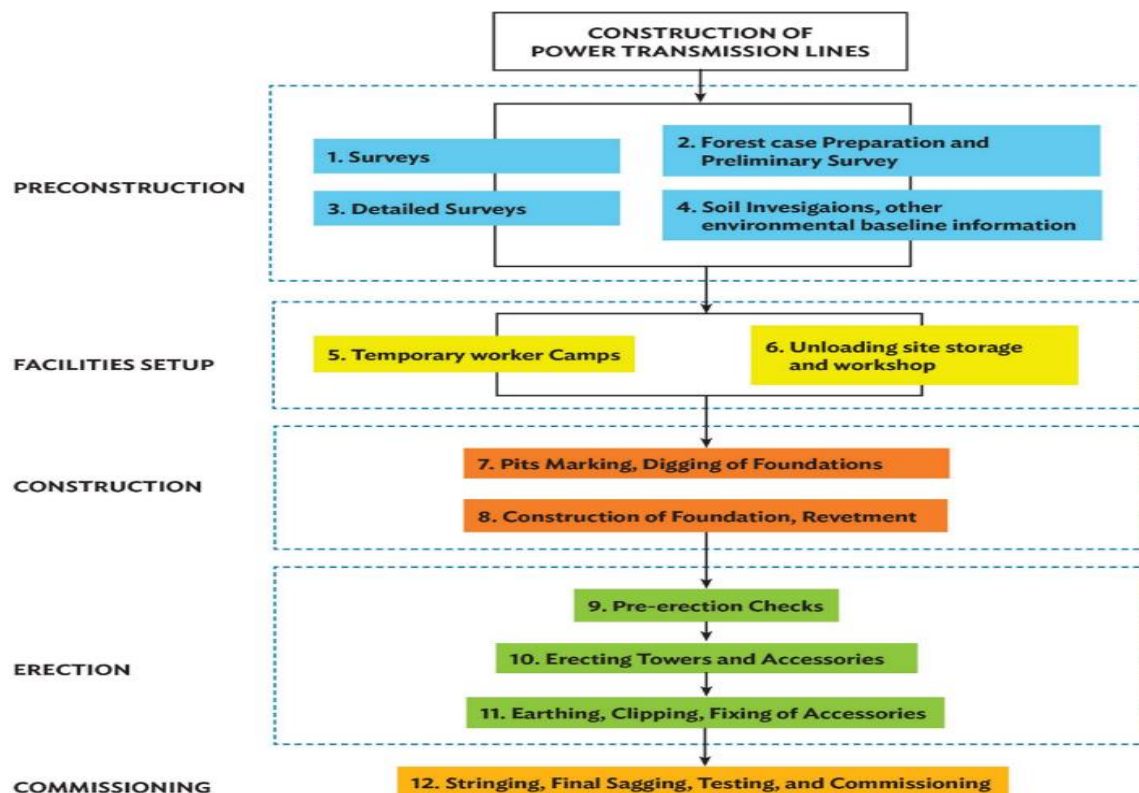
The pilot wire will be walked out from pole to pole and will then be used to pull the conductor into place. Conductor tension will be monitored throughout by a dynamometer. The puller and brake hydraulic machines apply tension to the cables to elevate them and finally adjust the tension to the design levels. The levelling process consists of elevating the cable's lowest point to the design height

through topographic methods, using the leveling plan in the detailed engineering phase. Once the cables are levelled, the last process consists of connecting the different isolated systems between anchorage towers. Jumpers are applied to connect the tranches between anchored towers. These jumpers are simple cables cut in a curve with the shape to avoid possible short-circuits between the phases in the operational period. Once jumpers are applied, electrical test can begin.

### 3.5.2.8 Restoration and Site Rehabilitation

Site reinstatement and rehabilitation are undertaken for each component of the construction phase, which include the following activities:

- Removal of excess building material, spoil material and waste;
- Repairing any damage caused as part of the construction activities;
- Reinstating existing access roads (where applicable);
- Replacing topsoil and planting indigenous grass (where necessary);
- Levelling the ground;
- Dismantling the temporary accesses; and



- Repairing any infrastructure that was damaged during the work (roads, fences, etc.).

**Source: EMC Consultants, 2019**

Figure 3-7: Transmission Line Construction Stages

### 3.5.2.9 Materials and construction equipment

The following equipment and materials will be required for use during the construction phase of the transmission line. Construction materials like cement, concrete, gravel, aggregate etc. will be sourced from local suppliers and there will be no need for the transmission line contractor to own and operate quarries and borrow pits. Other equipment including machinery, electrical wires etc. will be sourced locally or internationally.

**Table 9-Equipment Source**

<b>Equipment</b>	<b>Source</b>
Trucks	Local and international suppliers
Excavators	Local and international suppliers
Pulleys	Local and international suppliers
Cable drum	Local and international suppliers
Reel and tensioner	Local and international suppliers
Materials	Local and international suppliers
Cement	Local suppliers
Sand	Local suppliers
Concrete	Local suppliers
Aggregate	Local suppliers
Counterpoise wires	Local and international suppliers
Cables	Local and international suppliers
Steel bars	Local and international suppliers
Surge arresters	Local and international suppliers
Breaks	Local and international suppliers
Switches	Local and international suppliers
BED buses	Local and international suppliers
Conductors	Local and international suppliers
Insulators	Local and international suppliers
Isolators	Local and international suppliers
Lightning arrestors	Local and international suppliers
Circuit breakers	Local and international suppliers
Relays	Local and international suppliers
Capacitor banks	Local and international suppliers
Sequences	Local and international suppliers
Wave trapper	Local and international suppliers

**Source: EMC Consultants, 2019**

### **Material Transportation**

As some construction equipment and materials will be probably sourced outside Kenya, sea shipping or air shipping will be used to transport the equipment to the country. Once construction equipment



and materials are present in Kenya, terrestrial shipping (road transport) will be used to convey the equipment to site from Mombasa to the project site.

### **3.5.3 Operation and Maintenance Phase**

During the life of the project, KETRACO will perform routine, periodic maintenance, and emergency repairs to the transmission line. For lattice-steel towers, maintenance usually involves replacing insulators. Once constructed, the transmission line will be operated year-round, transmitting electricity to the targeted areas. KETRACO will have responsibility to operate the line and will ensure that available paths allow for access to the towers for maintenance. Access will be directly from the main roads, along existing access roads or from the corridor of the transmission line. During normal operation, transmission lines require very little intervention. The only exception is periodic inspections and vegetation management, which are discussed below. Inspections are periodically done using tracked or other ground vehicles.

KETRACO typically conducts routine inspection patrols of its transmission lines. Patrols are essential to determine where line maintenance is needed and ensure the continued reliability of the transmission system. Patrol teams look for damaged insulators, damaged support members, washed-out roads, hazardous vegetation, encroachments, and problems indicating that a repair may be needed. Maintenance vehicles would use access roads where established and maintenance workers may walk through agricultural fields to avoid damage to crops. In emergencies and some other situations, vehicles and equipment would need to be driven through fields and could cause damage to crops, vegetation and other property. KETRACO determines the damages and, if appropriate, compensates landowners for these damages.

### **3.5.4 Wayleave Management**

Wayleave maintenance is used to assure safe clearance between conductors and vegetation and to allow passage for inspections on foot or by vehicles. Vegetation also would be maintained along the line for safe operation and to allow access to the line. The project area would need continual vegetation maintenance. Vegetation management is a critical function; failure to manage vegetation can potentially lead to black-outs resulting from a combination of heavy electrical loads, high ambient temperature and low wind speed allowing a critical line to sag close enough to a tree which can cause a ground fault to occur. The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the lines. KETRACO will ensure on-going maintenance from time to time, in conformance with transmission line maintenance processes. Although normal operation requires minimal intrusion into the wayleave, line or tower failures can result in the reintroduction of heavy equipment, work crews, excavation, and materials transport. The maintenance will include: -

#### **Maintenance Aspects**

- Routine RoW maintenance through clearing of vegetation
- Structure maintenance and repairs (pylons, electrical wires)
- Environmental maintenance
- Emergency works
- Network and assets management



### **3.5.5 Decommissioning Phase Activities**

The proponent, as per its policies will comply with the decommissioning process as per EMCA Act and International best practices. The decommissioning procedure will include site specific rehabilitation plans for the footprint of the project and will be executed by the KETRACO. The decommissioning activities will include: -

- Dismantling the pylons
- Dismantling the foundations
- Dismantling of electrical lines
- Rehabilitation of the disturbed areas

## **3.6 Resources required during construction and operation**

### **3.6.1 Land Requirements**

The approximately 95Km transmission line will traverse properties belonging to private and communal landowners and a section of a gazette forest i.e., Lariak Forest which is in Laikipia County and under the management of Kenya Forest Service (KFS). The land required for the wayleave will be approximately 695acres based on the findings of the Resettlement Action Plan (RAP) which has been prepared separately based on the recommendation of this ESIA study which determined during the scoping and impact identification phase, displacement impacts, and which (RAP) report has been prepared in line with the AfDB's OS 2 on involuntary resettlement.

### **3.6.2 Construction Staff**

It is typical for this kind of construction to have a mix of skilled, semi-skilled and unskilled workers as part of the workforce. Whereas the contractor will be at liberty to hire workers as per skills required, he/she will be encouraged to source for workers from the local community as much as possible. This will reduce instances of negative impacts related to labour influx, Gender Based Violence (GBV) as well as provide jobs and income to the local community. The contractor will be required to take cognizance of the a third gender rule and give opportunities to women especially concerning jobs the can do. Women, youths and people living with disability will be encouraged to apply for the kind of work they can do during public sensitization meetings.

### **3.6.3 Water**

During the construction stage, contractor teams will require water for use during construction works (concrete mixing, slab, washing vehicles) as well as for drinking by the construction workers. As at now, no water sources for construction purposes have been identified in terms of location. The contractor (s) once procured will identify reliable sources of water to be utilized for construction. These sources may include use of piped water supply via water service providers (where applicable), from existing boreholes, drilling of boreholes, or abstracting streams and or rivers. The abstraction of water for construction by the contractor will be expected to follow national regulations and guidelines and permitting requirements as provided by the Water Resources Authority (WRA). The contractor is encouraged to have alternative sources of water like drilling borehole within the substations to avoid competition with locals for water. During operation phase, the water use

requirements will be low and required by the staff managing the line and periodically if required in maintenance works e.g., repairs on foundations that may need concrete mixing etc.

#### **3.6.4 Material Sites/Borrow Pit**

Borrow pits will not be needed because the contractor will obtain the necessary materials from local suppliers. Hence no need for ESIA.

#### **3.6.5 Electricity**

Electricity will be needed during for construction and also for lighting at night during construction and in the workers camp during the construction etc. Electricity may be supplied using diesel generators or temporary electricity connections during the construction phase.

#### **3.6.6 Reinstatement**

A detailed Reinstatement Plan will be agreed upon with the selected main contractor. For the purposes of this ESIA Study, the broad restoration measures proposed for the transmission line project are described below. General restoration will be required along the wayleave, construction camps and material laydown areas. Specific restoration will also be required around water crossings and borrow pits. As detailed in the various construction activities, the wayleave will be carefully cleared such that the excavated topsoil is neatly stored in windrows. Once the towers have been erected, construction camps have been demobilized and material laydown areas have been cleared, the stockpiled topsoil will be used for reinstatement. The stockpiles will be located away from surface water flows and their surfaces smoothed or covered to prevent erosion through rainfall. Excess subsoils will be transported for use at other areas on site, i.e., reinstatement of borrows pits. The areas will be restored with the materials previously set aside as soon as reasonably practical.

Access roads will be dressed off once the ROW reinstatement is complete. Soils and vegetation will generally be kept within their natural habitat and any excess used to cover areas where available soils are minimal. The site compound will be removed to the original formation level with all imported rock, geogrids and geotextile removed. All slabs and drainage facilities will be removed and backfilled. Previously set-aside materials will be used to backfill the area. The reinstated areas will be protected so as to prevent any erosion while vegetation re-establishes.

#### **3.6.7 Wastes and Emissions**

##### **Effluent Waste**

Construction effluent waste will emanate from construction camp (s) (if established) and from mobile toilet facilities that will be used by workers along the transmission line while at work and away from their area of residence. Wastewater will also emanate from activities related to washing/cleaning of equipment and vehicles. During operation, effluent waste is going to be minimal and will emanate from the cleaning activities.

##### **Solid Waste**

Construction waste will comprise general domestic waste from construction camp (s) (if established) including sanitary and food waste, office waste, organic material, small volumes of wastes arising from mobile plant, chiefly waste lubricating oil and packing materials (e.g., crates). Human waste

will also emanate from the construction camp (s) if established and workers on site will also generate human wastes and will require mobile toilets. Construction wastes will include among others:

- Used electrical wires
- Cement waste
- Construction packaging materials (cement bags, packaging wastes,)

No significant solid waste streams are expected during operations apart from sub-station where domestic wastes will be generated by staff at the sub-station.

Operation waste will comprise general domestic waste from sub-station including sanitary and food waste, office waste, small volumes of wastes arising from chiefly waste lubricating oil and packing materials (e.g., crates). Wastes from repairs and maintenance activities will include among others:

- Used electrical wires
- Cement waste
- Packaging materials

During the decommissioning phase, the primary waste will be the scrap metal from the steel lattice towers, insulators and cables. Several trucks will be required to transport wastes generated through the decommissioning phase to appropriate waste disposal sites. These vehicles will consume diesel and produce air emissions as a waste.

With respect to the control of ‘litter’ on site, all such waste will be collected and stored within sealed containers within the site compound and serviced by a NEMA licensed waste carrier. No disposal of litter will be permitted at other locations. All forms of wastes generated during the construction, operation and decommissioning phases will be disposed of in compliance with waste regulations in Kenya (Legal Notice 121: Environment Management and Coordination (Waste Management) Regulations, 2006).

### **Fuels and Oils**

All construction plant will be in good condition with no excessive emissions of exhaust, oil, fuel or coolants. Plant operators will check machines daily for oil/fuel leaks and take appropriate remedial action. All re-fuelling will be by an approved mobile fuel bowser using a suitable pump and hose. Absorbent material (spill kits) will be available on site and will be deployed to contain drips and small spillages. All other fuels, oils and potential contaminants will be stored within the site compound in secure, fit for purpose containers within bunded containment as appropriate.

Used oil from the transformers will also generate hazardous wastes during operation. Highly refined mineral insulating oils are used to cool transformers and provide electrical insulation between live components. Sulfur hexafluoride (SF<sub>6</sub>) may also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines and transformers. SF<sub>6</sub> is a greenhouse gas with a significantly higher Global Warming Potential (GWP) than carbon-dioxide. 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<sub>6</sub>. PCBs will not be used in this project.

## **Gaseous Emissions**

The use of motorised equipment during construction will generate gaseous emissions in the project area of influence. Motorised vehicles and equipment including trucks, excavators etc will generate among others SO<sub>x</sub>, NO<sub>x</sub> and PM<sub>10</sub>. Dust will also be generated by movement of motorised vehicles. The gaseous emissions during the operation phase are not significant but will also include SO<sub>x</sub>, NO<sub>x</sub> and PM<sub>10</sub> that will be generated by operation and maintenance vehicular teams.

During the decommissioning phase, the primary waste will be the scrap metal from the steel lattice towers, insulators and cables. Several trucks will be required to transport wastes generated through the decommissioning phase to appropriate waste disposal sites. These vehicles will consume diesel and produce air emissions as a waste. Secondly, through servicing of these trucks, used oils will be generated which are hazardous wastes. Potentially there may be tires that will be replaced and old tires that come out of the trucks during the decommissioning of the transmission line may also be wastes.

## **Noise Emissions**

The use of motorised equipment during construction will generate noise emissions in the project area of influence. Motorised vehicles and equipment including trucks, excavators etc will generate noise during construction, operation, and decommissioning phases of the project. Construction phase noise levels will be generated by construction plant and equipment such as excavators, lifting equipment, dumper trucks, compressors, generators, etc. Construction plant and equipment will be maintained in accordance with the preventive maintenance schedules indicated in the manufacturer's instructions to ensure that such equipment does not produce excessive noise and vibration.

### **3.7 Schedule for Implementation and Workforce**

Construction will commence once all the necessary approvals, funding, contractor and all the necessary logistics are in place. Line construction generally would occur after road construction. Construction work would be staged with one type of activity taking place in one area (such as construction of access roads) and another activity taking place in another area where roads exist (such as vegetation removal and tower construction).

A typical crew can usually construct about 10 miles of transmission line in 4 months. In areas where terrain is steep, progress may be slower. Construction of roads and tower pads (if required) usually takes about 3 to 5 months including close-out repairs of any roads damaged during construction. A typical transmission line construction crew and equipment for a 132-kV line would include the following:

- 20 to 30 construction workers (70-100 at the peak of construction; actual workforce numbers would vary over time).
- 45 vehicles (pickups, vans, trucks)
- Bucket trucks
- 1 conductor reel machine
- 3 large excavators (bulldozers, backhoes) 1 line tensioner, 1 puller, 1 reel trailer
- Helicopters (small helicopter and skycrane; size dependent on lifting required) 1 to 2 large (210-ton) and mid-sized (50-ton) cranes
- Road construction equipment (dump trucks, rollers, graders, dozers, excavators, water truck)

## 4 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

### 4.1 Introduction

This chapter sets out the standards to which the legal, policy and administrative framework within which the Project will be developed. It identifies the applicable lender requirements and national standards. The proponent through this ESIA will conform to the Kenyan legislative and regulatory framework and the AfDB's Integrated Safeguards System Policy Statement and Operational Safeguards. Where there is a difference between national Kenyan standards and AfDB's Policies, the latter will prevail.

### 4.2 National Policies and Legislation

**Table 10-Summary of National Policies**

Policy	Description	Relevance to the project
National Environment Policy, 2013	<p>The goal of the policy is to ensure a better quality of life for present and future generations through sustainable management and use of the environment and natural resources.</p> <p>The objectives of the Policy are inter alia to:</p> <ul style="list-style-type: none"> <li>• Provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources;</li> <li>• Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; and</li> <li>• Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods.</li> </ul>	<p>The proponent, KETRACO will ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods. Preparation of this ESIA is a first step in identifying possible impacts and how these can be mitigated towards environmental protection. Further throughout the lifecycle of the project, KETRACO will ensure to implement relevant aspects of the policy applicable to the project</p>

	<p>Some of the guiding principles in the implementation of the policy include:</p> <ul style="list-style-type: none"> <li>• Environmental Right: Every person in Kenya has a right to a clean and healthy environment and a duty to safeguard and enhance the environment;</li> <li>• Right to Development: The right to development will be exercised taking into consideration sustainability, resource efficiency and economic, social and environmental needs;</li> <li>• Sustainable Resource Use: Environmental resources will be utilized in a manner that does not compromise the quality and value of the resource or decrease the carrying capacity of supporting ecosystems; and</li> <li>• Public Participation: A coordinated and participatory approach to environmental protection and management will be enhanced to ensure that the relevant government agencies, county governments, private sector, civil society and communities are involved in planning, implementation and decision-making processes.</li> </ul>	
Wetlands Policy of 2013	The wetlands policy is intended to promote protection of wetlands in Kenya. The policy	The proponent has avoided impact on wetlands within the areas traversed by the

	sets out strategic measures for the protection of existing wetlands in Kenya.	transmission line project. Functions derived from wetlands will be enhanced throughout the project life cycle
m		
Sessional Paper No. 2 of May 2006 on Gender Equality and Development	The overall goal of this Policy is to mainstream gender concerns in the national development process in order to improve the social, legal/civic, economic and cultural conditions of women, men, girls and boys in Kenya.	The proponent & contractor will ensure all gender are given equal opportunity in employment especially ensuring the one third gender rule is observed. The same should applied to youths. Women and youths will be encouraged to apply for jobs and will be given a fair chance in recruitment processes
Human Immuno Virus/Acquired Immuno-deficiency Syndrome (HIV/AIDS) Policy, 2009	<p>In summary, the policy provides a mechanism for:</p> <ul style="list-style-type: none"> <li>• Setting Minimum Internal Requirements (MIR) for managing HIV and AIDS;</li> <li>• Establishing and promoting programs to ensure non-discrimination and non-stigmatization of the infected;</li> <li>• Contributing to national efforts to minimize the spread and mitigate against the impact of HIV and AIDS;</li> <li>• Ensuring adequate allocation of resources to HIV and AIDS interventions; and</li> <li>• Guiding human resource managers and employees on their rights and obligations regarding HIV and AIDS.</li> </ul>	KETRACO & its associated contractors and suppliers will will sensitise workers on HIV/AIDS prevention, supply condoms, and respect employees' rights regarding HIV/AIDS and non discrimination/stigmatization of affected persons.



The National Land use Policy (Sessional Paper No. 1 of 2017)	The overall objective of the national land use policy is to secure land rights and provide for sustainable growth, investment, and the reduction of poverty in line with the governments overall development objectives	The proponent will ensure people whose parcels of land are traversed by the proposed power line are given just and fair compensation. An up to date RAP has been prepared to guide this process.
National Forest Policy, 2014	The policy aims to ensure there is a sustainable conservation of forests and increase tree cover to 10%. This Forest Policy provides a framework for improved forest governance, resource allocation, partnerships and collaboration with the state and non-state actors to enable the sector to contribute in meeting the country's growth and poverty alleviation goals within a sustainable environment.	KETRACO Commits to ensure material assessment and compensation of trees in forests which will be traversed by the proposed line. The proponent will put in place mitigation measures for the trees which will be felled along the way leave as away of increasing the tree cover. Eg through reforestation and tree planting exercises
Energy Policy,2019.	The Energy Policy seeks to ensure an adequate, quality, cost effective and affordable supply of energy to meet development needs, while protecting and conserving the environment, with a bias towards the exploitation of green energy.	The project will contribute towards secure and reliable power supply in Baringo and Laikipia counties. This will contribute in climate change mitigation and environmental conservation in general due to reduced dependence on woodfuel.
National policy on gender and development 2019	The policy framework is geared towards ensuring gender equality and women empowerment in the social, economic, political and cultural spheres as envisaged in the Constitution.	The proponent will give women equal employment opportunity in the project. Availability of secure and reliable electricity supply will reduce the time and money spent by women in sourcing for woodfuel.
Kenya National Youth Policy 2016	This Policy aims at ensuring that the youth play their role alongside adults in the development of the Country. The National Youth Policy visualizes a society where youth have an equal opportunity as other	Youths should be encouraged to apply and be given equal employment opportunity in the project. It is expected the proposed project will identify the needs and concerns of youth and include their views.

	citizens to realize their fullest potential. Proposed transmission line will provide direct employment to the youth as required by the Policy.	
Environment and Sustainable Development Policy, Sessional Paper No. 6 of 1999	<p>This Policy aims to harmonize environmental and developmental goals for sustainability.</p> <ul style="list-style-type: none"> <li>▪ The policy defines approaches that will be pursued by the Government in mainstreaming environment into development.</li> <li>▪ The policy harmonized environmental and developmental objectives with the broad goal of achieving sustainable development.</li> </ul>	<p>The policy paper has provided guidelines and strategies for government action regarding environment and development. This policy is relevant to the proposed transmission line in view of the potential impacts on the environment and involvement of the public in project planning. The proponent will harmonize environmental and developmental objectives with the broad goal of achieving sustainable development through ensuring all potential impacts of proposed development will be avoided or mitigated in an acceptable and sustainable manner. Some of these measures are outlined in chapter 8 and 9</p>
The National Biodiversity Strategy and Action Plan of 2019-2030	<p>The National Biodiversity Strategy and Action Plan (NBSAP) was formulated in order to enable Kenya address national and international commitments defined in Article 6 of the Convention on Biological Diversity (CBD). The strategy is a national framework of action for ensuring that the present rate of biodiversity loss is reversed, and present levels of biological resources are maintained at sustainable levels for posterity.</p>	<p>The proponent will put in place mitigation measures against biodiversity loss and maintain present levels of biological resources for posterity. These measures are broad and not limited to:</p> <ul style="list-style-type: none"> <li>• Implementing the guiding principles in the project cycle</li> <li>• Incorporating all applicable standards and best practices in handling biodiversity along transmission line</li> </ul>
Wildlife Policy, Sessional Paper No. 3 of 1975	This Policy governs wildlife management in Kenya and its	The proponent commits to put in place mitigation measures such

	<p>goal is “to optimize returns from this resource, taking account of returns from other land use”. The policy not only recognizes economic benefits from tourism and consumptive uses but also the intangible benefits that include the aesthetic, cultural and scientific gains that accrue from conservation of habitats and the fauna within them.</p>	<p>as ensuring avoidance of migratory routes, bird diverters on conductors to avoid avifauna mortality and promotion of wildlife conservation through collaboration with stakeholders. Adoption of relevant wildlife guidelines against potential impacts of the project on all forms of wildlife along the transmission line route.</p>
The Kenya National Climate Change Response Strategy, 2010	<p>The vision of the Strategy is for a prosperous and climate change resilient Kenya. The mission is to strengthen and focus nationwide actions towards climate change adaption and greenhouse gas (GHG) emission mitigation. The following measures are proposed to counter potential threats to the energy sector in Kenya:</p> <ul style="list-style-type: none"> <li>-Accelerate the development of geothermal energy;</li> <li>-Accelerate the development of green energy including wind, solar and renewable biomass; and</li> <li>-Energy efficiency (EE).</li> </ul>	<p>KETRACO will ensure that the proposed project infrastructure design is climate-proof over its lifespan, which includes carrying out geotechnical site investigations (GSIs) to determine appropriate sites for infrastructure development; factoring a maintenance component into all infrastructural development funds; and designing infrastructure that can withstand the prevailing climatic conditions, e.g. structures that can withstand strong winds, tides.</p>
The National Water Policy, 2012	<p>The Policy is built on the achievements of the sector reform commenced with the Water Act and based on the sector principles lined out in the National Water Policy 1999. On water resources management, the policy seeks the management of water resources along natural catchment/basin boundaries following the Integrated Water Resource Management approach. It aims to ensure a comprehensive framework for promoting optimal, sustainable, and equitable development and use of water resources for livelihoods of Kenyans.</p>	<p>KETRACO, its contractors and associated Vendors will protect water catchment areas and ensure sustainable use of water along the areas traversed by the transmission line. Any abstraction will have approvals and requisite licenses for conservative use</p> <p>It is also expected that the proposed project will ensure adequate protection of water resources for population access such as Mara River which traverses near the boundary of the project</p>

Big 4 Agenda.	The Big 4 Agenda includes ensuring food security, affordable housing, manufacturing and affordable healthcare and prioritizes public investments towards their realization in the current budget and aligned to the MTP III of the Vision 2030.	The transmission line project will ensure secure and reliable power supply in the project area which contributes to manufacture, healthcare, food security and affordable housing. Electricity supply is a key component in the manufacturing, farming, housing and health sectors. The proposed project will see an increase in energy / electricity supply, quality, reliability and a reduction of power cost in the country, one of the key enablers of economic growth critical for achieving the Big Four Agenda on sustainable development.
Vision 2030	Long-term development blueprint for the country. It aims to transform Kenya into “a newly industrialized, middle-income country providing a high quality of life to all its citizens.	Power availability in the project area has the potential of attracting investors who will put up industries. The proposed Project aims to support creation of transmission and distribution infrastructure to enhance electricity service provision in Kenya in tandem with Vision 2030 on energy as a key enabler
Least Cost Power Development Plan 2011-2031	The policy aims at ensuring that the national electric power supply exceeds 3,000MW by 2018, to 15,026MW in 2030 and 16,905MW in 2031	The transmission line project will increase power supply in the project area.
Laikipia County Integrated development plan 2018 – 2022	The county integrated development plan (CIDP) is the development blueprint made by each county in Kenya for the period between 2018–2022	The CIDP has indicated the current power supply situation in the county, the need for increased supply and justification for the same. By implementing the Project in line with the CIDP, KETRACO will fulfill energy demand
Baringo County Integrated development plan 2018 – 2022	The CIDP is the development blueprint made by each county in Kenya for the period between 2018–2022	The CIDP has indicated the current power supply situation in the county, the need for increased supply and justification for the same.

National Policy For Prevention And Response To Gender Based Violence 2014	The policy recognizes sustainable development cannot be achieved where there is GBV.it outlines all actions and guidelines towards prevention and elimination	Project proponent commits to promote prevention and equality at all levels and incorporates Complaints and Grievance Redress Mechanisms (CGRM) that goes along way in ensuring all matters GBV are procedurally addresses
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Source: EMC Consultants, 2019

**Table 11-Summary of National Legislations**

Legislation	Provisions	Relevance to the Project
The Constitution of Kenya (2010)	<p>Article 69 provides for protection and conservation of the environment and ensuring ecologically sustainable development and use of natural resources;</p> <p>Mandates the State to:</p> <ul style="list-style-type: none"> <li>-Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;</li> <li>- eliminate processes and activities that are likely to endanger the environment;</li> <li>- Encourage public participation in the management, protection, and conservation of the environment; and</li> </ul> <p>Article 42 accords every person the right to a clean and healthy environment and where this is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.</p>	<p>The proponent commits to ensure that PAPs right to a clean and healthy environment is adhered to. Preparing this ESIA is the first step in identifying impacts on the environment triggered by the project and mitigation measures are proposed including thoss ensuring that effluent discharge, solid waste management and dust emissions etc are handled as per regulations.. By extension, tthe Contractor under KETRACO is obligated to implement commitments made by KETRACO in this ESIA.</p>

National Museums & Heritage Act, 2006	An Act of Parliament to consolidate the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya; to repeal the Antiquities and Monuments Act (Cap. 215) and the National Museums Act; and for connected purposes	The proponent shall follow due procedures including notification of the National Museums in case of unearthing any antiquity to ensure they are protected and conserved to promote cultural resources in the context of social and economic development of the Country.
Penal Code Act (Cap 63)	The Act states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution is dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.	The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendation provided for mitigation/ minimization/ avoidance of adverse impacts arising from the project activities. The contractor of the proposed transmission line and substation will therefore need to ensure that all emissions are controlled during the construction phase of the project to avoid interference on health of the local communities and the workers.
Physical and Land Use Planning Act, 2019;	<ul style="list-style-type: none"> <li>▪ The Physical and Land Use Planning Act, 2019 provides for the preparation and implementation of physical development plans.</li> <li>▪ Section 55 of the Act provides for development control to protect and conserve the environment and to ensure orderly physical and land use development amongst others. These</li> </ul>	The proponent and contractors of the proposed transmission line shall ensure compliance with the provisions of the act and land use planning. Public participation has been conducted to ensure the involvement of stakeholders in the planning process. Subject the project to environmental and social impact assessment – issuance of an EIA license

	<p>includes process and procedures for processing of easements and way-leaves;siting of base transmission station, power generation Plants,etc</p> <ul style="list-style-type: none"> <li>▪ The third schedule section 4 of the act specifically highlights that planning authorities shall require applications for major developments to be subjected to environmental and social impact assessment.</li> </ul>	Processing of easements and way-leaves;
Persons with Disabilities Act, 2003;	<ul style="list-style-type: none"> <li>▪ This act protects the rights of people with disabilities ensuring they are not marginalized and that they enjoy all the necessities of life without discrimination.</li> <li>▪ The act guarantees that <ul style="list-style-type: none"> <li>➤ No person shall deny a person with a disability access to opportunities for suitable employment.</li> <li>➤ A qualified employee with a disability shall be subject to the same terms and conditions of employment and the same compensation, privileges, benefits, fringe benefits, incentives or allowances as qualified able-bodied employees.</li> <li>➤ An employee with a disability shall be entitled to exemption from tax on all income accruing from his employment.</li> </ul> </li> </ul>	The project will offer equal access access to opportunities for suitable employment during construction and operation
The Traffic Act Cap 403	<ul style="list-style-type: none"> <li>▪ The Traffic Act reserves the use of the road corridor for</li> </ul>	The contractor's vehicles shall comply to all traffic



	<p>road facilities only. Encroachment along the project corridor roads will have to be checked especially during the construction and operational phase of the project.</p> <ul style="list-style-type: none"> <li>▪ Part III of the act deals with Licensing of Vehicles with section 15 (1) noting that no person shall own or possess a motor vehicle or trailer, or use it on a road, unless such vehicle or trailer is licensed under the act.</li> <li>▪ Part IV of the act deals with - Driving Licences with section 30 (1) stipulating that no person shall drive a motor vehicle of any class on a road unless he is the holder of a valid driving licence or a provisional licence endorsed in respect of that class of vehicle.</li> </ul>	<p>rules in Kenya. The proponent shall comply with conditions for use of roads by motorists. The proponent/contractor's:</p> <ul style="list-style-type: none"> <li>• vehicles and trailers shall be licensed.</li> <li>• Drivers shall hold Valid driving licence</li> </ul>
Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act, 2012,	<ul style="list-style-type: none"> <li>▪ The Act makes provision for the prevention, protection and provision of assistance to internally displaced persons and affected communities as per the United Nations Guiding Principles on Internal Displacement and for connected purposes.</li> <li>▪ The Government and any other organization, body or individual when responding to a situation of internal displacement and the needs of internally displaced persons under this Act, shall consider</li> </ul>	<p>The proponent will ensure that displaced persons and communities are protected and assisted in line with the Principles on internal displacement established by the Act. A RAP has been prepared to identify any displacement and mitigate the impacts.</p>

	<p>their rights and freedoms as set out in the Bill of Rights of the Constitution.</p> <ul style="list-style-type: none"> <li>▪ The Government shall protect every human being against arbitrary displacement</li> <li>▪ The Government shall put into place measures for assistance and protection needs of internally displaced persons with particular regard to displaced communities with a special dependency on and attachment to their lands and the protection needs of women, children, persons with disabilities, the elderly and other persons with special needs</li> <li>▪ The Government shall create the conditions for and provide internally displaced persons with a durable and sustainable solution in safety and dignity and shall respect and ensure respect for the right of internally displaced persons to make an informed and voluntary decision on whether to return, locally integrate or resettle elsewhere in the country.</li> <li>▪ The procedure for resettlement of internally displaced persons and the standards applicable to such resettlement shall be as prescribed</li> </ul>	
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Security Laws (Amendment) Act, 2014	<ul style="list-style-type: none"> <li>▪ This act entails a legal framework and jurisdiction on security matters. It is a constitutional entitlement to live and feel secure from agents that may compromise ones' life and safety.</li> <li>▪ Security measures are vital in this project following past terrorist experiences reported in the area; the contractor shall embark on a community policing program to be executed by a competent security firm.</li> </ul>	The proponent shall liaise with Ministry of interior and coordination to ensure security of its project workers and installations.
Environmental Management and Coordination Act Cap 387.	Part V, VI and VII provide for protection and conservation of the environment, environmental impact assessment, and environmental auditing and monitoring.	The proponent shall comply with all requirements of EMCA, Cap 387 and its subsidiary legislations ie. obtain EIA License prior to commencement of the project. This ESIA is a first step towards this licensing process
Environmental (Impact Assessment and Audit) Regulations, 2003	<p>Part II, III and IV provide for the procedure for carrying out Environmental Impact Assessment (EIA) and Environmental Audit (EA).</p> <p>Part V provides for the carrying out of an environmental audit study following commencement of project operations.</p>	The proponent shall comply with the Environmental & Social Management Plan in this ESIA report, EIA license conditions and all requirements of this regulation i.e undertake annual environmental audits.
Environmental Management and Co-ordination (Water Quality) Regulations, 2006	<p>Part II-V provide for the protection of ground and surface water resources.</p> <p>Part II provides the water quality standards for sources of domestic water.</p>	The proponent shall comply with the requirements of this regulation i.e undertake Quarterly effluent discharge quality and quantity monitoring through sampling. Apply for an effluent discharge license (EDL) (for campsites and substations)
Environmental Management and Co-ordination (Noise	Section 3 (1) prohibits the generation of unreasonable,	The proponent/contractor shall comply with the sound level

and Excessive Vibration Pollution) (Control) Regulations, 2009	<p>unnecessary, or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.</p> <p>The First Schedule provides for the maximum noise levels permissible in various environmental set ups such as residential areas, places of worship, commercial areas and mixed residential.</p>	<p>limits stipulated in these regulations i.e by switching off machines not in use, regularly servicing the machines, working during the day etc The transmission line construction activities does not qualify for noise and excessive vibrations pollution license except in cases of rock blasting activities. Rock blasting will require noise emission permit from the County government and permit to use explosive from department of Mines &amp; geology.</p>
Environmental Management and Co-ordination (Waste Management) Regulations, 2006	<p>Part III-VII provide standards for handling, transportation, and disposal of various types of wastes including hazardous wastes.</p> <p>Sections 4, 5 and 6 provide for waste minimization or cleaner production, waste segregation, recycling, or composting.</p> <p>Section 7 provides for licensing of vehicle transporting waste.</p> <p>Section 10 provides for the licensing of waste disposal facilities.</p>	<p>The proponent/ contractor shall comply with all the requirements of this regulations i.e contracting a NEMA licensed waste collector, disposing waste in NEMA licensed disposal sites etc</p>

Environmental Management and Coordination (Air Quality) Regulations, 2014	<p>The First Schedule provides for ambient air quality tolerance limits.</p> <p>Section 5 prohibits air pollution in a manner that exceed specified levels.</p> <p>Section 16 provides for installation of air pollution control systems where pollutants emitted exceed specified limits.</p> <p>Section 22 provides for the control of fugitive emissions within property boundary.</p> <p>Section 25 provides for the control of vehicular emissions.</p> <p>Section 29 provides for prevention of dispersion of visible particulate matter or dust from any material being transported.</p> <p>Part IX provides for acquisition of an emission license.</p>	<p>The proponent/contractor shall comply with all applicable requirements of this regulations i.e water sprinkling twice daily along access roads, regular servicing of equipment, conduct ambient air quality analysis of the generators as recommended under the third schedule of the regulations. The contractors' activities and equipment does not require air emission license.</p>
Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources, and Benefit Sharing) Regulations, 2006.	<p>Section 4 (1) provides that;</p> <ol style="list-style-type: none"> <li>1. A person shall not engage in any activity that may- <ol style="list-style-type: none"> <li>a. have an adverse impact on any ecosystem;</li> <li>b. lead to the introduction of any exotic species;</li> <li>c. lead to unsustainable use of natural resources,</li> </ol> </li> </ol>	<p>The proponent/contractor shall not engage in any activity that may have adverse impact on the ecosystem or lead to introduction of any exotic species. Obtain EIA License prior to commencement of the project since it may have an adverse impact on the ecosystem.</p>
Physical planning and land use Act 2019	<p>Under Section 3 of the Act, the law provides for norms and principles in physical planning and land use which include the requirement that planning takes into account new approaches such as transit-oriented development, mixed land-uses, planning for public transport and</p>	<p>The proponet/contractor shall obtain all the necessary approvals from the physical planning department to ensure the projects compatibility with other land uses.</p>

	non-motorized transport among others to achieve sustainable development and more efficient use of natural resources, be inclusive and take into consideration the culture and heritage of people concerned; and that development activities be planned in a manner that integrates economic, social and environmental needs of present and future generations	
The Water Act No. 43 of 2016 revised 2017	Section 3 outlines the objectives of the Act as to provide for the regulation, management and development of water resources and water and sewerage services	The proponent/contractor shall avoid water sources which might lead to competition issues with members of the local community. The proponent will apply for Water Extraction Permit and obtain EIA license prior to digging boreholes should boreholes be needed
County Government Act No.17 of 2012	The county Government Act is intended to provide powers, functions and responsibilities to deliver services to counties under the devolved government as spelt out under section 3 of the act Specifically to section 8 it emphasizes the need of public participation	The proposed project will traverse Baringo and Laikipia counties. The project proponent commits to implement the project following the principles and guidelines set out in the act. Adequate inclusivity and public participation has been part of this ESIA process and will continue to be upheld during project planning and preparation. The project design will be in line with the CIDPs of both Laikipia and Baringo Counties
The Public Health Act (Cap 242)	Section 115 provides for the prevention of the occurrence of nuisance or conditions dangerous/injurious to humans. Section 126 provides that the relevant local authority shall take all lawful, necessary, and	The proponent shall not release any waste into water bodies, emission into the atmosphere or spillages into the soil which might have adverse effect on human health. The construction of the proposed

	<p>reasonably practicable measures - :</p> <ul style="list-style-type: none"> <li>- for preventing any pollution dangerous to health of any supply of water which the public within its jurisdiction has a right to use and does use for drinking or domestic purposes (whether such supply is derived from sources within or beyond its jurisdiction); and</li> <li>- for purifying any such supply which has become so polluted, and to take measures (including, if necessary, proceedings at law) against any person so polluting any such supply or polluting any stream so as to be a nuisance or danger to health.</li> </ul>	<p>transmission line and substation has potential pollution risks related to water siltation in sections near water sources such as near River Perkera.</p> <p>The contractor will need to ensure that water pollution is controlled and does not affect residents.</p>
Civil Aviation Act, 2013	<p>-This is an Act of Parliament to provide for the control, regulation and orderly development of civil aviation in Kenya; and for connected purposes and Safety of aircraft and persons on board. Under Part V of 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.</p>	<p>The proponent commits to obtain all the necessary approvals from KCAA before commencement of construction work. i.e obtain a permit for erection of towers.</p>
Protection of Traditional Knowledge and Cultural Expressions Act, 2016;	<p>The Act of parliament provides a guideline for the protection and promotion of traditional knowledge and cultural expressions. Section 3 requires every person dealing with matters relating to traditional knowledge or cultural expressions to be guided by the national values and principles of governance set out in Article 10 of the Constitution.</p>	<p>The proponent will ensure transmission line route does not traverse areas of cultural importance. Members of the local community shall be vital in identifying such areas.</p>
Occupational Safety and Health Act (OSHA), 2007	<p>-Section 6 provides for the safety, health and welfare of workers and</p>	<p>The contractor shall register the transmission line route as a</p>



	<p>all persons lawfully present at workplaces.</p> <p>Part V provides for the registration of workplaces.</p> <p>Part VII outlines safety requirements in use of machinery to prevent accidents and injuries.</p>	<p>workplace, provide employees with personal protective equipment, train safety and health committee, employ safety &amp; health officer and comply with all requirements of OSHA, 2007 and other subsidiary legislations under the act. The proponent shall:</p> <ul style="list-style-type: none"> <li>• Obtain Registration of Workplace Certificate for workplaces (Campsites, substation offices etc)</li> <li>• Undertake Annual Safety and Health Audit</li> <li>• Establish a Safety and Health Committee</li> <li>• Undertake appropriate risk assessment of the Workplace</li> </ul>
The Work Injury Benefits Act, 2007	Part V provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc.	The proponent/contractor shall comply with all requirements of the act i.e putting in place an insurance cover that shall protect employees, should their employees incur injuries or die in the course of work.
The Energy Act, 2019	The Energy Act, 2019 has made several amendments to the repealed Energy Act, 2006. Its objective is to consolidate the laws relating to energy, to properly delineate the functions of the national and devolved levels of government in relation to energy, to provide for the	Obtain Permit and License to carry out electrical installation work (for contractor) Ensure electrical workers have a certificate for electrical works. Currently, provision of electricity proposed by the

	exploitation of renewable energy sources, to regulate midstream and downstream petroleum and coal activity and for the supply and use of electricity and other forms of electricity.	project is in line with the objectives of the Act.
The Land Act, 2012	Section 4 (2) obligates the Land Commission and other public officers to use the following guiding principles and values: -equitable access to land; security of land rights; - security of land rights; -sustainable and productive management of land resources; - Regulates the change of use for substation land from agricultural to industrial	The proponent in the process of wayleave acquisition shall respect the rights of land owners, offer just and fair compensation.
National Land Commission Act, 2012	Section 3 of the Act outlines its objectives to include among other things; to provide a linkage between the Commission, county governments and other institutions dealing with land and land related resources; to provide for the operations, powers, responsibilities and additional functions of the Commission and for the management and administration of land;	The proponent shall seek the assistance of NLC in wayleave acquisition since it is the body mandated to acquire land for public projects.
Land Registration Act No. 3 of 2012	This is an Act of Parliament to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes According to section 3, the Act applies to (a) registration of interests in all public land as declared by Article 62 of the Constitution (b) registration of	The proponent shall ensure that people whose land is traversed by the project will be verified, compensated, and an easement registered in their title deeds. It will also give notice to the owners and occupiers of the land along RoW

	interests in all private land as declared by Article 64 of the Constitution; and (c) registration and recording of community interests in land.	
Forest Conservation and Management Act No. 34 of 2016	This is an Act of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes. According to Section 3, the Act shall apply to all forests on public, community and private lands.	The proponent shall obtain authority from KFS and County Government to construct transmission line route through forests under their jurisdiction.
HIV/AIDS Prevention and Control Act No. 14 Of 2006 Revised in 2012	The Act provides for measures for the prevention, management and control of HIV and AIDS. Part III-V of the Act are dedicated the protection and promotion of public health and for the appropriate treatment, counseling, support and care of persons infected or at risk of HIV and AIDS infection	The proponent/contractor shall sensitise workers on HIV/AIDS awareness and provide condoms in the dispensers.
Sexual Offences Act, 2006	-This Act of Parliament makes provision about sexual offences and aims at prevention and the protection of all persons from harm from unlawful sexual acts. Section 15, 17 and 18 focuses mainly on sexual offenses on minors (children).	The proponent/contractor shall sensitise workers on the requirements of this act. Ample working environment should prevail in all workplaces in the project, to be enhanced through implementation of a Sexual Misconduct Policy.
Children Act, 2001	-This Act of Parliament provides safeguards for the rights and welfare of the child including the right to parental care, non-	The proponent/contractor shall put in place measures to prevent violation of children's rights particularly protection

	<p>discrimination, education, religion, health care and protection from child labour and armed conflict, among others.</p> <p>Under Section 4 (2) the Act requires that in all actions concerning children, the best interests of the child shall be a primary consideration.</p>	<p>from child labour. No child will be employed in the project as per the act.</p>
Climate change Act 2016	<p>Under Section 3 of the Act, the objectives of the Act include to provide for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development, and for connected purposes.</p>	<p>The proponent shall liaise with Kenya Forest Service and local schools to plant trees in gazetted forests and schools for better nurturing by KFS staff and school management on a daily basis. The transmission line design shall be climate-proof over its lifespan and undertaken as per provisions of the act specifically on planning and implementation stages.</p>
National Gender and Equality Commission Act, 2011	<p>As per Section 8, the overarching goal for NGEC is to contribute to the reduction of gender inequalities and the discrimination against all women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities.</p>	<p>The contractor should recruit employees from both genders. Women will be encouraged to apply and be considered for jobs they can do.</p>
Employment Act, 2007	<p>-This Act of Parliament prohibits discrimination in labour relations under section 5, sexual harassment under section 6, forced labour under section 4 and child labour in section 52. Section 6 (2) obligates all employers with twenty or more employees to issue a policy statement on sexual harassment.</p>	<p>The proponent/contractor shall be guided by the provisions of this Act on matters touching on equality of opportunities in employment, terms of service, age limit and prevention of sexual harassment in the workplace. Ensure Statutory deductions without delay to appropriate government agencies e.g. Kenya Revenue Authority, NSSF, NHIF</p>

Kenya Roads Act No. 2 of 2007	Part II provides for the establishment of the Roads Authorities.	The proponent shall obtain authorisation from the relevant road's authorities in cases where the line crosses the roads infrastructure.
Valuers Act Cap 532	This Act provides for the registration of valuers and the regulation of the valuation profession and practice in Kenya. Section 21 of Cap 532 prohibits any person who is not a registered Valuer and whose name does not appear in the register to prepare and submit a valuation report.	The proponent shall engage a registered valuation expert during the RAP preparation. Certificate of registration for the valuer to undertake land valuation shall be mandatory.
Community Land Act, 2016	This is an Act of Parliament to give effect to Article 63 (5) of the Constitution. Part II of the Act provides for the recognition, protection, and registration of community land rights. Part III provides for the management and administration of community land. Section 6 provides for the role of county governments in relation to unregistered community land.	The proponent shall compensate all affected community land (registered or unregistered) in accordance with the provisions of the Community Land Act.
Public Roads and Roads of Access Act (Cap. 399)	Sections 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent landowners seeking permission to construct the respective roads.	During the construction phase of the project, access to the site areas will be required for the construction vehicles. Where existing roads do not exist, the Proponent shall seek permission from the appropriate authorities to create such access during the construction phase.
Occupiers Liability Act (Cap. 34)	Rules of Common Law regulates the duty which an occupier of premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic material in the premises.	The Proponent shall acquire Way leave along the transmission line corridor. The Proponent shall ensure that the management of health and safety issues is of high priority during the operational phase of the project.

Building Code, 2000	<p>This law recognizes the county governments as the leading planning agencies mandating the potential developers to submit development applications for approval.</p> <p>The county governments will approve or reject plans if they do or don't comply with the law, respectively.</p>	<p>The proponent shall:</p> <ul style="list-style-type: none"> <li>• Obtain County approval of Building plans (such as campsites and substation offices)</li> <li>• Obtain certificate of completion for buldings (such as campsites and substation offices)</li> </ul>
Land Value Amendment Act 2019	<p>The Land Value (Amendment) Act, 2019 (the Act) came into force on 16 August 2019 and has amended various sections of the Land Act, the Land Registration Act as well as the Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act. The Act aims at standardising the value of land in Kenya for the primary purpose of enhancing efficiency and expediting the compulsory land acquisition process.</p>	<p>The proponent shall compensate affected land owners in accordance with this Act.</p>
Explosives Act 2012	<p>From preliminary baseline studies on geology, the project will traverse very rocky grounds in some areas and the Contractor might require blasting especially during tower foundation construction</p> <p>Section 4-12 Oof the act stipulates measures to be put in place from manufacturing, to usage to post usage</p>	<p>The project proponent EHS department will ensure all guidelines especially before during and after. Permits will must be issued after clearance by NEMA and geology department on usage.</p> <p>100% supervision will be adhered to to ensure this process is carried out safely in environmentally sound manner</p>

**Source: EMC Consultants, 2019**

#### **4.2.1 National Air Quality Emission Standards**

In undertaking the construction activities described above, the Contractor will comply with the following national regulatory air quality standards and World Health Organisation (WHO) Air

Emission and Ambient Air Quality guidelines, whichever is stringent. Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/mitigation measures applied where necessary.

**Table 12-Ambient Air Quality Tolerance Limits**

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
Sulphur oxides (SOX);	Annual Average	80 ug/m <sup>3</sup>	60 ug/m <sup>3</sup>	15 ug/m <sup>3</sup>
	24 hours	125 ug/m <sup>3</sup>	80 ug/m <sup>3</sup>	30 ug/m <sup>3</sup>
	Annual Average		0.019 ppm/50ug/m <sup>3</sup>	
	Month Average			
	24 Hours		0.048ppm /125ug/m <sup>3</sup>	
	Instant Peak		500 ug/m <sup>3</sup>	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m <sup>3</sup>	60 ug/m <sup>3</sup>	15 ug/m <sup>3</sup>
	24 hours	150 ug/m <sup>3</sup>	80 ug/m <sup>3</sup>	30 ug/m <sup>3</sup>
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 ug/m <sup>3</sup>	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 ug/m <sup>3</sup>	0.1 ppm	
	One Hour		0.2 ppm	
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 ug/m <sup>3</sup>	140 ug/m <sup>3</sup>	70 ug/m <sup>3</sup>
	24 hours	500 ug/m <sup>3</sup>	200 ug/m <sup>3</sup>	100 ug/m <sup>3</sup>
	Annual Average		100 ug/m <sup>3</sup>	
	24 hours		180 ug/m <sup>3</sup>	
Respirable Particulate Matter (<10µm) (Respirable Particulate Matter-RPM)	Annual Average	70 ug/m <sup>3</sup>	50 ug/m <sup>3</sup>	50 ug/m <sup>3</sup>
	24 hours	150 ug/Nm <sup>3</sup>	100 ug/Nm <sup>3</sup>	75 ug/Nm <sup>3</sup>



Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
PM2.5	Annual Average	35 ug/m <sup>3</sup>		
	24 hours	75 ug/m <sup>3</sup>		
Lead (Pb)	Annual Average	1.0 ug/Nm <sup>3</sup>	0.75 ug/Nm <sup>3</sup>	0.50 ug/m <sup>3</sup>
	24 hours	1.5 ug/m <sup>3</sup>	1.00 ug/m <sup>3</sup>	0.75 ug/m <sup>3</sup>
	Month Average		2.5	
Carbon monoxide (CO)/ carbon dioxide (CO <sub>2</sub> )	8 hours	5.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>	1.0 mg/m <sup>3</sup>
	1 hour	10.0 mg/m <sup>3</sup>	4.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>
Hydrogen sulphide	24 hours	150ug/m <sup>3</sup>		
	instant Peak	700ppb		
Total VOC	24 hours	600 ug/m <sup>3</sup>		

#### **Source - NEMA**

**Table 13-National Air Quality Standards for General Pollutants**

<b><u>Pollutant</u></b>	<b><u>Time Weighted Average</u></b>	<b><u>Property Boundary</u></b>
Particulate matter (PM)	Annual Average	50 ug/m <sup>3</sup>
	24 hours	70 ug/m <sup>3</sup>
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m <sup>3</sup>
	24 hours	150 ug/m <sup>3</sup>
Sulphur oxides (SOX);	Annual Average	50 ug/m <sup>3</sup>
	24 hours	125 ug/m <sup>3</sup>
Hydrogen Sulphide	24 hours	50 ug/m <sup>3</sup>
Lead (Pb)	Annual/24 hours	0.5 – 2.0ug/m <sup>3</sup>
Ammonia	24 hours	100 ug/m <sup>3</sup>

#### **Source-NEMA**

#### **4.2.2 National Noise Emission Guidelines**

In undertaking the construction activities described above, the Contractor will comply with the following national regulatory air quality standards and permissible noise levels.

**Table 14-National Noise Guidelines**

Zone	Maximum Noise level limits dB (A)		Time Frame
	Day	Night	
Places of worship	30	25	Day time: 6.01a.m – 8.00p.m  Night time: 8.01p.m – 6.00p.m
Residential:			
1. Indoors	35	25	
2. Outdoors	40	25	
Mixed Residential (inclusive of Entertainment and commercial places)	55	45	
Commercial	70	70	
Silent arena	30	25	

**Source - NEMA**

**Table 15-Noise Levels for different areas and facilities**

Facility	Maximum Noise level limits dB (A)		Time Frame
	Day	Night	
Health facilities, Educational Centres and homes of disabled	60	35	Day time: 6.01am- 10.00pm Night time: 10.01pm – 6.00am
Residential	60	35	
Industrial	85	65	
Commercial	75	50	

**Source - NEMA**

**Table 16-Noise levels from a factory or a workshop (Continuous or intermittent noise)**

dB(A)	Daily	Weekly
85	8 hours	40 hours
88	4 hours	20 hours
91	2 hours	10 hours
94	1 minute	5 hours
97	30 minutes	2.5 hours
100	15 minutes	1.25 hours
103	7.5	37.5 minutes
106	3.75	18.75 minutes

109	1.875 minutes	9.375 minutes
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### **Source – NEMA**

**N/B: Noise levels should not exceed a level of**

- I.** Factory/Workshops 85 dB (A)
- II.** Offices 50 dB (A)
- III.** Factory/Workshop Compound 75 dB (A)

**Table 17-Maximum Permissible Noise level for Impact or Impulsive Noise**

<b>Sound Level dB(A) Max</b>	<b>Permitted impulses per day</b>
140	100
130	1,000
120	10,000

### **Source-NEMA**

#### **4.3 National Water Quality Standards**

The contractor will comply with the following national regulatory wastewater and effluent discharge standards. Regular monitoring to determine compliance will be done by the contractor and corrective/mitigation measures applied where necessary.

**Table 18-National Wastewater Discharge Standards**

<b>Parameters</b>	<b>Maximum levels permissible</b>
Suspended solids (mg/L)	250
Total dissolved solids (mg/L)	2000
Temperature °C	20 -35
pH	6-9
Oil and Grease (mg/L)	where conventional treatment shall be used - 10
Oil and Grease (mg/L)	
Ammonia Nitrogen (mg/L)	where ponds is a final treatment method - 5
Substances with an obnoxious smell	20
Biochemical Oxygen Demand BOD <sub>5</sub> days at 20°C (mg/L)	Shall not be discharged into the sewers 500
Chemical Oxygen Demand COD (mg/L)	1000
Arsenic (mg/L)	0.02
Mercury (mg/L)	0.05
Lead (mg/L)	1.0

Parameters	Maximum levels permissible
Cadmium (mg/L)	0.5
Chromium VI (mg/L)	0.05
Chromium (Total) (mg/L)	2.0
Copper (mg/L)	1.0
Zinc (mg/L)	5.0
Selenium (mg/L)	0.2
Nickel (mg/L)	3.0
Nitrates (mg/L)	20
Phosphates (mg/L)	30
Cyanide Total (mg/L)	2
Sulphide (mg/L)	2
Phenols (mg/L)	10
Detergents (mg/L)	15
Colour Less than	40 Hazen units
Alkyl Mercury Not Detectable	(nd)
Free and saline Ammonia as N (mg/L)	4.0
Calcium Carbide	Nil
Chloroform	Nil
Inflammable solvents	Nil
Radioactive residues	Nil
Degreasing solvents of mono-di-trichloroethylene type	Nil

#### **Source-NEMA**

#### **4.4 AfDB's Integrated Safeguards System Policy Statement and Operational Safeguards**

In 2013, the African Development Bank adopted an Integrated Safeguards System (also referred to as the “2013 ISS”) which established the Bank Group’s commitment to sustainable development, consolidating and building upon the Environment (2004) and Involuntary Resettlement (2003) safeguard2 policies, as well as cross-cutting policies and strategies on Gender (2001), the Civil Society Engagement Framework (2012) and the AfDB Climate Change and Green Growth Strategic Framework: Projecting Africa’s Voice (2021). This consolidated approach also built upon the Bank’s sector policies such as Forestry (1993), Agriculture and Rural Development (1999), Water (2021), and the Strategy for Quality Health Infrastructure in Africa 2021-2030 (2021). The key aims underlying the ISS are:

- Better align the safeguards with the Bank’s new policies and strategies.
- Adopt Good International Industry Practice.
- Adapt the safeguards to an evolving range of lending and investment products.

- Work towards greater harmonization of safeguards with those of other multilateral finance institutions.
- Tailor safeguards approaches to the nature and needs of different Borrowers with varying capacities.
- Improve internal processes and resource allocation.

The Five ***E&S Operational Safeguards (OS)*** set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with operations supported by the Bank. The Bank believes that the application of these safeguards, by focusing on the identification and management of environmental and social risks and impacts, will support Borrowers' goal of protecting communities and the environment from unintentional harm, as well as in achieving their goal to reduce poverty and increase prosperity, in a sustainable manner, for the benefit of the environment and communities.

The E&S Operational Safeguards will support Borrowers:

- a) in achieving good international practice relating to environmental and social sustainability;
- b) in fulfilling their national and international environmental and social obligations;
- c) enhance non-discrimination, transparency, participation, accountability and governance; and
- d) (d) enhance the sustainable development outcomes of projects, activities and other initiatives through ongoing stakeholder engagement.

Under the categorization of project E&S risks, the Kabarnet -Rumuruti 132 Kv TL is classified as a Category 1 project. Category 1 projects are High risk operations likely to cause significant and/or irreversible adverse environmental and/or social impacts on a large scale, or to significantly affect environmental or social components that the Bank or the borrowing country considers sensitive. The following are the relevant Operational Safeguard that will be triggered by this project:

**Table 19-AfDB's Operational Safeguard triggered by the TL project**

<b>Standard</b>	<b>Provision/objective</b>	<b>Obligation/trigger mechanism</b>
<b>OS 1: Environmental and Social Assessment</b>	<ul style="list-style-type: none"> <li>• To identify and assess the environmental and social impacts (including gender) and climate change vulnerability issues of Bank lending and grant financed operations in their area of influence;</li> <li>• To avoid or if not possible minimize, mitigate and compensate for adverse impacts on the environment and on affected communities;</li> <li>• To ensure that affected communities have timely access to information in suitable forms about Bank operations and are</li> </ul>	This OS is triggered through the mandatory Environmental and Social Screening Process through which the project is assigned a Category based upon its potential environmental and social risks and impacts in its area of influence. These potential risks and impacts include physical, biological, socio-economic, health, safety, cultural property, transboundary impacts and global impacts including Greenhouse Gas (GHG) emissions and vulnerability to climate change effects.

	consulted meaningfully about issues that may affect them	<i>Based on the screening process, the project has been assigned Category 1. The proposed project will not result in adverse impacts on climate change but will consider and analyse social and environmental risks/impacts in their entirety. This ESIA is a first step in this process.</i>
<b>OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation</b>	<ul style="list-style-type: none"> <li>• To avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is unavoidable, exploring all viable project designs;</li> <li>• To ensure that displaced people receive significant resettlement assistance, preferably under the project, so that their standards of living, income earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels;</li> <li>• To set up a mechanism for monitoring the performance of involuntary resettlement programs in Bank operations and remedying problems as they arise so as to safeguard against ill-prepared and poorly implemented resettlement plans</li> </ul>	<p>This OS is triggered if projects require the involuntary acquisition of land, involuntary acquisition of other assets or restrictions on land use and on access to local natural resources which result in:</p> <ul style="list-style-type: none"> <li>• Relocation or loss of shelter by the people residing in the project area of influence;</li> <li>• Loss of assets or restriction of access to assets including national parks, protected areas or natural resources; or</li> <li>• Loss of income sources or means of livelihood as a result of the project, whether or not the PAPs are required to move.</li> </ul> <p><i>KETRACO has conducted a comprehensive RAP to provide the framework for compensation and resettlement.</i></p>
<b>OS 3: Biodiversity and Ecosystem Services</b>	<ul style="list-style-type: none"> <li>• To preserve biological diversity by avoiding, or if not possible, reducing and minimizing impacts on biodiversity;</li> <li>• In cases where some impacts are unavoidable, to endeavor to reinstate or restore biodiversity including, where required, the implementation of biodiversity</li> </ul>	<p>This OS is triggered if a project is to be located in a habitat where there may be potential biodiversity impacts or in areas providing ecosystem services upon which potentially affected stakeholders are dependent for survival, sustenance, livelihood or primary income, or which are used for sustaining the project. It is also</p>

	<p>offsets to achieve “not net loss but net gain” of biodiversity;</p> <ul style="list-style-type: none"> <li>• To protect natural, modified and critical habitats; and</li> <li>• To sustain the availability and productivity of priority ecosystem services to maintain benefits to the affected communities and to sustain project performance.</li> </ul>	<p>triggered if the project is designed to extract natural resources as a main purpose (e.g. plantation forestry, commercial harvesting, agriculture, livestock, fisheries and aquaculture).</p> <p><i>The proposed project is not resource extractive in nature. However, there may be potential loss of habitats due to clearance of vegetation along the wayleave corridor. The Proponent will in collaboration with KFS roll out afforestation programmes to offset loss of vegetation along the wayleave corridor.</i></p>
<b>OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency</b>	<ul style="list-style-type: none"> <li>• To manage and reduce pollutants likely to be caused by a project so that they shall not pose harmful risks to human health and the environment, including hazardous, nonhazardous waste and GHG emissions; and</li> <li>• To set a framework for efficiently utilizing all a project’s raw materials and natural resources especially focusing on energy and water.</li> </ul>	<p>This OS is triggered if the project is likely to cause significant adverse environmental or social impacts owing to the emission of pollutants, waste or hazardous materials covered by national legislation, international conventions or internationally recognized standards or by unsustainable resource use. It is also triggered by potentially significant levels of GHG emissions.</p> <p><i>The project will not emit any hazardous substances to the atmosphere, only dust/particulate matter and vehicle emissions during the construction phase.</i></p>
<b>OS 5: Labour Conditions, Health and Safety</b>	<ul style="list-style-type: none"> <li>• To protect the workers’ rights and to establish, maintain, and improve the employee – employer relationship;</li> <li>• To promote compliance with national legal requirements and provide due diligence in case</li> </ul>	<p>This OS is triggered if the project involves the establishment of a temporary or permanent workforce.</p> <p><i>The Contractor shall develop a Contractor Environmental and Social Management Plan (C-</i></p>



	<p>national laws are silent or inconsistent with the OS;</p> <ul style="list-style-type: none"> <li>• To provide broad consistency with the relevant International Labour Organization (ILO) Conventions, ILO Core Labour Standards and the UNICEF Convention on the Rights of the Child in cases where national laws do not provide equivalent protection;</li> <li>• To protect the workforce from inequality, social exclusion, child labour and forced labour; and</li> <li>• To establish requirements to provide safe and healthy working conditions</li> </ul>	<p><i>ESMP) to ensure compliance with labour and occupational health and safety requirements. .</i></p>
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#### 4.5 International Conventions

Kenya has signed a number of international conventions and treaties on environment and natural resources also known as multi-lateral environmental agreements (MEAs) that obligate the country to promote sustainable environmental and natural resources management and social equity. Conventions are legally binding bilateral, regional or international agreements that binding to the states that are parties thereto. Kenya has ratified some of the most important conventions on the environment as discussed below which apply to the proposed power transmission project hence the contractor is bound to comply by the respective provisions.

**Table 20-Multilateral Environmental Agreements**

<b>Multilateral Environmental Agreements</b>	<b>Key areas of application</b>
United Nations Framework Convention on Climate Change (UNFCCC)	<ul style="list-style-type: none"> <li>▪ UNFCCC has near universal membership and is the parent treaty of the 1997 Kyoto Protocol. The Kyoto Protocol has been ratified by 192 of the UNFCCC Parties.</li> <li>▪ The ultimate objective of both treaties is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system.</li> </ul> <p><i>The project proponent commits to ensure all activities and development plans are undertaken in line with the provisions of the Convention aimed at stabilizing greenhouse gas concentrations in the atmosphere.-No hazardous emissions expected during implementation</i></p>
Vienna Convention for the Protection of the Ozone Layer	<ul style="list-style-type: none"> <li>▪ The Vienna Convention for the Protection of the Ozone Layer was adopted in 1985 and entered into force on 22 Sep 1988. In 2009, the Vienna Convention became the first Convention of any kind to achieve universal ratification.</li> </ul>

Multilateral Environmental Agreements	Key areas of application
	<ul style="list-style-type: none"> <li>The objectives of the Convention were for Parties to promote cooperation by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer.</li> </ul> <p><i>KETRACO will ensure the ODS emissions are highly minimized or eliminated entirely during project implementation especially construction phase</i></p>
Convention on the Conservation of Migratory Species	<ul style="list-style-type: none"> <li>The convention on migratory species (CMS) was adopted to conserve migratory species of wild animals given that migratory species are an international resource.</li> <li>Such species may be terrestrial or marine.</li> <li>The convention's agreement on the conservation of African-Eurasian migratory water birds is specific on the need to protect the feeding, breeding, and wintering habitats, the main ones being wetlands and open water bodies.</li> </ul> <p><i>This convention has been domesticated in the Wildlife (Management and Conservation) Act (2013) hence the project proponent will adopt stipulated controls</i></p>
Convention on Biological Diversity (CBD)	<ul style="list-style-type: none"> <li>The CBD is one of the outcomes of the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992.</li> <li>The CBD establishes a global legally binding framework for the conservation of biodiversity, the sustainable use of its components and the fair and equitable sharing of benefits arising out of utilization of genetic resources.</li> </ul> <p><i>The provisions of this convention will be considered in the conservation of various species of plants, animals and the variety of ecosystems in the project area. The data shared with KWS KFS will assist in implementation</i></p>
African Convention on the Conservation of Nature and Natural Resources	<ul style="list-style-type: none"> <li>The convention was adopted in Algiers on 15th September 1968 and came into force on 16th June 1969.</li> </ul> <p><i>This convention reaffirms the importance of natural resources both renewable and non-renewable, particularly the soil, water, flora and fauna. The main objective is to facilitate sustainable use of the above resources.</i></p>
Rio Declaration on Environment and Development	<ul style="list-style-type: none"> <li>The Rio Declaration on Environment and Development, often shortened to Rio Declaration, was a short document produced at the 1992 United Nations "Conference on Environment and Development" (UNCED), informally known as the Earth Summit.</li> <li>The declaration aimed at establishing a new and equitable global partnership through the creation of new levels of co-operation among States, key sectors of societies and people, working towards international</li> </ul>

Multilateral Environmental Agreements	Key areas of application
	<p>agreements which respect the interests of all and protect the integrity of the global environmental and developmental system, recognizing the integral and interdependent nature of the Earth, our home.</p> <ul style="list-style-type: none"> <li>▪ The Rio Declaration consisted of 27 principles intended to guide countries in future sustainable development. It was signed by over 170 countries.</li> </ul> <p><i>Principle 17 of the Rio Declaration provides key relevance to the proposed project; the principle denotes that environmental impact assessment as a national instrument shall be undertaken for proposed activities that are likely to have a significant impact on the environment and are subject to a decision of a competent national authority.</i></p>
Earth Summit on Sustainable Development Agenda 21	<ul style="list-style-type: none"> <li>▪ Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations regarding sustainable development. It is a product of the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992.</li> <li>▪ It is also regarded as an action agenda for the UN, other multilateral organizations, and individual governments around the world that can be executed at local, national, and global levels. The "21" in Agenda 21 refers to the 21st Century. Agenda 21 Section I on Social and Economic Dimensions is directed toward combating poverty, especially in developing countries, changing consumption patterns, promoting health, achieving a more sustainable population, and sustainable settlement in decision making.</li> <li>▪ Section II on Conservation and Management of Resources for Development Includes atmospheric protection, combating deforestation, protecting fragile environments, conservation of biological diversity (biodiversity), control of pollution and the management of biotechnology, and radioactive wastes.</li> <li>▪ Section III focuses on strengthening the Role of Major Groups including the roles of children and youth, women, NGOs, local authorities, business and industry, and workers; and strengthening the role of indigenous peoples, their communities, and farmers.</li> </ul> <p><i>Kenya continues to implement Agenda 21 to support sustainable development through the integration of environmental concerns into the national development policies, plans, and programmes. Also relevant is the implementation of Agenda 17. The proposed project commits to adhere and to be consistent with the objectives of Agenda 21.</i></p>
The World Commission on Environment and Development	<ul style="list-style-type: none"> <li>▪ The Commission in its 1987 report dubbed “Our Common Future” focused on the environmental aspects of development, in particular the emphasis on sustainable development that produces no lasting damage to the biosphere and to particular ecosystems.</li> </ul>

Multilateral Environmental Agreements	Key areas of application
(The Brundtland Commission of 1987)	<ul style="list-style-type: none"> <li>▪ In addition to environmental sustainability is economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources.</li> <li>▪ While social sustainable development is development that maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement. The key aspect of sustainability is the interdependence of generations.</li> </ul> <p><i>The concept of EIA is embodied in many multilateral environmental agreements. Principle 17 of the Rio Declaration provides that environmental impact assessment as a national instrument shall be undertaken for proposed activities that are likely to have a significant impact on the environment and are subject to a decision of a competent national authority.</i></p>
The 1992 United Nations Framework Convention on Climate Change (UNFCCC)	<ul style="list-style-type: none"> <li>▪ The primary purpose of the convention is to establish methods to minimize global warming and the emission of the greenhouse gases.</li> <li>▪ The UNFCCC was adopted on 9th May 1992 and came into force on 21st March 1994.</li> <li>▪ The Convention has been ratified by 189 states. Kenya ratified the Convention on 30th August 1994. NEMA is the focal point for the Convention.</li> </ul> <p><i>The project proponent will ensure minimizing Greenhouse Gas Emissions as well as adopting climate action initiatives in mitigation</i></p>
The Paris Agreement	<ul style="list-style-type: none"> <li>▪ This agreement was adopted on 12th December 2015 at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in Paris, it then came into force on 4th November 2016 after meeting the ratification threshold.</li> <li>▪ The Agreement provides the framework to address climate change for a safer and sustainable future, it has an objective of preventing a global temperature increase above 1.5 degrees Celsius relative to pre-industrial levels by reduction of Greenhouse gas emissions.</li> <li>▪ Kenya ratified the Paris Agreement and welcomed it into force on 28th December 2016. As at now a total of 171 parties out of 197 have ratified the agreement.</li> </ul> <p><i>The proposed project will ensure all activities are in line with the tenets of the Paris Agreement to minimize greenhouse gas emission.</i></p>
Convention on the Elimination of all forms of	<ul style="list-style-type: none"> <li>▪ The Convention on the Elimination of all forms of Discrimination against Women (CEDAW) places explicit obligations on states to protect women and girls from sexual exploitation and abuse.</li> </ul>

Multilateral Environmental Agreements	Key areas of application
Discrimination against Women	<ul style="list-style-type: none"> <li>▪ Universal Declaration of Human Rights (Article 7), the UN Charter (Articles 1, 13, 55, and 76) and the International Covenant on Civil and Political Rights (Article 24) reaffirm the freedoms and rights of all children, including internally displaced children.</li> </ul> <p><i>The proposed project will ensure tenets of human right and protection of women and girls from sexual exploitation and abuse are embroiled in the development.</i></p>
International Labour Organization	<ul style="list-style-type: none"> <li>▪ The International Labour Organization (ILO) is built on the constitutional principle that universal and lasting peace can be established only if it is based upon social justice. The ILO has generated such hallmarks of industrial society as the eight-hour working day, maternity protection, child-labour laws, and a range of policies which promote workplace safety and peaceful industrial relations. The ILO has four principal strategic objectives: <ul style="list-style-type: none"> <li>➤ To promote and realize standards, and fundamental principles and rights at work.</li> <li>➤ To create greater opportunities for women and men to secure decent employment.</li> <li>➤ To enhance the coverage and effectiveness of social protection for all.</li> <li>➤ To strengthen tri-parties and social dialogue.</li> </ul> </li> <li>▪ <b>The key ILO Conventions applicable to the proposed power transmission project include:</b> <ol style="list-style-type: none"> <li>i. Equal Remuneration Convention (1951) (No. 100) - <b>Calls for equal pay and benefits for men and women for work of equal value.</b></li> <li>ii. Discrimination (Employment and Occupation) Convention (1958) (No. 111) - <b>Calls for a national policy to eliminate discrimination in access to employment,</b> training, and working conditions, on grounds of race, colour, sex, religion, political opinion, national extraction or social origin, and to promote equality of opportunity and treatment.</li> <li>iii. Minimum Age Convention (1973) (No. 138) - <b>Aims at the abolition of child labour,</b> stipulating that the minimum age for admission to employment shall not be less than the age of completion of compulsory schooling.</li> <li>iv. Worst Forms of Child Labour Convention (1999) (No. 182) - <b>Calls for immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour</b> which include slavery and similar practices, forced recruitment for use in armed conflict, use in prostitution and pornography, any illicit activity, as well as work which is likely to harm the health, safety, and morals of children.</li> </ol> </li> </ul>

Multilateral Environmental Agreements	Key areas of application
Sustainable Development Goals (SDGs)	<ul style="list-style-type: none"> <li>▪ The Sustainable Development Goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will be expected to use to frame their agendas and political policies over the next 15 years. The SDGs include 17 Sustainable Development Goals and 169 targets. The 17 sustainable development goals (SDGs) include <ul style="list-style-type: none"> <li>➤ GOAL 1: No Poverty</li> <li>➤ GOAL 2: Zero Hunger</li> <li>➤ GOAL 3: Good Health and Well-being</li> <li>➤ GOAL 4: Quality Education</li> <li>➤ GOAL 5: Gender Equality</li> <li>➤ GOAL 6: Clean Water and Sanitation</li> <li>➤ GOAL 7: Affordable and Clean Energy</li> <li>➤ GOAL 8: Decent Work and Economic Growth</li> <li>➤ GOAL 9: Industry, Innovation and Infrastructure</li> <li>➤ GOAL 10: Reduced Inequality</li> <li>➤ GOAL 11: Sustainable Cities and Communities</li> <li>➤ GOAL 12: Responsible Consumption and Production</li> <li>➤ GOAL 13: Climate Action</li> <li>➤ GOAL 14: Life Below Water</li> <li>➤ GOAL 15: Life on Land</li> <li>➤ GOAL 16: Peace and Justice Strong Institutions</li> <li>➤ GOAL 17: Partnerships to achieve the Goal</li> </ul> </li> <li>▪ The GOALs seek to build on the Millennium Development Goals that expired in 2015. Most notably SDGs are integrated, indivisible and balance the three dimensions of sustainable development: the economic, social and environmental.</li> </ul> <p><i>This project is expected to cut-across the three dimensions of sustainable development hence making SDGs a key reference point. The SDGs are also linked to several Kenyan legal frameworks such as Water Act, Forestry Act, and EMCA Cap 387.</i></p>

#### 4.6 Institutional Frameworks

There are various national institutions that are important in matters related to resettlement in Kenya. Below is a highlight of the key institutions and their mandate:

**Table 21- Key National Institutions on Resettlement in Kenya**



Institutions / Key Mandate Departments	
The Ministry of Energy	<ul style="list-style-type: none"> <li>▪ The Ministry of Energy and Petroleum is responsible for energy policy and regulation of electricity and gas reticulation. The ministries mission statement is to facilitate provision of clean, sustainable, affordable, reliable, and secure energy services for national development while protecting the environment. The mandate of the ministry is               <ul style="list-style-type: none"> <li>➤ Hydro power Development.</li> <li>➤ Geothermal Exploration and Development.</li> <li>➤ Thermal Power Development.</li> <li>➤ Oil and Gas Exploration.</li> <li>➤ Oil/Gas and Minerals sector capacity development.</li> <li>➤ Rural Electrification Programme.</li> <li>➤ Petroleum products, import/export/marketing policy Management.</li> <li>➤ Renewable Energy Promotion and Development</li> <li>➤ Energy Regulation, Security and Conservation.</li> <li>➤ Fossil Fuels Exploration and Development.</li> </ul> </li> </ul> <p><i>MoEP will be the coordinating agency for the proposed project.</i></p>
Ministry of Lands and Physical Planning (MOLPP)	<ul style="list-style-type: none"> <li>▪ The Directorate of Land is charged with the responsibility of ensuring efficient administration and sustainable management of the land resource in the country.</li> </ul> <p><i>The MoLPP is responsible for, among others: lands policy management, physical planning, land transactions, land adjudication, settlement matters, land registration, as well as land and property valuation services which is important in acquisition and resettlement issues for the proposed project, as well as urban planning.</i></p>
Ministry of Environment and Natural Resource	<ul style="list-style-type: none"> <li>▪ This Ministry is responsible for policies and programmes aimed at improving, maintaining, protecting, conserving, and managing the Country's natural resources (water, forestry, wildlife and environment).</li> </ul> <p><i>The proposed project is expected to align with the policies and programs of this Ministry notably the requirements of EMCA Cap 387, its implementing regulatory Authority-NEMA, all which are enshrined within this Ministry.</i></p>
National Environmental Tribunal	<ul style="list-style-type: none"> <li>▪ The National Environment Tribunal (NET) created under Section 125 of EMCA Cap 387 has the following functions:               <ul style="list-style-type: none"> <li>➤ To hear and determine appeals from NEMA's decisions and other actions relating to issuance, revocation or denial of (EIA) licenses or amount of money to be paid under the Act and imposition of restoration orders;</li> <li>➤ To give direction to NEMA on any matter of complex nature referred to it by the Director General; and</li> <li>➤ If the proponent or any other stakeholder disagree with NEMA decisions in exercising the above-mentioned functions, then they may lodge a case at the NET to seek to overturn the decision. Should</li> </ul> </li> </ul>



Institutions / Departments	Key Mandate
	<p>this avenue not lead to a favorable ruling from the NET, an appeal may be lodged in the Environment and Land Court.</p>
National Environment Complaints Committee	<ul style="list-style-type: none"> <li>▪ The National Environment Complaints Committee performs the following functions: <ul style="list-style-type: none"> <li>➤ Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Cabinet Secretary.</li> <li>➤ Prepare and submit to the Cabinet Secretary periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and</li> <li>➤ To undertake public interest litigation on behalf of the citizens in environmental matters.</li> </ul> </li> </ul> <p><i>This committee will act as a safeguard for members of the public who feel aggrieved by actions taken under the proposed project and can exercise their constitutional rights to launch a complaint should they have exhausted all other grievance redress mechanisms available to them.</i></p>
National Environment Management Authority (NEMA)	<ul style="list-style-type: none"> <li>▪ The National Environment Management Authority (NEMA) exercises general supervision and, co-ordination of all matters relating to the environment.</li> <li>▪ NEMA is also the principal instrument of the government in the implementation of all policies relating to the environment.</li> <li>▪ NEMA is also the Designated National Authority for certain Multilateral Environmental Agreements.</li> </ul> <p><i>The Authority will review this EIA report for the proposed project, visit the project sites to verify information provided in the report and issue EIA license if it considers that all the issues relevant to proposed projects have been identified and mitigation measures to manage them have been proposed.</i></p>
Baringo and Laikipia County Governments	<ul style="list-style-type: none"> <li>▪ The proposed project is within the jurisdiction of Baringo and Laikipia County Governments</li> <li>▪ The County governments are expected to enact legislation as well as collaborate on physical planning.</li> </ul> <p><i>Liaison with Baringo and Laikipia County government authorities on the proposed project ,will be required for functions that fall under their jurisdiction.eg Public works,health,agriculture,lands,environment</i></p>
The County and Sub-County	<ul style="list-style-type: none"> <li>▪ Governors shall by notice in the gazette constitute a County Environment Committee that shall be responsible for the proper management of the environment within the County for which it is appointed.</li> </ul>

Institutions / Departments	Key Mandate
Environment Committees	<ul style="list-style-type: none"> <li>▪ The County and Sub-County Environmental Committees contribute to decentralization of activities undertaken by NEMA.</li> <li>▪ This enabled local communities to have greater access to environmental management information. It has also enabled the County and Sub-County Environment Committees to conduct quick site visits and review of reports of proposed projects.</li> </ul> <p><i>Since the proposed project is of national importance, the review of the report will be done at a National level for issuance of EIA license. However, it is also notable that the EIA study report should also be reviewed at Baringo and Laikipia County level to create awareness and obtain local institutional ownership.</i></p>
Kenya Forest Service (KFS),	<ul style="list-style-type: none"> <li>▪ Kenya Forest Service is a corporate body established under the Forest Conservation and Management Act no 34 of 2016.</li> <li>▪ The Act, which was operationalized on 31st March 2017, gave the Service's mandate as “to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes.”</li> </ul> <p><i>KFS will hence play a critical role on providing information on Madunguni Forest land that will be traversed by the proposed line. KFS is bound to Conserve, protect and manage all public forests in accordance with the provisions of the Act;</i></p>
Kenya Wildlife Services (KWS),	<ul style="list-style-type: none"> <li>▪ Kenya Wildlife Service is a state corporation that was established by an Act of Parliament (Cap 376), repealed by Wildlife Conservation and Management Act (WCMA 2013), with the following mandate of among others: conserve and manage national parks, wildlife conservation areas, and sanctuaries under its jurisdiction.</li> <li>▪ KWS undertakes conservation and management of wildlife resources across all protected areas systems in collaboration with stakeholders.</li> </ul> <p><i>KWS will be key on wildlife management found within the ROW of the proposed transmission line.</i></p>
Water Resources Authority (WRA)	<ul style="list-style-type: none"> <li>▪ Water Resources Authority (WRA) is a state corporation established under Section 11 of the Water Act, 2016.</li> <li>▪ Pursuant to Section 6 of the Act, the Authority is an Agent of the National Government responsible for regulating the management and use of water resources.</li> <li>▪ The Water Act, 2016 makes extensive provisions on the Authority's role in regulating the use and management of water resources.</li> <li>▪ WRA was operationalized on 21st of April 2017 vide Gazette Notice No. 59. However, the Authority has been in existence for 12 years following its establishment under the Water Act, 2002 as Water Resources Management Authority (WRMA).</li> </ul>

Institutions / Departments	Key Mandate
	<i>WRA will provide the necessary water extraction permits envisioned / required for the project.</i>
The Directorate of Occupational Safety and Health Services (DOSHS)	<ul style="list-style-type: none"> <li>▪ The Directorate of Occupational Safety and Health Services (DOSHS) is one of departments within the Ministry of Labour and East African Community Affairs, whose primary objective is to ensure safety, health and welfare of all workers in all workplaces.</li> <li>▪ Unsafe and unhealthy work environment causes accidents, diseases, disasters and environmental pollution that occasion huge economic and social burdens to individuals and enterprises thereby stifling economic and social growth.</li> </ul> <p><i>DOSHS is a key stakeholder based on the role they play regarding safety, health and welfare of all workers in all workplaces and in registration of all workplaces which are envisioned in the proposed project.</i></p>
The National Land Commission	<ul style="list-style-type: none"> <li>▪ The National Land Commission: <ul style="list-style-type: none"> <li>➤ One of the Key functions of the commission as detailed in the Constitution Article 67(2) and The National Land Commission Act No. 5 of 2012, Sec 5 is to manage public land at community level on behalf of the national and county governments</li> <li>➤ Advises the national government on a comprehensive programme for the registration of land titles</li> <li>➤ Investigates present or historical land injustices, and recommends appropriate redress</li> <li>➤ Encourages the application of traditional dispute resolution mechanisms in land conflicts</li> <li>➤ Monitors/oversees land use planning throughout the country</li> <li>➤ Ensures that public land/land under the management of designated state agencies is sustainably managed</li> <li>➤ Develops and encourages alternative dispute resolution mechanisms in land dispute handling and management.</li> </ul> </li> <li>▪ The land Act No. 6 of 2012-Gives the definition of an easement and wayleave. Also details the procedure of application of wayleave through the NLC.</li> <li>▪ It will take up the issues of verification of ownership after the completion of the RAP Study. It will set out clear procedures for land acquisition considering project impacts and land rights. The exercise will be part of the verification of ownership of property before compensation is paid and relocation carried out. KETRACO will share the Final RAP Report to NLC with a schedule of lands to be affected for ownership verification and gazettelement for “acquisition.” The “acquisition” process will take 45 days (30 days for the notice and 15 days for the Public inquiry).</li> </ul>

Institutions / Key Mandate Departments	
	<i>The National Land Commission (NLC) will be engaged in the project on matters related to land acquisition as a result of physical displacement and will facilitate the compulsory acquisition of all land to be acquired in accordance with the Land Act 2012.</i>
Kenya Civil Aviation Authority (KCAA)	<ul style="list-style-type: none"> <li>Kenya Civil Aviation Authority is a state corporation of Kenya that is responsible for regulating the aviation industry in Kenya and for providing air navigation services in the Kenya flight region.</li> </ul> <p><i>Erecting transmission line towers requires a permit from the Kenya Civil Aviation Authority hence the proponent will be required to obtain permits and clearance from KCAA.</i></p>
National Museums of Kenya (NMK)	<ul style="list-style-type: none"> <li>The National Museums of Kenya is a state corporation that manages museums, sites and monuments in Kenya. It carries out heritage research, and has expertise in subjects ranging from paleontology, ethnography and biodiversity research and conservation.</li> </ul> <p><i>NMK will be a key institution to be engaged if the proposed project finds any important cultural heritage sites and/or archaeological sites.</i></p>

## 5 BASELINE INFORMATION OF PROJECT AREA (BARINGO & LAIKIPIA COUNTIES)

### 5.1 Baringo County

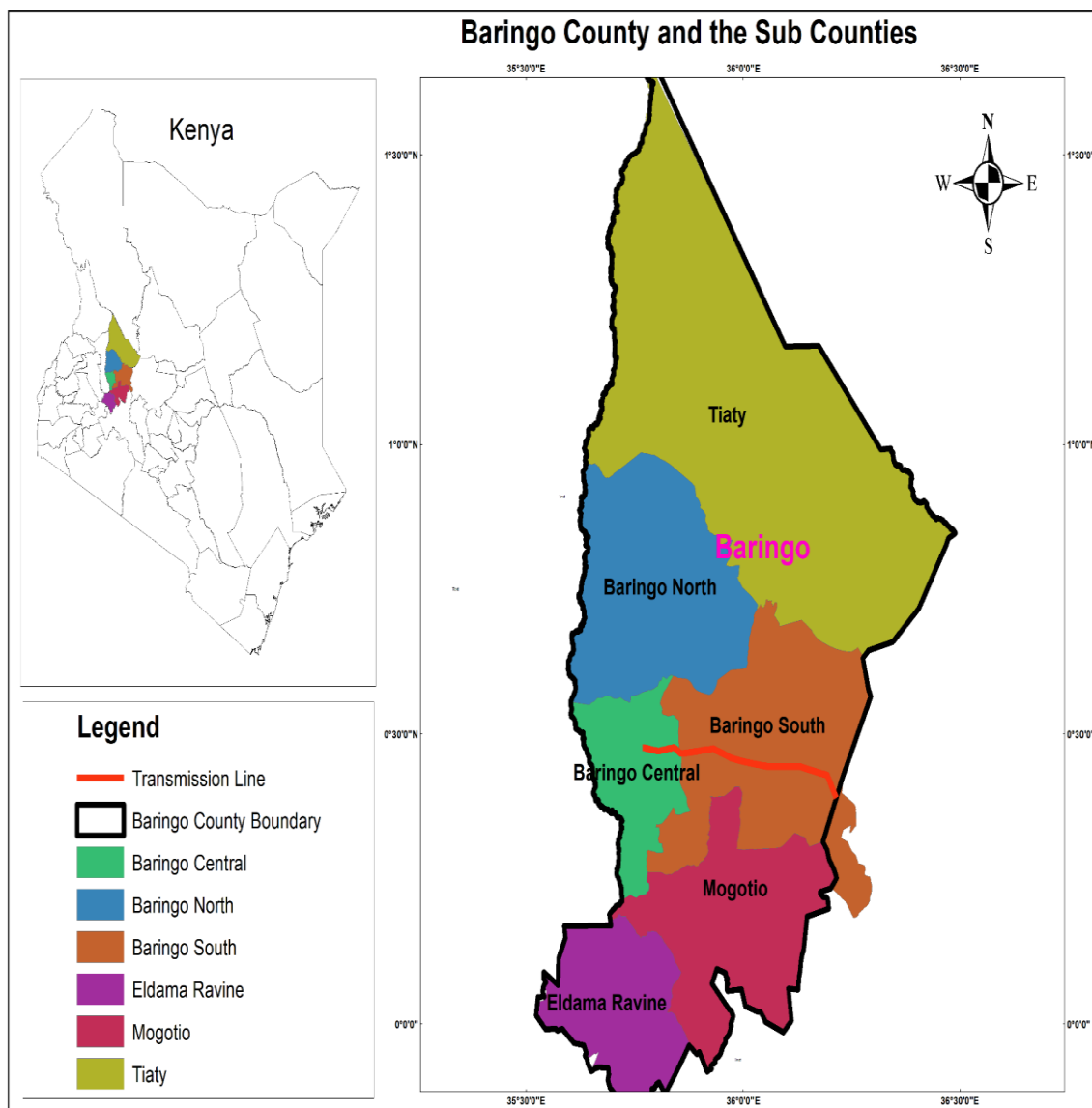
#### 5.1.1 Overview

Baringo County is situated in the Rift Valley Region and shares borders with 8 counties namely, West Pokot to the North West, Turkana to the North, Samburu to the North East, Laikipia to the East, Nakuru to the South, Kericho and Uasin-Gishu Counties to the South West, and Elgeyo-Marakwet to the West. The County is divided into 6 Sub-Counties, namely Baringo South, Mogotio, Eldama Ravine, Baringo Central, Baringo North and Tiaty. *The proposed transmission line passes through Baringo Central (Kapropita) and Baringo South (Marigat, Ilchamus, Mochongoi) subcounties.*

The County occupies an area of 11,015 square kilometers and had a population of 666,763 people in 2019. The main ethnic communities inhabiting Baringo County are the Tugen, Pokot and Ilchamus with minority groups such as the Endorois, Nubians, Ogiek, Kikuyu and Turkana. *The communities within the areas traversed by the proposed transmission line within Baringo Central and Baringo South sub counties are the Tugen, Ilchamus and Endorois.*

#### 5.1.2 Location and Size

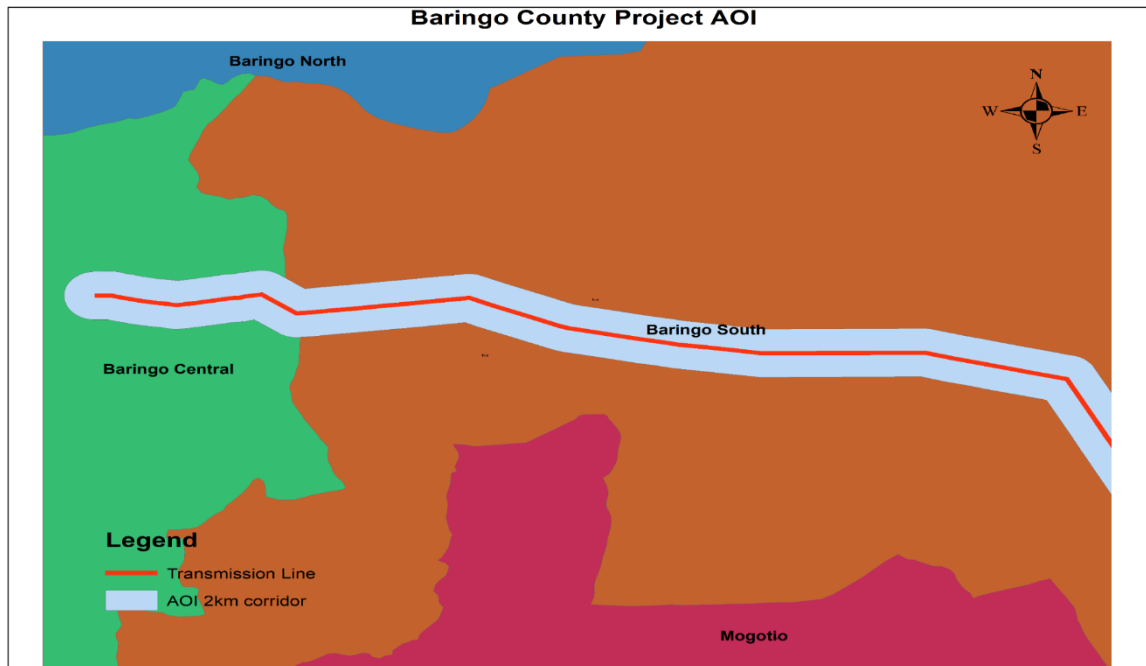
The Equator cuts across the county at the southern part. Baringo covers an area of 11,015.3 sq km of which 165 sq km is covered by surface water from Lake Baringo, Lake Bogoria, and Lake Kamnarok. Figure 9 below shows map of Baringo County and Sub counties. *The proposed transmission line will take off at Kabarnet substation in Kasoiyo area then traverse Kapropita, Kituro, Koriema, Kimalel, Marigat, Ilngarua, Kiserian, Kasiela, Logumgum and Arabal locations within Baringo County and thereafter get into Laikipia County. The total length of the transmission line in Baringo County is **69.95 km.***



**Figure 5-8: Map of Baringo County and Subcounties**

*Source: EMC Consultants, 2019*

Figure 5-9 below shows project area of influence.



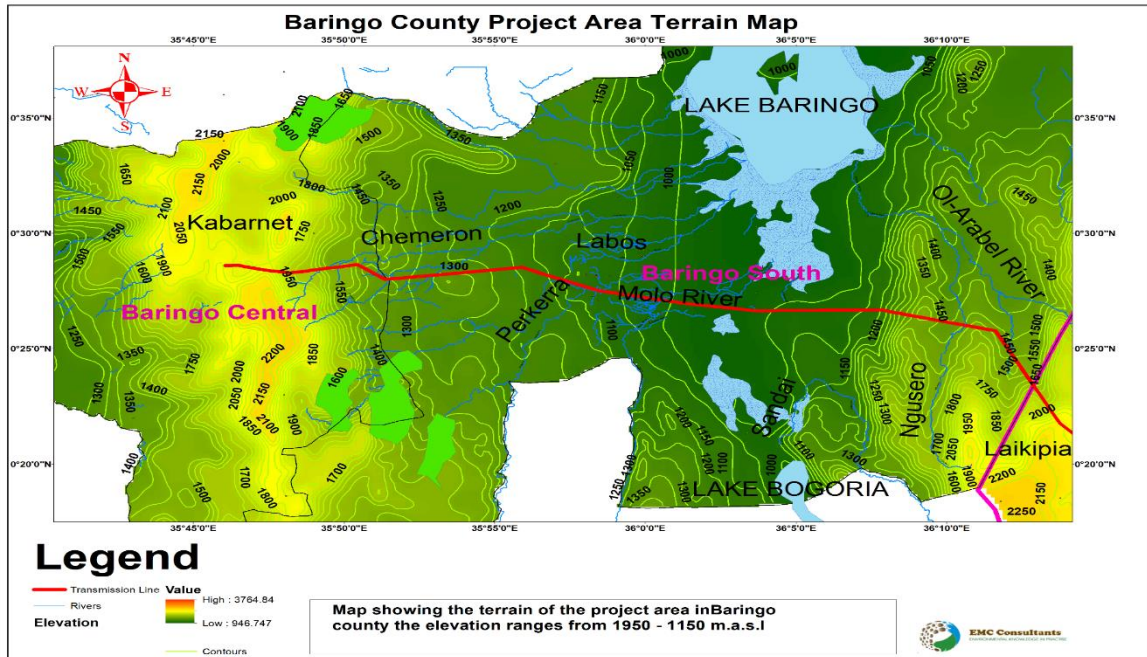
**Figure 5-9: Baringo County AOI**

*Source: EMC Consultants, 2019*

### 5.1.3 Topography

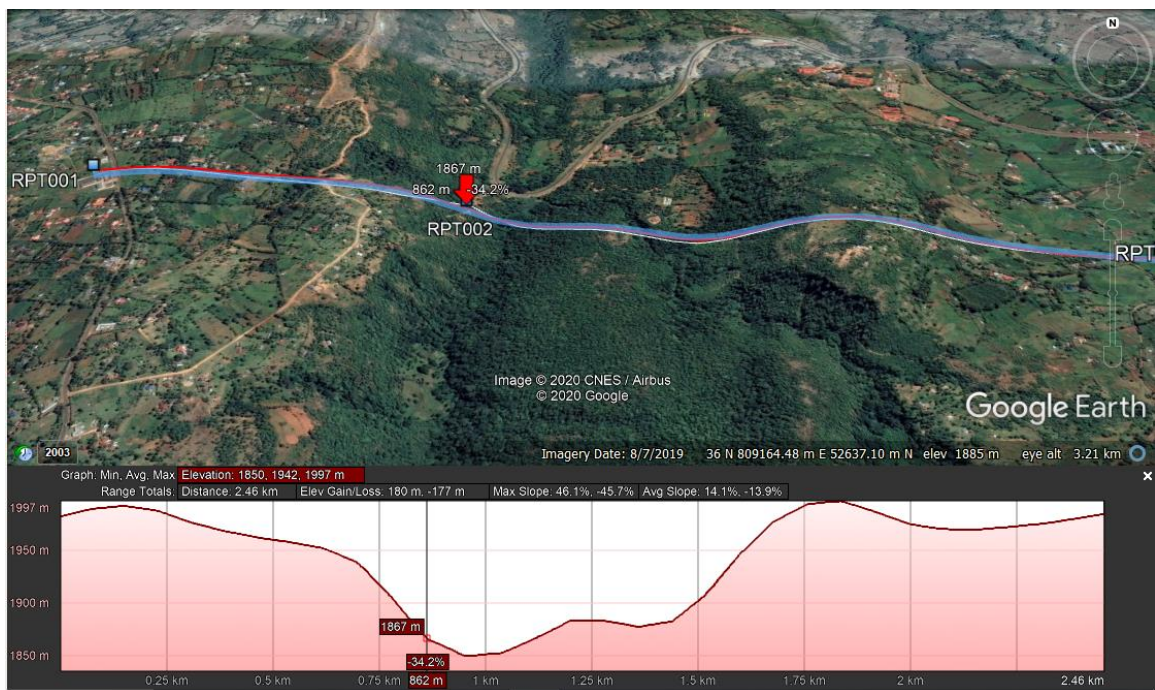
The county can be divided into four; the eastern edge of the Basin Uasin Gishu Plateau in the west followed eastwards by the Kerio Valley, the Kamasian Hills and the floor of the Rift Valley. The high ground of the south-west quadrant is a continuation of both the Uasin Gishu Plateau and the Kamasian Hills around the head of the Kerio Valley. One of the prominent features in Baringo is the Kerio Valley, which is situated on the western part of the county; other features include the Lobo Plain covered mainly by the latchstring salt silts deposits situated in the eastern part of the county near Lake Baringo and Bogoria. The Tugen Hills in the north-south which mainly consist of volcanic rocks, form a conspicuous topographic feature in the county. The hills have steep slopes with prominent gullies and rivers that flow into very deep gorges while on the eastern and western parts are escarpments. The prevailing conditions make the area prone to soil erosion or earth movement. Some part of the county is in the floor of the Rift Valley which owes its origin to the tectonic plate movement and volcanic activities resulting to dislocated surfaces and formation of separate ridges. The troughs of the rift that have a north-south alignment occupied by Lakes Baringo and Bogoria, which cover 164 KM<sup>2</sup>. The elevation profile of the transmission line route, the highest elevation is 2205m ASL and the lowest is 982 m ASL. The high points (elevation) where towers are to be sited and hence prone to erosion are highlighted in figures 5-11 and 5-12 below.





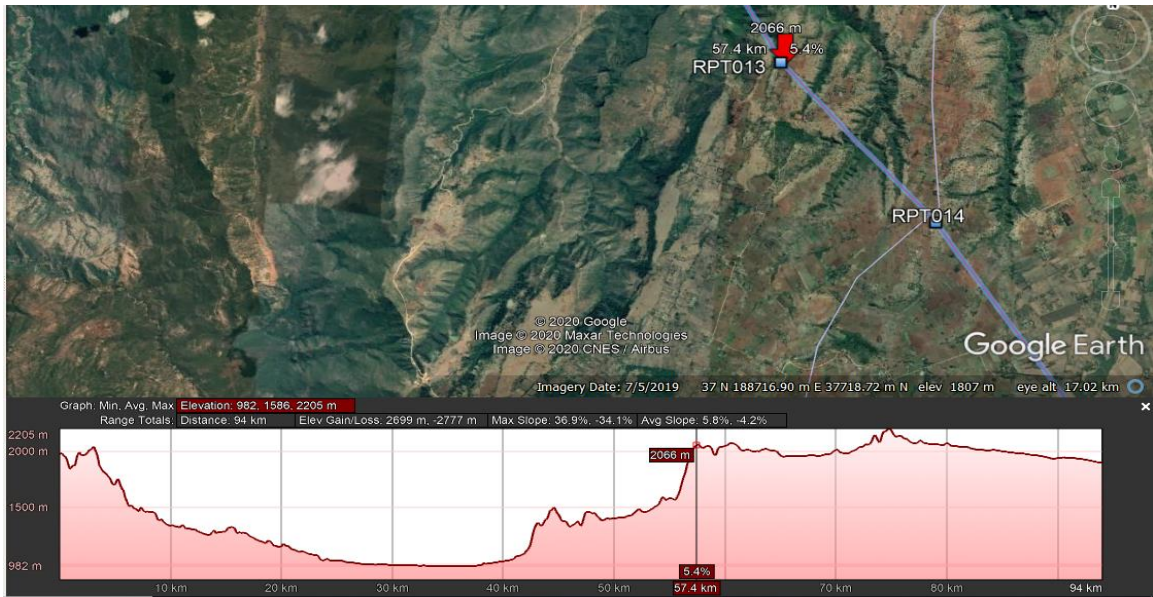
**Figure 5-10: Transmission line area terrain**

Source: EMC Consultants , 2019



**Figure 5-11: Erosion risk areas based on elevation and slope are at RPT002**

Source: EMC Consultants, 2019



**Figure 5-12: Section RPT 013 is located near a cliff**

Source: EMC Consultants, 2019

*The proposed transmission line route passes between Tugen hills and Kabarnet-Marigat road from Kasoyo towards Marigat through Koriema and Kimalel areas. The topography of transmission line route from Kasoyo in Kapropita location is rugged with numerous hills and rocks slanting towards Kimalel through Kituro. From Koreima in Kimalel location, the topography slopes gently towards Marigat. From Marigat, Iinharua, Ilchamus to Kiserian, the topography is relatively flat. From Kiserian, Kasiela and Kapkechir, the areas is hilly. Mochongoi is a plateau.*

#### 5.1.4 Climate

The rainfall is about 50% reliable and rainfall variability is very high. There is one rainy season from April to August and a prolonged dry season. The rainfall varies from 1,000mm to 1,500mm in the highlands to 600mm per annum in the lowlands. Due to their varied altitudes, the sub-counties receive different levels of rainfall. Koibatek sub-county receives the highest amount of rainfall. The lowland sub-counties of Mogotio, East Pokot and Baringo North receive relatively low amounts. The temperatures range from a minimum of 10°C to a maximum of 35°C in different parts of the county. Average wind speed is 2m/s and the humidity is low. Figure 14 below shows rainfall distribution in the project area. *For areas traversed by the project, Kapropita and Kituro locations are humid but this changes to Arid from Korieme, Kimalel, Marigat, Ilngarua, Illchamus, Kiseria, Kasiela and Kapkechir. Mochongoi which neighbours Laikipia county is humid.*



**Figure 5-13: Rainfall distribution in the project area**

**Source: Kenya Meteorological Department**

Baseline ambient air and noise measurements and soil sampling was conducted to understand the baseline situation of the project area specifically in areas with sensitive receptors that may be affected by the project construction activities. The results are presented in Annex 1.

#### 5.1.5 Geology and soils

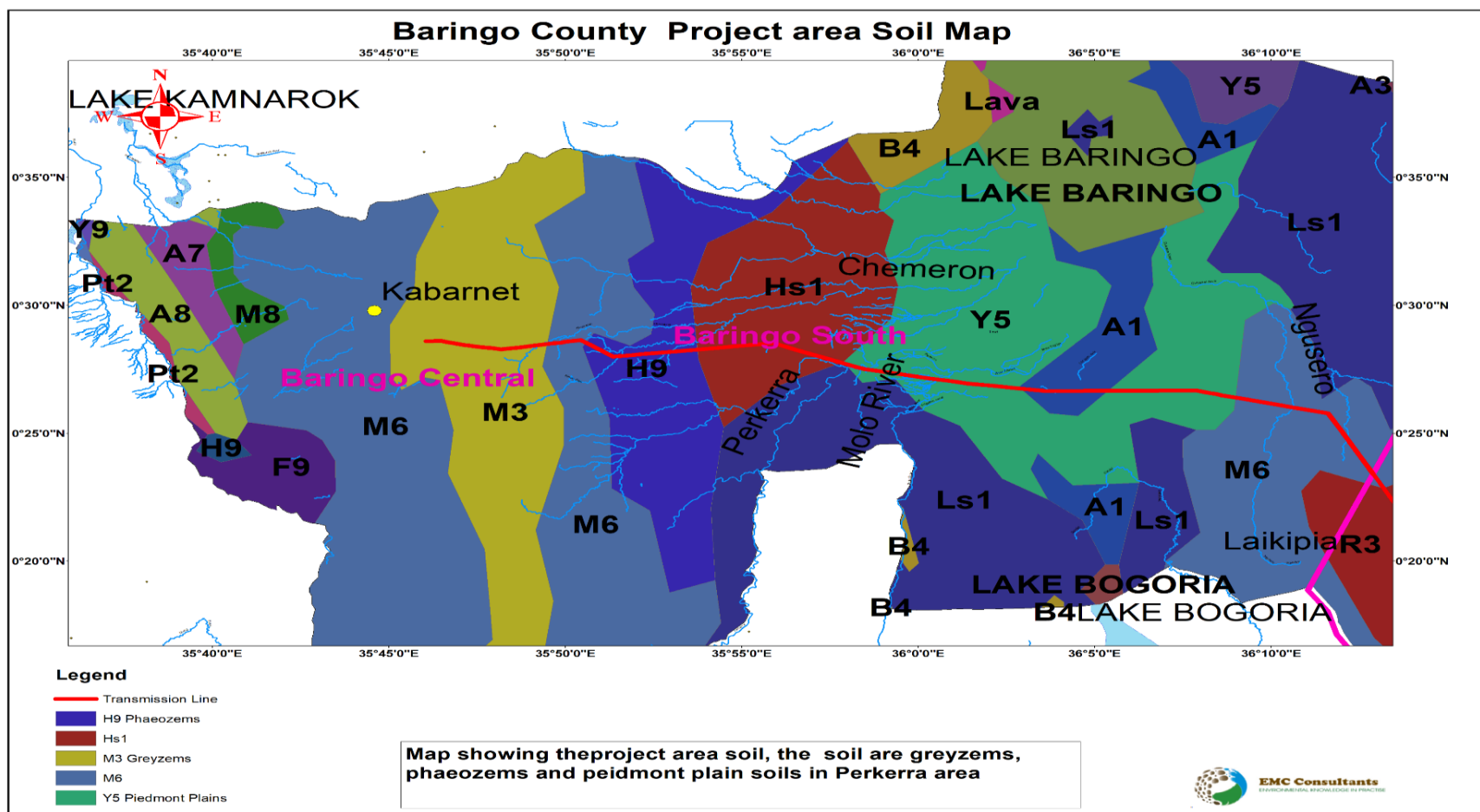
Baringo County offers good examples of landforms, typical of the Eastern Rift Valley. The rift faulting has resulted in large altitude differences of the land, accompanied by often mountainous escarpments. A wide range in climate, soil and vegetation types goes along with these height differences; hence contrasting potential and use of the land is a result of landform distribution. Most prominent are the mountainous slopes of the Tugen hills and the escarpment of the Eastern Rift Valley flanks towards the Lherogi/Laikipia plateau (unit MV). Soils are formed on mostly older (Pliocene) volcanic rocks and due to the prevailing



very steep and long slopes, are shallow and very stony. Above and outside these rift valley flanks the more humid and cooler highlands of the Tugen hills, Eldama Ravine area (unit UhV) at altitudes over 2200 m) and the Lherogi/Laikipia Plateau (unit HsV at an altitude of 1800 m) are found. Also, here older volcanic rocks prevail, that mostly bear a combination of shallow soils over rock and deeper red clays (Tugen hills, Eldama Ravine area) or shallow gravelly clay loams and some deeper grey clays at the Laikipia side.

The major part of the county is occupied by the Rift Valley floor, highlighted by the lakes Bogoria and Baringo, and to the west by the Kerio River. The deepest central part of both valleys descends gradually to well under the 900 m, 3000 ft) contours in the North, near to the county boundary with Turkana. At the base of the Tugen hills, a zone of badly eroded Uplands and minor Hills are found, developed on largely unconsolidated and highly erodible material (HV and UV). Apart from these, the majority of the arid lowlands is occupied by basalt Plateaus that are broken and tilted by faulting in more recent geological times. Numerous rocky cliffs alternate with gently undulating, but mostly very shallow and stony clay loam soils of the step faulted basalt Plateaus (unit LsB). The latter and lower parts of the step faulted rift valley floor are the areas where sedimentation takes place.

The geological erosion that has been active since the beginning of the crustal movements has detached large quantities of materials from both flanks of the Rift valley. These sediments have settled in Piedmont Plain-like low slopes (e.g., the Njemps flats; the Mukutan area), often with promising irrigation potential (unit YV). Soils are mostly well drained deep friable silty loams, or heavy cracking clays. These predominant plains are (partly) due to recent crustal movements, partly due to overutilization themselves subject to erosion, especially towards the north, and as a result, bear a dense gravel layer at the surface, are transformed into badland topography due to gully erosion. In the center of the Rift Valley, north of Lake Baringo, relatively vulcanicity produced some Hills (HP) and the more recent basalt flows that are partly covered by a blanket of ash and fine gravel (LaP). Figure 5-14 below shows the project area soil.



**Figure 5-14 Project area soil**

### **Agricultural Potential of Dominant Soil Types along the Transmission line Route**

The current land use along the route of the proposed transmission line also provides an indication of the agricultural potential. The current land use was determined using a combination of field observations and the interpretation of publicly available high-resolution satellite imagery. Agricultural activities observed include the cultivation of crops including potatoes, maize, wheat, sorghum, beans, peas, cassava, tomatoes, onions, coffee, tea, and livestock farming of cows, goats, sheep, donkey, poultry, and pigs. Based on these data and observations, the dominant land use along the route of the proposed transmission line is interpreted to be small-scale subsistence farming, which is of medium to high agricultural potential.



**Figure 5-15- Cultivation along the Transmission Line Route**

Source: EMC Consultants Field Survey, 2019

### **5.1.6 Drainage and Hydrology**

The surface water potential in the County exists in form of rivers, dams and lakes. The main rivers in the County are Pekerra, Molo, Kerio, Lobo, Suguta, Ol-Arabel and Waseges.

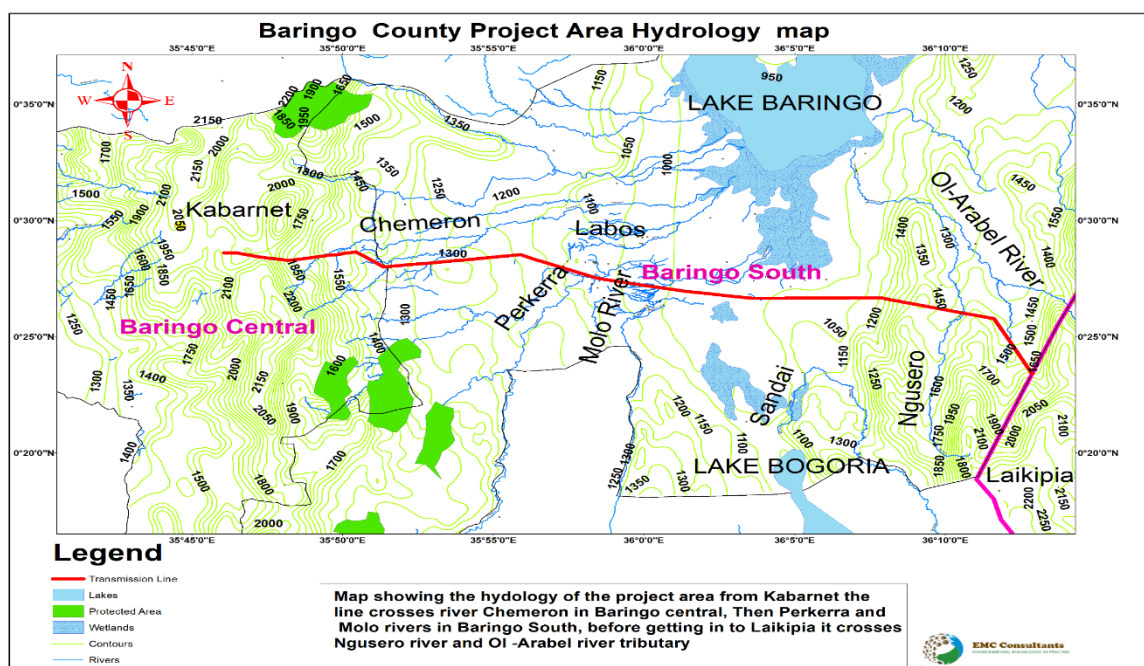


Figure 5-16 Project area hydrology map

Source: EMC Consultants, 2019

These rivers are all fresh water sources with fluoride content of less than 1.5mg/l. Lake Baringo is the largest of the three lakes, but the water from the lake is of limited domestic uses due to its high turbidity. *The proposed transmission line traverses River Perkerra and other small streams. It is 2kms away from Lake Baringo and 40.1kms away from Lake Bogoria.*

On the higher ground most of the streams and rivers are perennial, but from 5,000 ft. downwards only the largest rivers, notably the Molo, Perkerra and Kerio and their main tributaries, have water throughout the year. Lake Baringo, a fresh-water lake, lies a few miles north-east of Marigat, and Lake Hannington, a soda lake, a few miles south-east of that place. Lake Narasha in the south-west of the area is little more than a marshy pond and is exceeded in size by many of the bodies of water impounded by dams nearby. Lelen Swamp, in the east, is a lake during the wetter months of the year. *The Eldume area which is traversed by the transmission line is usually swampy during the rainy season. In Baringo Central and Baringo South, there are several rivers traversed by the transmission line which drains into Lake Baringo. They are Ol Arabel, Makutan, Tanguulbei, Endao and Chemeron which are seasonal rivers. Perkerra and Molo rivers are perennial rivers traversed by the proposed transmission line although they have significantly reduced water discharges during dry seasons. No tower will be located within the 6-30m riparian reserve.*

## Molo River

The upper catchment in the Molo and Kuresoi areas, functions as the primary source of the Molo River. Several streams that begin in the Mau Complex flow into the Molo River and are depended upon all the way down to Lake Baringo. Flowing down from the Mau



Complex, the Molo River has served citizens of the Rift Valley for several years. Over the approximately 100 km length that the river covers from the Mau Forest to Lake Baringo, this waterway is a primary source of livelihood amongst the communities it flows through. The constituencies that the Molo River serves along its coverage include: Kuresoi, Molo, Rongai, Mogotio, and Baringo Central. Up to 1985, the water in Molo River remained clean, safe, and sufficient for communities in the region and for fisheries. The transmission line will cross a section of this river at Lon: 36° 0'31.90"E, Lat: 0°27'4.70"N.

### **Perkerra River**

The Perkerra River is a river in the Great Rift Valley in Kenya that feeds the freshwater Lake Baringo. It is the only perennial river in the arid and semi-arid lands of the Baringo County. The Perkerra river supplies water to the Perkerra Irrigation Scheme in the Jemps flats near Marigat Township, just south of the lake. The river has a catchment area of 1,207 square kilometres. It rises in the Mau Forest on the western wall of the Rift valley at 2,400 m, dropping down to 980 m at its mouth on the lake. The catchment area has steep slopes on the hillsides, flattening out lower down. Most of the water comes from the hill slopes, where annual rainfall is from 1,100 millimetres to 2,700 millimetres. The region around the lake is semi-arid, with annual rainfall of 450 millimetres and annual evaporation rates of 1,650 millimetres to 2,300 millimetres. The transmission line will cross a section of this river at intersection point Lon 35°51'35.58"E, Lat 0°28'1.39"N, *just in front of Marigat chief's office close to Marigat-Nakuru road (Yatoi village, Rabai sublocation)*

### **Chemeron River**

Chemeron River flows seasonally. The ground has a gentle slope in some areas but is generally rough towards the river. Vegetation is mainly dense-bushed grassland dominated by *Acacia reficiens*, *A. mellifera*, *tortilis*, *Boscia angustifolia* and *A. coriaceae*. The sandy river valleys and banks are characterized by *Balanites aegyptiaca*, *Grewia bicolour* and *Tamarindus indica*. The main grasses are *Cenchrus ciliaris*, *Enteropogon macrostachyus*, *Chloris roxburghiana* and *Eragrostis superba*. It only reaches the lake only when there are heavy floods during the rainy season. *The transmission line will cross a section of this river at intersection point Lon 35°49'24.68"E, Lat 0°28'28.88"N.*

### **Ngusero and Arabel Rivers**

The Ngusero and Ol Arabel rivers drain the northern end of the Aberdare Range. The river forms a delta where it enters the southeast of Lake Baringo at 0.531113°N 36.115837°E, and this forms a dense marsh during periods when the lake level is relatively high. The river is seasonal and in the dry period of the early 2000s no longer reached the lake. Ol Arabel (or Olarabel) is a river in the Great Rift Valley of Kenya that feeds Lake Baringo. It gives its name to a forest covering its headwaters and to a region. *The transmission line will cross a section of this river at intersection point Lon 35°49'47.86"E, Lat 0°28'31.88"N for Ngusero River.*

### **Lake Baringo**

Lake Baringo is one of only two freshwater Rift Valley lakes, together with Lake Naivasha, in Kenya. The lake is fed by a number of rivers but has no visible outlet. It is assumed that the water seeps away into the faults in the bedrock. The water level of the lake dropped to some of the lowest levels recorded due to drought and agricultural irrigation but the floods

in Northern Kenya in recent years pushed the level up alarmingly. This has caused the water levels to rise to up as much as four meters, putting locals at risk and damaging the limited tourism structure. The highwater levels are presumed to be a result of the large deposits of sediment brought in by the flooding. Most of the tourist structures were damaged by the rising waters.

The lake has several islands such as Ol Kokwe Island which has hot springs and fumaroles, some of which have precipitated sulphur deposits. The area is also important for its archaeological and paleontological sites, where important hominid fossil discoveries have been made. Many of the Kenyan Rift Valley lakes are known for their birdlife, and in particular the concentrations of flamingoes, but because of Baringo's freshwater properties flamingoes tend to stay away. The lake is home to more than 470 species of birds however many of which breed on and around the lake. It is an important stop for migratory birds both inter-Africa and globally.

The lake has seven fish species with the Nile Tilapia being endemic. Fishing is an important part of the socioeconomics of the region. The numbers of Nile Perch have declined markedly in Lake Baringo over the years, but this may have to do with the proliferation of the African Lungfish which was introduced into the lake in the 1970's. The Lungfish is now the most important food source from the lake. Moreover, the area is also home to a number of species such as Hippo, Crocodile, Zebra, Klipspringer, Grant's gazelle, Chandler's Mountain Reedbuck, and the rare Greater Kudu. *The Lake is approximately 2kms from the proposed transmission line. The proposed transmission line has also avoided Lake 94.*

Annex E contains the birdlife in Lake Baringo which is an Important Bird Area (IBA) but transmission line will not cross a section of this habitat which is 2kms from the transmission line. Figure 5-17 below shows the Endemic Bird Areas sections in the County traversed by the line with no Important Bird Area traversed by the line.

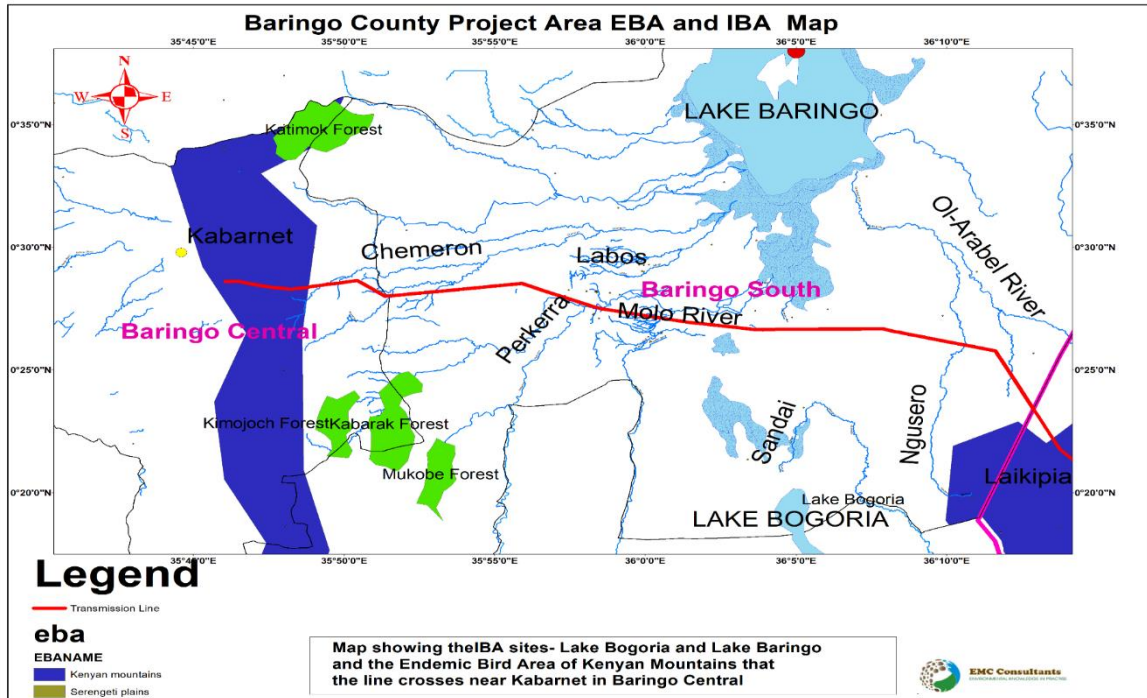


Figure 5-17-Endemic Birds area section  
Source: EMC Consultants, 2019



Figure 5-18- River Perkerra draining into Lake Baringo  
Source: EMC Consultants Field Survey Photo, 2019

## Lake Bogoria

Lake Bogoria was declared a national reserve due to its rich in biodiversity, scenery and hydrological features in 1970 and was made a Ramsar site of international importance in 2001. It has an altitude between 970 m at the lake to 1650 meters on Siracho escarpment. The Reserve lies close to the eastern wall of the Great Rift Valley and has its headquarters at Lobo Gate. The Lake Bogoria catchment basin covers an area of about 1,200 km<sup>2</sup>, occupying the Eastern wall of the central part of Kenya's Great Rift Valley. The lake has a depth of about 10 meters and is approximately 34 km long by 3.5 km wide.

The lake is a saline, alkaline lake and lies just south of Lake Baringo. With its ideal conditions it is home to one of the world's largest populations of lesser flamingos. Due to the lake's alkalinity, blue green algae grow well, this in turn feeds the flamingos. At times the number of flamingos feeding in the lake may be as many as two million-creating a wonderful undulating blaze of pink as the flamingos go about their feeding.

Lake Bogoria National Reserve (LBNR) that lies in the catchment area covers an area of 107 km<sup>2</sup> and supports many regionally and nationally endangered species including the migratory Lesser flamingos (*Phoeniconaias minor*) as well as Greater flamingos (*Phoenicopterus ruber*) and Black-necked grebe (*Podiceps nigricollis*). Populations of up to two million birds can occur at any time and can reside in the reserve for months. Aside from the flamingos there are many other birds and animals to see at Lake Bogoria such as buffalo, zebra, baboon, warthog, caracal, spotted hyena, impala and dikdik.

Since the ground in the lake area was formed geologically from recent volcanic rocks from the miocene-pleistocene era, the region around Bogoria has about 200 hot springs with water temperatures from 39 to 98.50 C. Nearly all these springs are close to the lake or are inside the lake. The hot springs in general have a high content of carbon dioxide, which causes the wild boiling of the springs. There are also many geysers found spouting within, formed by the vents in the earth's surface by the volcanic activity. Over the past decade, there have been some major hydrothermal changes which have occurred by frequent fluctuations of water level of Lake Bogoria. Even slight changes of water level in this shallow lake can impact geyser behaviour. Some geysers that were active during 2001 and 2005 have become weak hot springs or steam vents by 2006 with the fall in water level due to drought, whereas activity on other springs increased. *The proposed transmission line will not cross the lake, closest section of this habitat is 12 kms from the transmission line.*



Figure 5-19-Flamingoes in Lake Bogoria

Table 22-Bird life in Lake Bogoria

Common Name	Scientific Name	Common Name	Scientific Name
Common Ostrich	<i>Struthio camelus</i>	Jackson's Francolin	<i>Francolinus jacksoni</i>
Little Grebe	<i>Tachibuptus ruficollis</i>	Crested Francolin	<i>Francolinus saphaena</i>
Black necked Grebe	<i>Podiceps nigricollis</i>	Black Crake	<i>Amaurornis flavirostris</i>
Great-white pelican	<i>Pelecanus onocrotalus</i>	Grey Crown Crane	<i>Balearica regulorum</i>
Cattle Egret	<i>bubulcus ibis</i>	Black-winged Stilt	<i>Himantopus</i>
Striaed/Green-backed Heron	<i>butorides striatu</i>	Pied Avocet	<i>Recurviurosta avosetta</i>
Little Egret	<i>Egretta garzeta</i>	Spur winged Lapwing	<i>Vanellus spinosus</i>
Gredy Heron	<i>Ardea cinerea</i>	Crowned Lapwing	<i>Vanellus coronatus</i>
Black-headed Heron	<i>Ardea malanocephala</i>	Black-headed lapwing	<i>Vanellus tectus</i>
Hamerkop	<i>scopus umbrette</i>	Kittlitz's plover	<i>Charadrius pecuarius</i>
Yellow-billed stork	<i>Mycteria ibis</i>	Three-banded plover	<i>Charadrius tricollaris</i>



Wooly-necked Stork	<i>Ciconia episcopus</i>	Common ringed plover	<i>Charadrius hiaticula</i>
Marabou stork	<i>Leptoptilos crumeniferus</i>	Lesser sandpiper	<i>Chandarius mongolus</i>
Sacred ibis	<i>Threskiornis aethiopicus</i>	Little Bee-eater	<i>Merops pasillius</i>
Hadada ibis	<i>Bostrychia hagedash</i>	Cinammon-chested Bee-eater	<i>Meros oreobates</i>
Glossy ibis	<i>Bostrychia falcinellus</i>	European Bee-eater	<i>Merops apiaster</i>
Greater flamingo	<i>Phoenicopterus rubber</i>	Madagascar Bee-eater	<i>Merops superilius</i>
Lesser flamingo	<i>Phoenicopterus minor</i>	Lilac breasted Roller	<i>Coraciass caudate</i>
Egyptian Goose	<i>Alopochen aegyptiacus</i>	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>
Spur- winged goose	<i>Plectopterus gambensis</i>	African Hoopoe	<i>Upupa Africana</i>
Knob-billed duck	<i>Sarkidiornis melanotos</i>	Red- billed Hornbill	<i>Tockus erythrorhynchus</i>
White –faced Whistling Duck	<i>Dendrocygna viduata</i>	Von der Deckens Hornbill	<i>Tockus deckeni</i>
Cape Teal	<i>Anas capensis</i>	Jackson’s Hornbill	<i>Tockus jacksoni</i>
Yellow-billed Kite	<i>Milvus parasiticus</i>	African Grey Hornbill	<i>Tockus nasutus</i>
African fish eagle	<i>Haliaeetus vocifer</i>	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>
African Harrier-Hawk	<i>Polyboroides typus</i>	Red-fronted Barbet	<i>Tricholaema diademata</i>
Augar buzzard	<i>Buteo augur</i>	Black throated Barbet	<i>Tricholaema melanocephala</i>
Common buzzard	<i>Buteo buteo</i>	White -headed Barbet	<i>Lybius leucocephalus</i>
Montangu’s Harrier	<i>Circus ranivorus</i>	d’Arnaud’s Barbet	<i>Trachyphonus darnaudii</i>

Dark Chanting Goshawk	<i>Melierax metabates</i>	Red and Yellow Barbet	<i>Trachyphonus erythrophalus</i>
Gabar Goshawk	<i>Micronisus gabar</i>	Lesser Honeyguide	<i>Indicator minor</i>
Tawny Eagle	<i>Aquila rapax</i>	Nubian Woodpecker	<i>Campethera nubica</i>
Steppe Eagle	<i>Aquila nipalensis orientalis</i>	Cardinal Woodpecker	<i>Dendropicos fuscescens</i>
Verreaux Eagle	<i>Aquila verreauxii</i>	Bearded Woodpecker	<i>Dendropicos namaquus</i>
Martial Eagle	<i>Polemaetus bellicosus</i>	Grey Woodpecker	<i>Dendropicos goertae</i>
Pygmy Falcon	<i>Polihierax semitorquatus</i>	Fischer's Sparrow Lark	<i>Eremopterix leucopareia</i>
Peregrine Falcon	<i>Falco peregrinus</i>	Rock Martin	<i>Hirundo filigula</i>
Helmeted Guinea fowl	<i>Numida meleagris</i>	Plain Martin	<i>Riparia paludicola</i>
Red-rumped Swallow	<i>Hirundo fuligula</i>	Sand Martin	<i>Riparia riparia</i>
Lesser striped swallow	<i>Hirundo abyssinica</i>	African scops-owl	<i>Otus senegalensis</i>
Barn swallow	<i>Hirundo rustica</i>	Verreaux's eagle-owl	<i>Bubo lacteus</i>
Wire-tailed swallow	<i>Hirundo smithii</i>	Pearl-spotted owl	<i>Glaucidium perlatum</i>
African pied wagtail	<i>Motacilla lutea</i>	Little swift	<i>Apus affinis</i>
Common bulbul	<i>Pycnonotus barbatus</i>	White-rumped swift	<i>Apus caffer</i>
African thrush	<i>Turdus pelios</i>	Mottled swift	<i>Apus aequatorialis</i>
Isabelline wheatear	<i>Oenanthe pleschanka</i>	Nyanza swift	<i>Apus niansae</i>
Sported morning Thrush	<i>Cichladusa guttata</i>	Eurasian swift	<i>Apus apus</i>
Grey-backed camaroptera	<i>Camaptera brachyuran</i>	Speckled mousebird	<i>Colias striatus</i>
Southern black flycatcher	<i>Melaenornis pammelaina</i>	Blue-naped mouse bird	<i>Urocolias macrourus</i>



African flycatcher	grey <i>Bradornis microrhynchus</i>	Red-faced mouse bird	<i>Urocolias indicus</i>
Silverbird	<i>Empidornis semipartitus</i>	Grey-headed kingfisher	<i>Halcyon leucocephala</i>
Rufous chatterer	<i>Turdoides rubiginosus</i>	Woodland kingfisher	<i>Halcyon senegalensis</i>
Northern babbler	pied <i>Turdoides hypoleucus</i>	Malachite kingfisher	<i>Alcedo cristata</i>
White-bellied tit	<i>Parus albiventris</i>	African pigmy kingfisher	<i>Ispidina picta</i>
Northern grey tit	<i>Parus thruppi</i>	Beautiful sunbird	<i>Cinnyris pulchella</i>
Red-throated tit	<i>Parus fringillinus</i>	Eastern violet-backed sunbird	<i>Anthreptes orientalis</i>
Ruff	<i>Philomachus pugnax</i>	Common fiscal	<i>Lanius collaris</i>
Common sandpiper	<i>Actitis hypoleucos</i>	Long-tailed fiscal	<i>Lanius cabanisi</i>
Wood sandpiper	<i>Tringa glareola</i>	Grey-backed fiscal	<i>Lanius excubitoroides</i>
Green sandpiper	<i>Tringa ochropus</i>	Slate-coloured boubou	<i>Laniarius funebris</i>

**Source: EMC Consultants Field Survey, 2019**

The figure below shows Baringo County protected areas.

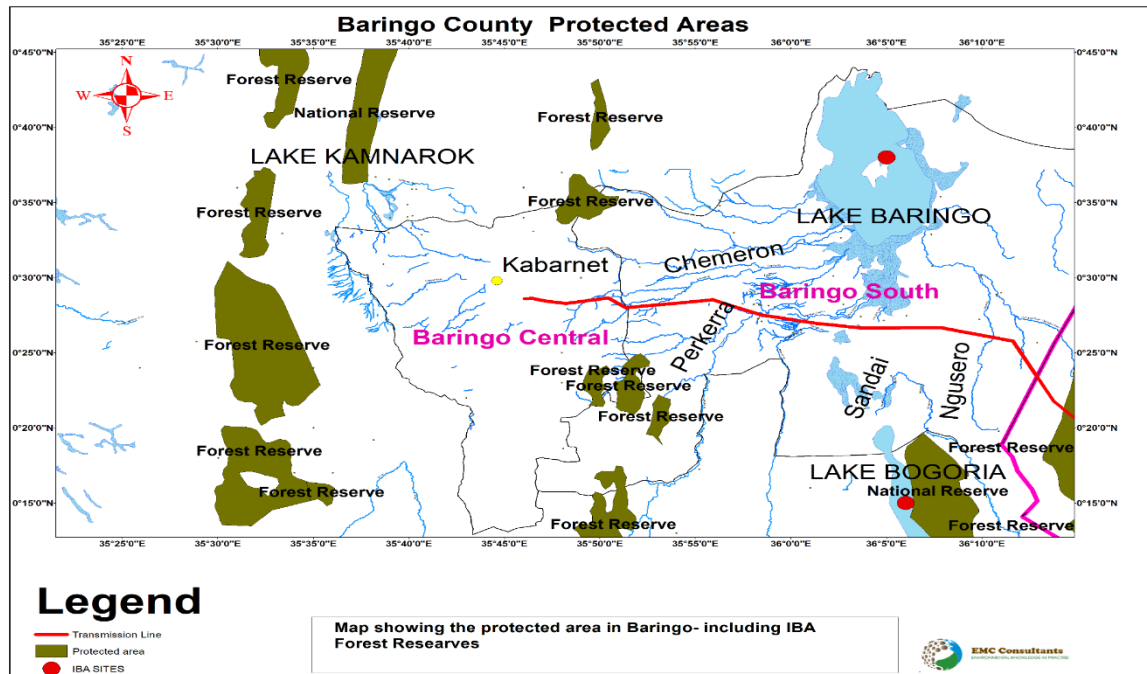


Figure 5-20-Baringo County protected areas

### 5.1.7 Water resource

Being an ASAL county, Baringo has prioritized the provision of water for human, livestock and for irrigation as a necessary requirement for the general development of the county. Water shortage is prevalent, especially in Lake Baringo and Lake Bogoria, parts of Kerio Valley, Mogotio, western slopes of Ng'elecha (Mochongoi) and the entire East Pokot (Kollowa to Tangelbei). This is caused by the low rainfall received and cyclic droughts. This has hindered development of livestock and farming activities, as people spend many hours daily looking for water

The water sources currently in use are Pans & Dams, Pools, Rivers, Traditional River wells, Boreholes, Lakes and springs. Distance to the nearest water source has reduced from an average of 4.0 km to 3.0 km for most of the households while the distance to grazing fields also reduced from 9 km to 5 km during the month. *The areas traversed by the transmission line mainly depends on water from rivers, streams and boreholes. Kabarnet, Kapropita and Kituro areas are served by water from Kirandich dam. Population with Marigat, Ilchamus and Ilngarua area mainly gets water from River Perkerra.*

### 5.1.8 Biological Environment

The vegetation condition index for the county is 81.89. The above normal greenness has been attributed to the cumulative effects of good rainfall performance for the last few months. The performance of the long rains season has been above normal and this has contributed to the good conditions of the natural vegetation.

The quantity of forage in most parts of the project area is fair after the rains. The quality of the available pasture was also fair. Following the rainfall received it is expected that the forage will improve fairly. The distance to grazing areas has reduced owing to improving pasture and browse conditions

Baringo County has 25 gazetted forests where majority are indigenous and are found in Kabarnet, Kabartonjo, Tenges, Lembus, Saimo, Sacho and Ol' Arabel and Eldama Ravine. The main exotic species include: *Grevillea Rabusta*, *Cuppressus lusitanic* and *Eucalyptus saligna*. *Prosopis juliflora*. Kipng'ochoch forest in Sacho is one of the 10 forest blocks under Tenges forest station and is an example of a well conserved indigenous forest where visitors and nature lovers view the entire Lake Baringo basin, fluorspar mines, Laikipia ranges, Elgeyo escarpment, Kerio Valley, and other touristic attractions that the county offers. The county is classified as arid and semi-arid since most of East Pokot, Baringo Central, Baringo South, Baringo North, Mogotio sub-counties are arid and semi-arid except for Koibatek sub-county, which is in a highland zone. Bushland and thickets is the most common tree species belong to the deciduous genera *Acacia* and *Commiphora* occupying major proportion of the line route. The understory consists of shrubby herbs less than one meter high, such as *Acalypha*, *Barleria* and *Aerva*. At lower elevations where rainfall is less consistent, vegetation becomes semi-desert scrubland. *Acacia* and *Commiphora* are joined by *Euphorbia* and *Aloe*, as well as grass species such as *Dactyloctenium aegyptium* and *Panicum turgidum*. Important evergreens include *Boscia*, *Dobera*, *Salvadora*, *Grewia* and *Cadaba*. Additionally, Lake Bogoria supports 53 plant families and approximately 210 plant species. Six broad vegetation types can be classified according to physiognomic representation. They include riverine forest, wooded bushland, bushed thicket, bushland, bushed grassland, and swamps. Depressions (wadis) harbour varied vegetation types such as those found in the Lobo swamps and grasslands.

Evergreen and semi-deciduous bushland cover large areas along stream, valley, and other inhospitable areas. *Spirulina platensis* and other species of phytoplankton, which occur depending on season and water chemistry, dominate the lake's open water. A small forest of *Ficus* sp. occurs at the southern end of the lake associated with freshwater springs. Because of the gentle topography of the land around Lake Bogoria, human beings have settled on it and disturbed it. This has promoted the invasion of *Prosopis juliflora* (Mathenge weed) which is rampant especially adjacent to major settlements

Baringo District has a forest cover of 24,346.9 hectares. The gazetted forests cover a total area of 22,953.7 hectares, representing about 94% of the District's forest area. Most of the gazetted forests are in highlands, where they are threatened by encroachment due to the high demand for agricultural land. *The proposed transmission line will pass through Kinyo Conservancy Forest which is managed by the Kenya Forest Service . Authority will be obtained from KFS before commencement of construction to pass the transmission line project through the forest. Kapkechir forest which is on the Baringo side just before getting into Laikipia County is also traversed by the proposed transmission line and is managed by Kenya Forest Service*

### **Avifauna and Endemic Bird Area (EBA) and Important Bird Area (IBA) Site**

Birdlife in the project area is supported by the numerous ecosystem types found within the confines of the transmission line. Despite this, birdlife is sparsely populated and scattered in the area. They included: Fork-tailed Drongo, Yellow-vented Bulbul, Superb Starling, Rupelles Long tailed Glossy Starling, White-crested Helmet Shrike, Kori Bustard, Northern White-crowned Shrike, Brown-necked Crow, Mourning Dove, White-bellied Cuckoo, Martial Eagle, Abyssinian Roller, Rufous-crowned Roller, Blue-headed Coucal, African Scops Owl, Greyheaded Kingfisher, Pied Kingfisher, Pied Wagtail, White-browed Sparrow-Weaver, Crested Lark, Variable Sunbird, Shinning Sunbird, Speckled Pigeon, Blue-headed Bee-eater, Carmine Bee-eater, Paradise Flycatcher, Namaqua Dove, White-headed Buffalo Weaver, White-browed Sparrow-Weaver, Nubian Woodpecker, Ring-neck Dove, Eastern Pale Chanting Goshawk, Sacred Ibis, Lesser Flamingo, Greater Flamingo, Lesser Egret, Intermediate Egret, Greater Egret, Goliath Heron, Yellow-billed Stork, Red-billed Hornbill, White-headed Moosebird, Somali Ostrich and African Hoopoe among others.

The transmission line crosses tiny sections of Endemic Bird Areas in Baringo Central, in Kabarnet but does not cross any Important Bird Area. *Some of the birds found in Baringo Central area are bat hawk and majestic verrwaux eagle. Others include flycatcher, African fish eagle, marabou storks, shikra, white-faced scops owl, Hemprich's hornbill, African darter and the African skimmer. Birds found within Lake Baringo area are Hemprich's Hornbill, Jackson Hornbill, Bristle-crowned Starling, Brown-tailed Rock Chat, Fox Kestrel, Somali Fiscal, Mouse-coloured Penduline-tit, Somali Tit, Fan-tailed Raven, Brown Babbler, Parrot-billed Sparrow, White-billed Buffalo Weaver and Little Weaver*

### **Arthropods**

The ecosystem has a rich diversity of invertebrate species, including insects such as: Odonata (Dragonflies), Orthoptera (Grasshoppers and crickets), Isoptera (termites), Coleoptera (Beetles), Lepidoptera (Butterflies and Moths), Diptera (Flies and Mosquitoes), Hymenoptera (Wasps and Bees), Blattodea (Cockroaches) and Phasmida (Walking sticks). Arachnids present include ticks, spiders and scorpions.





**Figure 5-21-Traditional beehives in Marigat, Baringo County**  
**Source: EMC Consultants Field Survey Photo, 2019**

### **Reptiles**

The semi-arid to arid climate in the block creates a suitable environment for reptilian life and thus it is expected that many reptilian species are present. They include: Snakes, Lizards, Tortoise, Crocodile, Gecko and Skinks. During the course of the field trip not many were encountered. *Reptiles found in Baringo Central and Baringo south subcounties are Black Mamba, Puff Adder, Boomslang and Spitting Cobra as well as Monitor Lizards, Crocodiles and a central pit shared by endangered tortoises and harmless Stripe Bellied Sand Snakes. Crocodiles are mainly found in Lake Baringo.*



**Figure 5-22-Red headed agama lizard**  
**Source: EMC Consultants Field Survey photo, 2019**

## Mammals

The Baringo central and Baringo south subcounty habitats are numerous and diverse. A few live observations were made but a majority of the mammalian life observed were made indirectly by signs of their activity. The animals include: Greater kudu, Dik dik, Cape hare, Silver backed jackal, Hedgehog, Porcupine, Impala, Elephant, Buffalo, Grants gazelle, Cheetah, Leopard, Lion, Vervet monkey, Olive baboon and Hyena, among others. There are no wildlife dispersal routes or migratory corridors in the areas traversed by the line based on secondary literature and confirmed by Kenya Wildlife Service. *The proposed transmission line has not traversed any wildlife migratory route.*

### 5.1.9 Disasters and Environmental Threats

Baringo County experiences daunting environmental challenges as indicated in table 31 below. The major threat in Baringo County is the climate related disasters which include; drought, floods, diseases and conflicts. According to Kilifi County Integrated Development plan (CIDP), the effects of climate change are evident across all the sectors of the County including livestock, crop production, fisheries, and environment. Communities who live in the semi-arid areas of Marigat, Koriema, Ingarua, Ilchamus, Arabal, Kapkechir and Kasiela. Kabarnet South subcounty is more prone to the impacts of extreme weather events such as drought given their weak coping strategies and high poverty levels among the households. Areas prone to flooding include the Lake 94 area.

Table 23-Environmental hotspots areas in the county

Issue	Hotspot areas	Hotspot areas that are within the project's area of influence	Contribution to Environmental Degradation
Deforestation	Kinyo and Kapkechir forests	Kinyo and Kapkechir	Soil Erosion, land degradation, Climate change.
Charcoal Production for commercial purposes	Arid and Semi-Arid Areas of Koriema, Marigat, Ilchamus, Ingarua, Kiserian, Arabal and Kasiela	Koriema and Marigat area	Pollution, Soil Erosion, land degradation, Climate-change
Quarrying (ballast, Sand)	Longewan, Yataoi, Kimalel, Kasiela and Kiserian	No quarrying was observed.	Noise, visual, air pollution, land degradation, water sources pollution, Water borne diseases,

Issue	Hotspot areas	Hotspot areas that are within the project's area of influence	Contribution to Environmental Degradation
Sand Harvesting	Kasiela and Kiserian	No Mining activities were observed.	Salt brine, pollution of Underground water, Diseases,
Air pollution from industrial activities	Kabarnet and Rumuruti	No industries were observed.	Diseases,
Solid Waste	Major urban centres Kabarnet , Marigat, Mochongoi and Rumuruti	Key issue for most market centre areas (Koriema, Marigat, Mochongoi and Rumuruti	Land degradation, various diseases,

***KETRACO ESIA Team Field Survey, 2021***

Communities along the proposed project were noted to have weak weather coping strategies and high poverty levels among the households. Key environmental issue included deforestation for agricultural purposes and charcoal burning mostly within Marigat area and solid waste management in most of the market centre areas Kituro, Kimalel, Eldume, Karandi, Kiserian, and Chebinyiny.

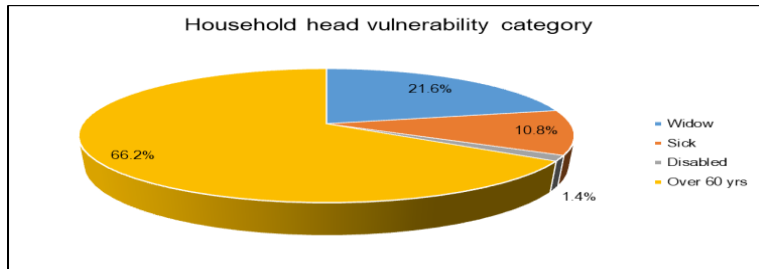
### **5.1.10 Socio Economic Environment**

#### *5.1.10.1 Population and Demography*

The County's population according to the 2019 National Population and Housing Census was approximately 666,763 million with 336,322 males and 330,428 females and 13 intersex. The population is estimated to be; 804,346 in 2020; 829,346 in 2021; and 853,515 by 2022 using inter-censural population growth rate for the county. The total Number of project affected households within Baringo County fifty five (55). Vulnerability identified during the survey within the PAPs as shown below was composed of: -

1. The elderly over 60 years (66.2%)
2. Women headed households/widows (21.6%)
3. The sick/Chronic illnesses (10.8%)
4. Disabled (1.4%)





**Figure 5-23: Perceived Level of Vulnerability**

Source: EMC Consultants, 2019

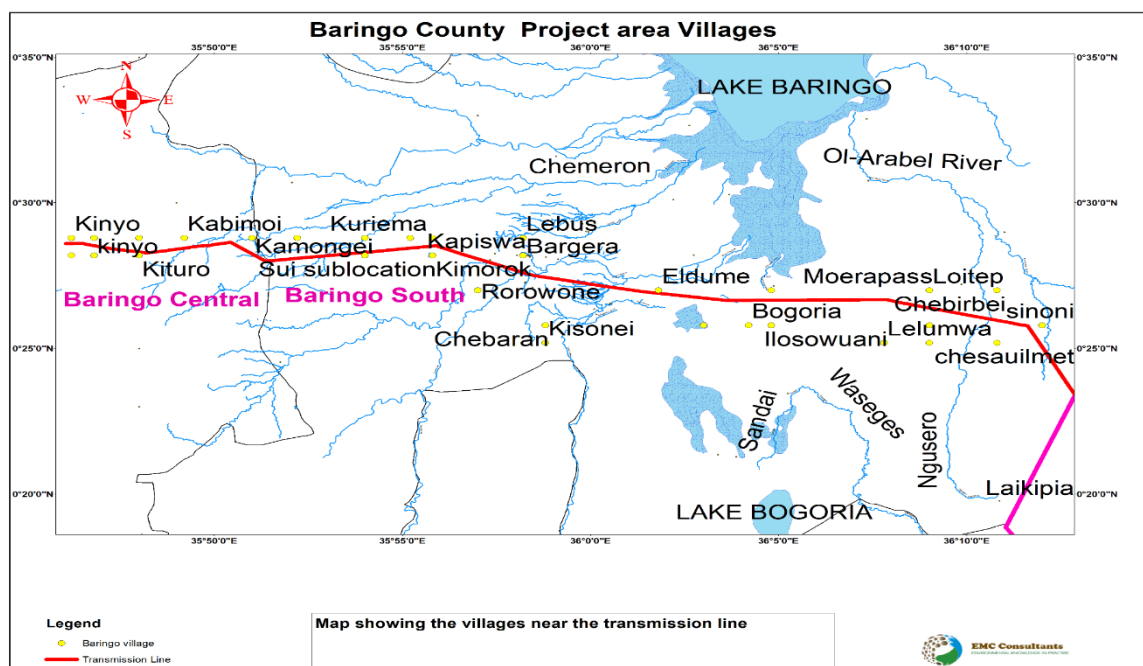
#### 5.1.10.2 Settlement Patterns

Settlement patterns in Baringo County can be classified into rural and urban.

#### Settlement Areas along Transmission Line

**Urban Centres:** -Urban settlements are characterized by linear settlements configured majorly by road transport network, administrative functions and commercial. Settlements patterns in the urban areas are either linear or clustered and can be categorized as principal towns, rural towns and market/local centres. The settlements in the following towns are influenced by transport network; Mogotio, Emining, Marigat, Loruk, Nginyang', Chemalingot, Kolowa, Muserechi, Ravine, Majimazuri, Timboroa, Kabarnet, Tenges, Kabartonjo, Kipsaraman, Bartabwa and Barwessa. Urban centres with administrative function include Kabarnet, Mogotio, Eldama Ravine, Chemolingot, Marigat and Kabartonjo. The predominant settlements patterns in urban areas are linear and clustered. Rural settlements follow nucleated patterns. This is necessitated by the economic activities in rural areas (agriculture and livestock keeping).

**Rural Settlements:** -Human settlements are more concentrated in Baringo central and Eldama Ravine due to the favorable climate for agriculture. In rural areas the settlements are mainly in clusters while along the major roads settlements are linear. Figure 22 shows Baringo County Project villages along the route



**Figure 5-24: Baringo County Project Villages**

Source: EMC Consultants, 2019

The rural agricultural land is subdivided into smaller parcels due to rapid growing population in the highlands. Subdivision of agricultural land leads to the decline of the rural economy that heavily depend on agriculture. Cultivation along forests and water catchment towers has far reaching implications on conservation and protection of reserves as it leads to degradation. The challenge with agriculturally based settlements is the declining productivity due to subdivision of land, poor road infrastructure and the impacts of climate change. Example of such settlements include Majimazuri, Sabatia and Narasha in Eldama Ravine sub county; Kabartonjo, Barwessa, Pemwai, Bartolimo in Baringo North. Other areas include Baringo central, Baringo south and Mogotio.

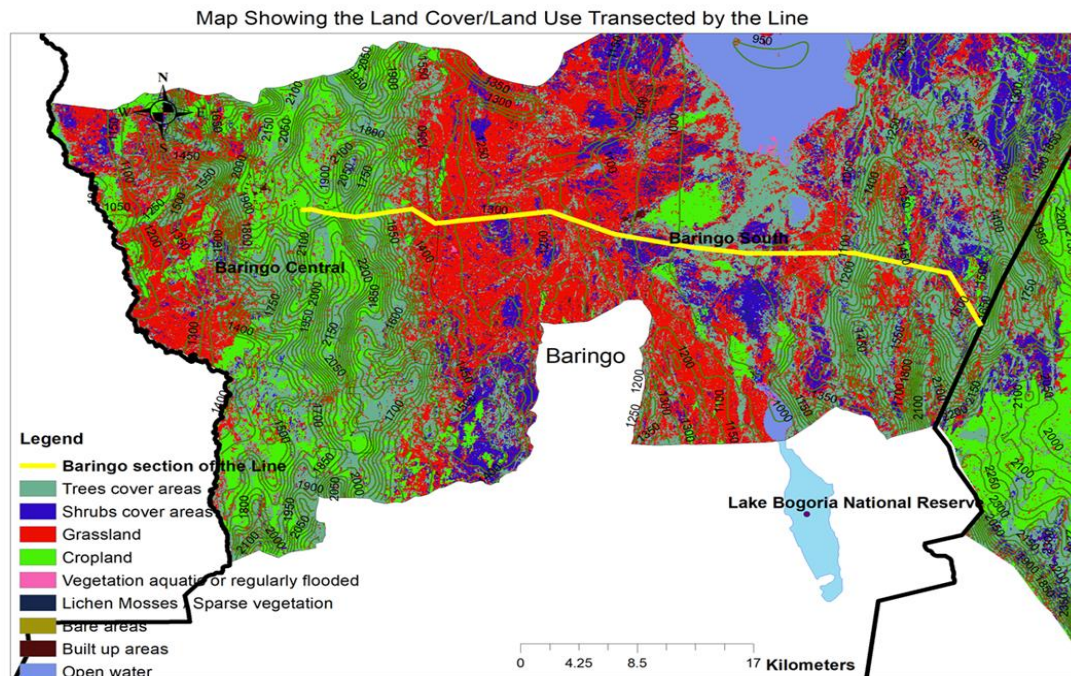
*Both rural and urban areas are traversed by the entire transmission line route from Kasoiyo, kapropita, Kituri, koriema, Kimalael, Marigat, Iilngarua, Ilchamus, Kiseria, Kasiela, Logumgum, Arabal Lomoiwe in Kapkechir. The transmission line has however avoided town and market centres in Baringo Central and Baringo South subcounties such as Marigat, Kituro, Kimalael, Koriema, Logumgum, Kapkechir and Mochongoi. This means that the transmission line route has been carefully chosen to minimise human settlements as much as possible, resulting in impact only where it could not be avoided. Along the project route, the proposed project will displace a number of residential structures (settlements). According to the RAP report, 128 structures will be affected by the project within Baringo County. The structures are generally made of mud as depicted in the photos below.*



**Figure 5-25: Sample residential structures along the project route**

### 5.1.10.3 Land Use and Land Tenure

Land, sometimes referred to as dry land, is the solid surface of the earth that is not permanently covered by water. Figure 25 below shows land use map showing transmission line route.



**Figure 5-26: Land Use Map showing transmission line route**

Source: EMC Consultants, 2019

Most human activities occur on land which supports agriculture, vast habitats, and natural resources. Baringo County with a total land area of 11,015 square kilometers, has total arable land of 4,435, total non-arable land of 5,700 and total urban area land of 715 square kilometers. The largest portion of land in Baringo County is under community land tenure



system, held in trust by the County Government. Community land is protected under Article 63 of the Kenyan Constitution and is governed as outlined by the Community Land Act 2016. Community land ownership in the county is predominant in Tiaty, North and South Baringo sub-counties. Private land ownership is dominant in Baringo Central, Eldama Ravine and Mogotio while in the highlands of Baringo North (such as Ossen, Kabartonjo and Kipsaraman) land is largely held under freehold basis. In towns/urban centers, land is held on leasehold basis. Group ranches are mostly found in Marigat, Kimalel, Bartun, Salabani, Kokwa Island, Eldume, Sabor, and Ngaratuko.



**Figure 5-27: Maize crop in Mochongoi, Baringo County**

**Source: EMC consultants Field Survey, 2019**

The community land in Baringo South has been a source of conflict; this will be addressed through the Community Land Act 2016 which provides a big opportunity for development where large portions of community land exist. The Act will enable communities to register their rights and interests in communal land, and prepare their own plans for development, management and use of the land. Conservancies are one form of community land management, and the benefits range from improved security, better land management, income, employment, and support to community projects. The county has several conservancies. Public land refers to land governed either by the national government or by the county government (other than community land). In Baringo County public land includes forests, Lake Bogoria National Reserve and Lake Kamnarok National Reserve (managed by the County Government), Lake Baringo and the public land within town centers.

In Baringo County, along the project transmission line, the dominant land uses include agriculture (animal husbandry and crop production) and residential. The project will affect PAHs who do not have legal land ownership documents in Baringo Central and South Subcounties. The transmission line traverses areas where PAHs own land as group ranch or community land. These areas include Kimalel (registered group ranch) and unregistered community land in Eldume, Iingarua, Logumgum, Arabal and Kasiela. The project will

also affect public land. The project will affect individually owned private land used by the PAHs for farming, grazing and residential and commercial purposes.

Part of the land within the ROW is categorized as community land which exist in the form of one registered group ranch<sup>1</sup> with a group title (Kimalael Group Ranch) and will also be compensated in accordance with the Community Land Act 2016 unless the group ranch agrees to dissolve the group ranch and subdivide into individual parcels. There are also unregistered community lands in Eldume, Il'ngarua, Logumgum, Arabal and Kasiela areas of Baringo South Sub County. Communities in Eldume, Il'ngarua, Arabal and Kasiela and Kimalael Group Ranch were sensitized on the provisions of the Community Land Act 2016, and particularly on cash compensation whereby, compensation monies are to be deposited in a special interest earning account held by the County Government and shall be released (including interest accrued) to the community upon registration of the community land and the community. The County Government is prohibited from selling, disposing, transferring, and converting for private purposes or in any other way disposing of any unregistered community land that it is holding in trust on behalf of a community. Upon registration of community land and the community, the trusteeship of the county government to manage and administer the community land ceases to exist.

The project will re-sensitize affected communities and ranch members and their management on the Community Land Act 2016 (and particularly on cash compensation for unregistered community land/ranch) during the disclosure of ESIA and RAP. The transmission line has avoided Marigat chief's office in Baringo Central subcounty.

The main livelihood systems are livestock and crop production, wildlife-based tourism and fishing. Forestry and harvesting of sand and stones are practiced at a relatively much lower scale. About 20,000ha of the land is used for cultivation of food and cash crops. The main food crops grown are maize, beans, finger millet and sorghum while cash crops are coffee, maize and pyrethrum. Livestock is the primary livelihood system. *Land uses in Baringo Central especially Kapropita, Kituro and Kimalael areas are livestock and crop production. The main land uses in the lowlands of Marigat, Ilngarua, Ilchamus, Kserian are mainly livestock keeping. In Mochongoi area of Baringo South, farmers are involved in both livestock keeping and crop production.*

#### 5.1.10.4 Economy and Livelihoods

The economy of the county is mainly agro-based. The main food crops grown are maize, pigeon peas, beans, Irish potatoes, sweet potatoes, sorghum, cassava and finger millet while the cash crops are coffee, cotton, macadamia and pyrethrum. Livestock products include honey, beef, mutton as well as hides and skins. However, little value addition is done to these products. *In Baringo Central and Baringo South, areas traversed by the transmission line, farmers are involved in bee keeping and livestock keeping. In humid*

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<sup>1</sup> A livestock production system or enterprise where a group of people jointly hold freehold title to land (theoretically on an equal basis), maintain agreed stocking levels, and herd their individually-owned livestock collectively. (The Lawrence Report).

locations like Mochongo, Kituro and Kapropita, farmers also grow beans, maize, and pigeon peas.

Agriculture employs 80% (GoK, 2013) of the population. About 46% of the heads of households are engaged in agriculture (crop and livestock farming) as a primary occupation. More male-headed households are engaged in the sector compared to youth- and female-headed households (32, 10, and 6% respectively). However, adult female members of households provide the highest share of family labour for crop (46%) and livestock (44%) production; hired labour for crops (42%) and livestock (50%) is mostly provided by youth.

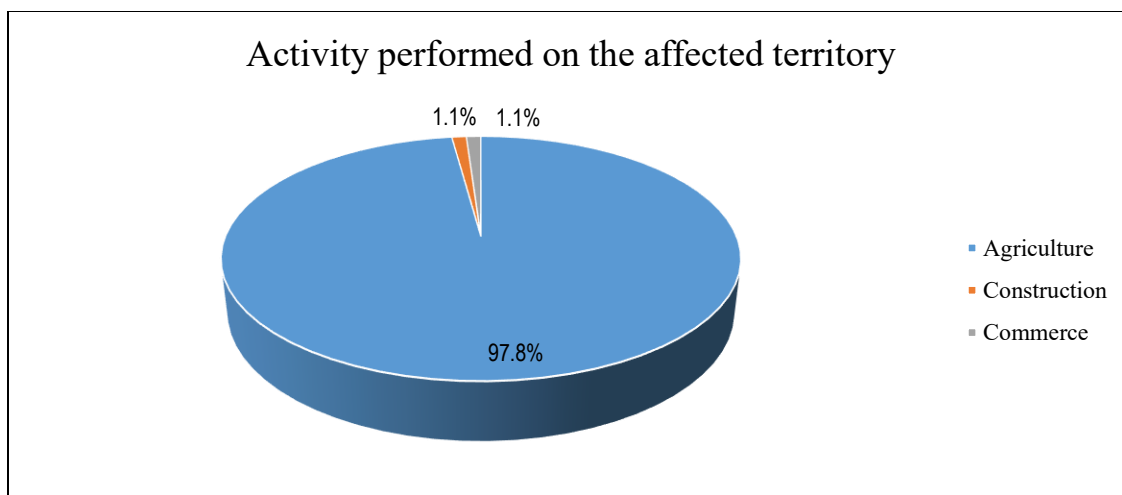


**Figure 5-28: Economic Activities in Baringo County**

Source: EMC Consultants Field Survey, 2019

Livestock and crop farming; are the key sources of livelihood for the people and the main economic activity in the county. The county is largely semi-arid with a few pockets for intensive agriculture. Mixed farming is mainly in the Highland areas and pastoralism in the arid regions.

Majority of the respondents were farmers 97.8%. Being that the project area is rural, formal employment and business are not the main socio-economic activities. The other socio-economic activities are shown in figure below.



Source: EMC Consultants, 2019

#### 5.1.10.5 Communication network

The information and communication technology penetration in the county is quite low at approximately 45 per cent. The mobile phone coverage in the county is low. Most schools and institutions are not covered by any service providers in terms of mobile telephony or internet services. *Mobile phone network coverage is very poor in Baringo South area especially Kiserian, Arabal and Kasiela areas which are traversed by the proposed transmission line. Baringo Central has very good mobile phone network coverage.*

#### 5.1.10.6 Road Network

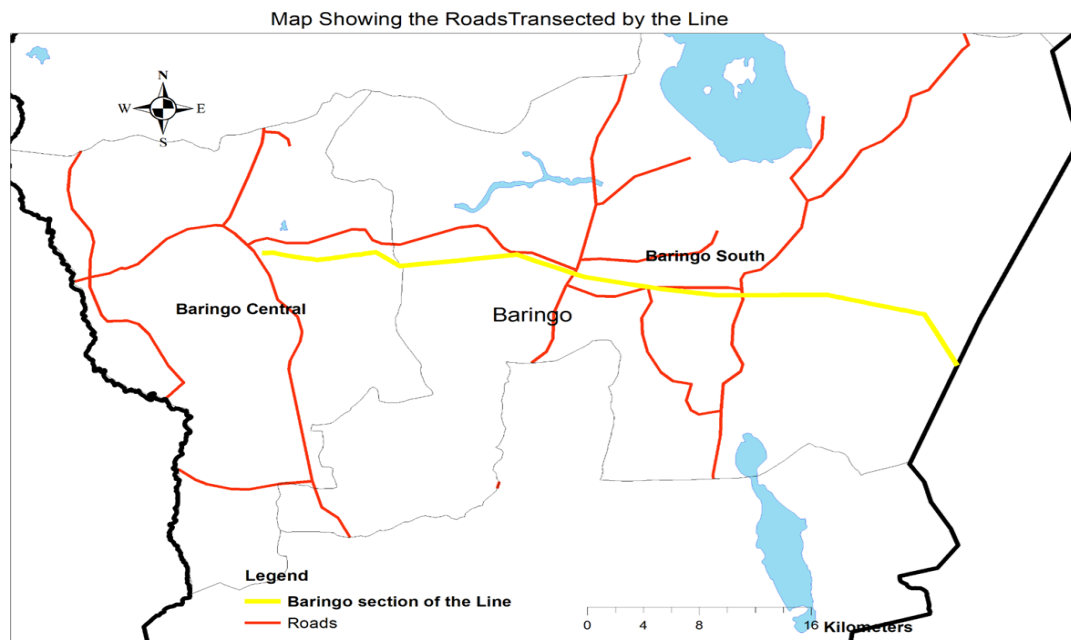
Road infrastructure is an enabling factor of economic growth that is pivotal especially in the realization of our development goals. Road transport is the main mode of transport in Baringo County. The County has a fairly good road network with most of the roads being earth roads which are rendered impassable during the rainy seasons. The current road coverage is estimated at 1,588 Kms of which 330 Kms are of bitumen standards, 720 Kms gravel and 538 Kms surface roads. The tarmac roads in the County include a section of the Nakuru-Marigat-Kabarnet highway which traverses the County from Nakuru to Kabarnet town and connects the county to Eldoret town via Elgeyo-Marakwet county.





**Figure 5-29: Road network in Baringo County**  
**Source: EMC Consultants Field Survey, 2019**

Access/feeder roads within the villages are dirt roads. Some of these roads are not passable during the rainy season due to flooding or muddiness. The most common mode of transport is Boda Boda (motorcycles) which is a source of employment to the youth in the area. In addition to transporting people, the boda-bodas are used to transport farm produce to the market. The proposed transmission line crosses a number of road infrastructure under the mandate of different road agencies. The transmission line does not cross any railway line.



**Figure 5-30: Roads transected by the transmission line**  
**Source: Field Survey, 2019**

There are only 289 km paved roads in the entire county, which is not sufficient. *Along the proposed transmission line route, Kabarnet-Marigat road is of bitumen standard while the road from Marigat to Mochongoi in Baringo South is earth road though it is currently being upgraded to Bitumen standard from Mochongoi. Construction work has reached Kasiela. The major roads traversed by the transmission line are Kabarnet-Marigat road*

*and Marigat – Nakuru road. Authority will be obtained from the relevant roads department before construction commencement.*

#### *5.1.10.7 Airstrips and airfields in Baringo County*

Baringo County is endowed with many wide spread tourist attraction sites across the County with accessibility challenges but with many mapped airstrips and airfields. Most of these airstrips and airfields are undeveloped with only Kabarnet airstrip having a tarmacked runway. There is need to invest in the improvement of these aviation facilities in the county.

*The transmission line is within the acceptable clearance distance from Kabarnet Airport & Kimalel Airstrip. **Kimalel Airstrip as partially serviceable, Dirt surface, Gazetted***

#### *5.1.10.8 KCAA approval was obtained on 6/7/2021, Refer to annex L Energy sources and conservation*

Electricity connections in the county are just above 9.6% of the County Population. This situation is rapidly changing as the County in collaboration with the National Government invests more resources in power generation, transmission, and distribution through its last mile programmed. The County is still below the national averages in the renewable improved energy sources. *In Baringo Central, Kabarnet and Marigat towns are connected to electricity. Market centers like Kaosoiyo, Kituro and Koriema are also connected to electricity. In Baringo South, Mochongoi is connected to electricity. Wood fuel is also used as a source of energy in this area, this leads to deforestation and a major contributor to climate change.*

#### *5.1.10.9 Health.*

The Constitution of Kenya 2010 guarantees the people of Kenya the right to healthcare and gives the County Government specific responsibilities to deliver on this right. The health sector also strives towards provision good health and wellbeing and sanitation in line with the Sustainable Development Goals (SDG) No. 3 & 6. Further, health care is one of the major devolved functions of County Governments. The most common diseases facing the people of Baringo are **upper respiratory tract infection, malaria, disease of the skin, diarrhea, pneumonia, arthritis and joint pains**. Most of these diseases are preventable and thus there is need to put more emphasis on preventive measures to reduce these ailments. Baringo Central is one of the sub counties where malaria is most prevalent. These can negatively affect the transmission line workers if precautionary measures are not put in place. Upper Respiratory Tract Infections is quite prevalent within Marigat area. The prevalence of HIV currently stands at 1.6%. Prevalence has reduced over the years due to aggressive efforts towards counselling and testing and starting those infected on ART. This has been achieved through support from partners, mainly global fund. Many of those infected are now able to live normal productive lives and even raise HIV negative children.

Access to health care refers to the ease with which an individual can obtain needed medical services. A healthy population is important for development; it is more productive and contributes to economic development. Access to basic health services for majority of Baringo County residents is a challenge; some cover a distance of more than 15km to access health services to the nearest health center. The county has health facilities distributed across the sub-counties as follows; one level 5 facility the Baringo County Referral Hospital located in Kabarnet, 4 level four facilities located in Eldama Ravine, Marigat, Kabartonjo and Chemolingot towns, level 3 facilities are health centers while level four facilities are dispensaries. Level one represents the community units which are the lowest level of health care are carried out mostly by community health volunteers (CHVs). The infant mortality rate is 63/1000.

*Kabarnet County Referral Hospital is the largest and best public hospital in the county, it is situated in Baringo Central subcounty. The transmission line route has avoided health facilities hence none will be affected. Example of health facilities avoided but found in close proximity to the proposed route are Lomoowe dispensary in Kapkechir location, Kosoio dispensary in Kapropita location and Kituro dispensary.*

#### 5.1.10.10 Education

The county has 1012 functional public Early Childhood Development (ECD) with an enrolment of 47,409 pupils. there are 60 upcoming ECD centers. These ECD impart knowledge skill, values as stipulated in education curriculum. Baringo county government has employed 1772 ECD teachers and 9 ECD coordinators, who oversee department activities in the sub counties. The county has 331 special needs children in ECCD. Baringo County literacy level according to 2019 census is 16% (KNBS, 2019).

Education is one of the indicators of a population's potential for socioeconomic development and the more educated a person is the more productive they are. Baringo County has relatively low education indicators, 16% of the population have a secondary level of education Baringo Central is the constituency with the highest share of residents with a secondary level of education or above at 27%. This is nine times Tiaty constituency, which has the lowest share of residents with a secondary level of education or above. Baringo Central constituency is therefore 11% points above the county average. Kapropita ward has the highest share of residents with a secondary level of education or above at 34%. This is 34% points above Silale ward, which has the lowest share of residents with a secondary level of education or above. Kapropita ward is 18% points above the county average.





**Figure 5-31: Eldume Secondary school within the project area**

Source: Field Survey, 2019



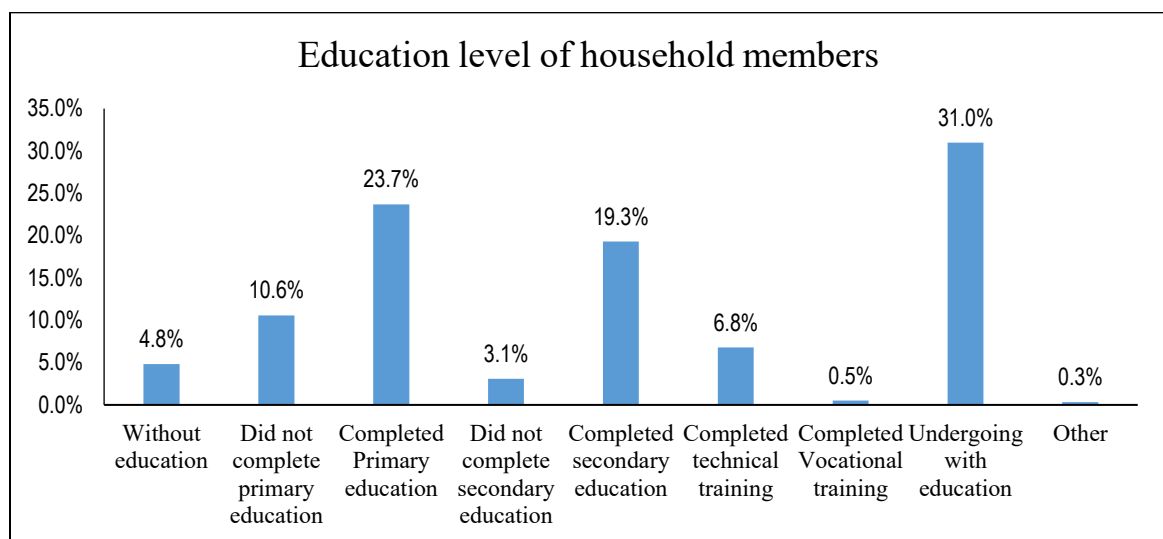
**Figure 5-32: Kiserian High School within the project area**

Source: Field Survey, 2019

The proportion of Baringo County residents who only have a primary education stands at 48%. Baringo North constituency has the highest share of residents with a primary education only at 60%. This is four times Tiaty constituency, which has the lowest share of residents with a primary education. Baringo North constituency is 12% points above the county average. Lembus ward has the highest share of residents with primary education only at 64%. This is 32 times Silale ward, which has the lowest share of residents with primary education only. Lembus ward is 16 percentage points above the county average. The share of Baringo County residents with no formal education is at 36%. Tiaty constituency has the highest share of residents with no formal education at 82%. This is five times the number in Baringo Central constituency, which has the lowest share of

residents with no formal education. Tiaty constituency is 46 percentage points above the county average. Silale ward has the highest percentage of residents with no formal education at 98%. This is seven times more than Kabartonjo ward, which has the lowest share of residents with no formal education. Silale ward is therefore 62 percentage points above the county average.

About 23.7% of the PAPs household heads had attained primary level of education and 19.3% achieving secondary levels of education. These percentages are inclusive of household heads and other members of the household. In the survey conducted 6.8% of the PAPs had completed technical training, while 3.1% and 10.6% respectively did not complete Secondary and Primary level education. A further 4.8% of the PAPs had no formal education.



**Figure 5-33: Household Literacy Level**

Source: Field Survey, 2019

### ***Primary education***

The county has 681 primary schools with total enrollment of 143,445 pupils. The county has 2030 pupils with special needs enrolled in primary schools since the introduction of Free Primary Education, remarkable improvement in enrollment has been observed. The county's performance in National Examination has greatly improved over the years in spite of the unique challenges which the pupils undergo. *In Baringo Central and South Sub counties, the transmission line route has avoided primary schools, hence none will be affected i.e Kapropita Primary school is one of the schools which is very far from the ROW.*

### ***Secondary Education***

There are 159 secondary schools with an enrolment of 19469 boys and 18962 girls this makes a total of 38,731 students as at end of 2017. secondary school net enrolment rate for the county stands at 45.3% (NCPD 2017) Among notable challenges facing the sector include harsh climatic conditions, especially in the lower part of the county; insecurity,

which often results in closure of some schools; poor infrastructure; floods in the low lands; prolonged draught; high illiteracy rates among parents and retrogressive cultural beliefs *No secondary school is traversed by the proposed transmission power line, the closest schools but not within the wayleave in Baringo Central are Kituro Secondary school and Kapropita Girls Secondary school. In Baringo south, Eldume Secondary school and Kiserian Secondary school among others are way out of the transmission line route.*

### ***Tertiary & Technical Institutions***

The county has two Technical Institutions i.e Emining technical training insitutue and Baringo technical training institutes with an enrolment of 372(226 Male and 146 Female) and 361(243 Male and 118 Female) respectively there are a total of 54 instructors for these two institutions, the county has one teachers training college namely Baringo teachers training college with an enrollment of 757 students (342 Males and 393 Female) with 42 lecturers the county also has one Kenya Medical Training College (KMTC), one university campus and three commercial colleges. *There is no tertiary and technical institution within the transmission line route in Both Baringo South and Baringo Central sub counties.*

#### ***5.1.10.11 Religion***

The county is occupied by the Tugens, Njemps, Lembus, Endorois, Pokots, Turkanas, Kikuyus, Nubians, and others. Christianity is the most practiced religion in the county. Traditionally, Baringo people believed in a god *Asis*, who is represented by the sun; however, currently, most individuals in the county believe in Christianity. The well-known Christian denominations within Baringo County include the Anglican Church of Kenya (ACK), African Inland Church (AIC), full gospel churches of Kenya and Roman Catholic. *The transmission line has avoided churches and cultural sites in both Baringo South and Baringo Central sub counties. No tower will be located within grave sites as members of the local community were asked during public consultation meetings to help the KETRACO and contractor identify areas of cultural significance to ensure they are avoided by the transmission line route.*

#### ***5.1.10.12 Poverty, Income and Employment***

Baringo County is among the marginalized counties in Kenya with a poverty incidence of 52.2% against 45.2% nationally and a contribution of 1.7% to the national poverty. The economic growth and development of the county is mainly driven by agriculture. Trade and tourism are the other major contributors to the county economy. There are various economic activities in the county ranging from–land sale, manufacturing, horticulture, agro-business and strong service industry.

### **Work force**

Labour force is defined as the population in the age of 15-64 years who can actively engage in economic activities. It is assumed that 92% of this age group are considered active and participate in economic activities while the remaining 8% comprise of sick and



disabled persons with no capacity to engage in economic activities. According to the Baringo County CIDP (2018-2022) , 190,349 people were in employment in Baringo County against a total population of 555,561. The employed workforce comprised 106,126 males and 83,223 females. The reports further indicate that 58.9% of the County population is self-employed, mainly as small scale farmers and up to 68% are unemployed. This sector plan is aimed at addressing the critical issue of unemployment in the county through stimulation of self-employment opportunities in the rural and the urban informal sector. The main reason for which the sector promotes small-scale (micro) enterprises is to create income and employment amongst the poor and so reduce poverty level in the county. The importance of Self-employment cannot be underestimated as it provides an important entry point for the poor to access microfinance and banking services. Self-employment allows communities to start in a small way and subsequently be able to establish social and economic links for empowerment.

### **Unemployment**

Unemployment Rate in Kenya averaged 10.62 percent from 1991 until 2016, reaching an all-time high of 12.18 percent in 2010 with 9.7 per cent in 2009 and a record low of 8.10 percent in 1999. In Baringo County, unemployment stood at 11 per cent in 2009 and increased at the same rate. The percentage of employed labour force in the formal sector in the county is at 15.8% compared to 21.9% in the Country, with the county having a higher percentage of economically inactive population in the labour force at 29.4% compared to 22.9% national percentage.

#### **5.1.10.13 Gender Based Violence**

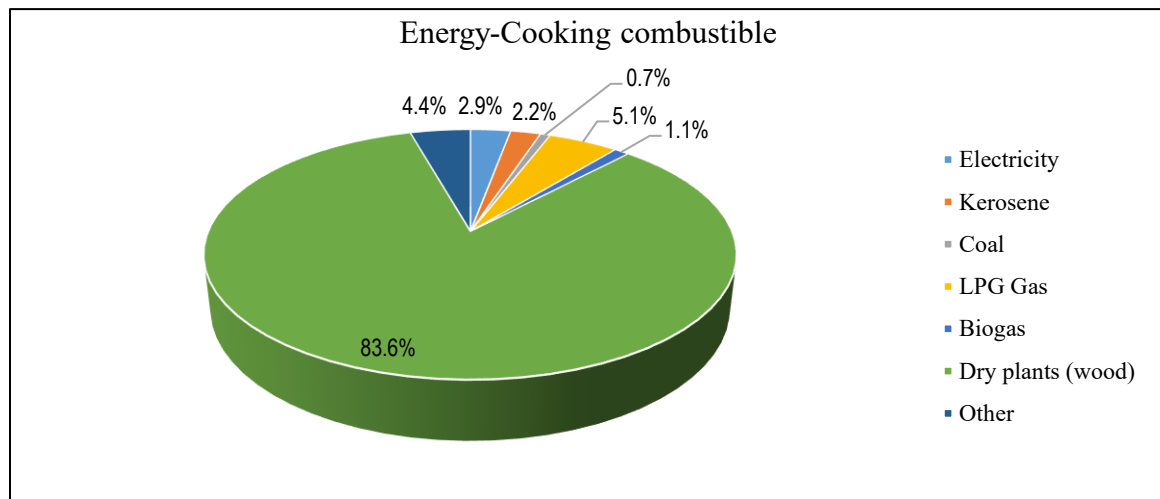
Perennial insecurity in the County, which revolves around cattle rustling, causes displacement, closure of health facilities (making them inaccessible) and gender-based violence (GBV). The vastness and terrain of the County coupled with poor health-seeking behavior hinders access and utilization of health services. Gender inequality leads to GBV which contributes to poor health-seeking behavior for survivors of violence. It also affects disclosure of HIV status, especially among young girls and women. Stigma hinders the uptake of HIV testing and counselling and safer sex practices. It prevents PLHIVs from seeking health services and disclosure. According to the National Crime Research Centre statistics, GBV accounted for 5.2% of crimes in the County during the 2019 period.

#### **5.1.10.14 Energy**

Electricity connections in the county are just above 9.6% of the County Population compared to 22.7% average for the Country population. This situation is rapidly changing as the County in collaboration with the National Government invests more resources in power generation, transmission, and distribution through its last mile program. The County is still below the national averages in the renewable improved energy sources.

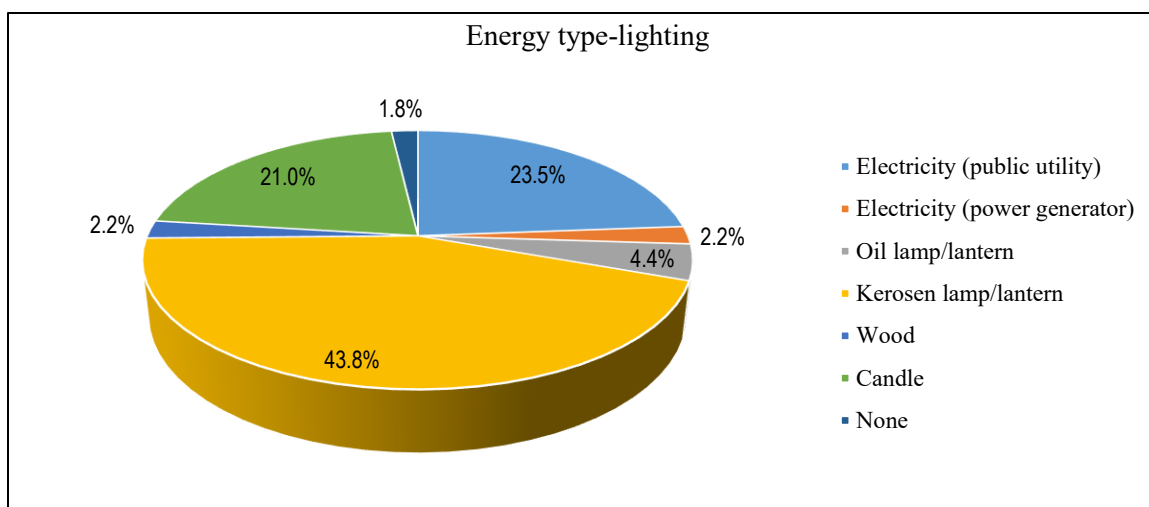
Access to various utilities is high in the urban areas compared to the rural areas. According to Kenya Power and Lighting Company (KPLC), over 49,000 households connect to electricity; of these, 10% use electricity for cooking. Firewood is a major source of cooking and lighting fuel (87 and 28% respectively). Access to water is limited, with 14% of the households accessing piped water while 52% use streams.

Dry plants/wood fuel/dry plant parts is the main source of energy used by the community for cooking at 83.6%. Other fuel sources constitute 16.4%.



**Figure 5-34: Sources of Energy for cooking**

Kerosene (43.8%) is the main source of energy used in lantern lumps for lighting; those PAPs using electricity formed 23.5%.



**Figure 5-35: Sources of Energy for lighting**  
Source: EMC Consultants, 2019

#### **5.1.10.15 Tourism and Recreation**

The bubbling waters, hot springs, gushing geysers, flamingoes and ostriches are among the major attractions in Lake Bogoria and Kapedo hot springs. Other wildlife includes tortoises, large aquatic and terrestrial game. There is also huge potential for private/community conservancies as well as cultural and agro-eco-tourism tourism.

Baringo County boasts of high-class tourist resort centers, among them Lake Bogoria Spa Resort and Papyrus Inn hotels. Some forests in Tugen Hills, Laikipia escarpment and Eldama Ravine have beautiful sceneries that attract regular visitors. Apart from being good catchment areas for birds, wildlife, picnics and eco-tourism, forests encourage soil conservation through terracing, vegetable growing and beekeeping.



**Figure 5-36: Tourism Sites in Baringo County**

**Source: EMC Consultants Field Survey , 2019**

Lake Baringo has 13 islands and viewpoints that provide magnificent views of the lake. The largest island being Ol-kokwe, with Samatian being small but with breathtaking views across the bronze waters of Lake Baringo. Other interesting tourist locations in the lake are Soi Safari Lodge, Lake Baringo Club as well as Reptile Park, which is one of the largest reptile parks in the Rift Valley. Another one is Ruko Wildlife Conservancy that scenic attractions ranging from wildlife to cultural villages. Korossi volcano, which rises 1,449m above sea level, offers an ideal spot for watching birds such as bat hawks and majestic verreauxs eagle. Kabarnet National Museum and Kipsaraman Community Museum are located on top of Tugen Hills. The two museums form unique tourist sites with varied attractions and house traditional Kalenjin artifacts, which include musical instruments, storage equipment, furniture, and ornamental decorations. At Eldama Ravine, there are the Kursalal falls, a stunning waterfall within Lembus forests.

#### **5.1.10.16 Trade and Industry**

Trade and Industrialization are important economic activities in Baringo County. These two thematic areas have so many informal entities that contribute to the county revenue base. These two thematic areas require transformation in order to sustainably develop. The three formal industries in the county which include Salawa Cotton Ginnery in Salawa, Goldox slaughterhouse in Mogotio and abattoir in Mogotio.

There are also two existing industrial zones in Kabarnet and Eldama Ravine, planned industrial zones in Marigat and Mogotio. There are two operating coffee processing factories at Kituro and Kapkawa. There is small scale honey processing at Koriema, Radat (KBS approved) and Kapimoi. Several slaughterhouses are being constructed in Barwessa, Maoi and Loruk. Mineral extraction is being undertaken in Tenges and Tiaty.

**Figure 5-37: Economic activities at Koriema and Marigat, Baringo County**



Source: EMC Consultants Field Survey, 2019

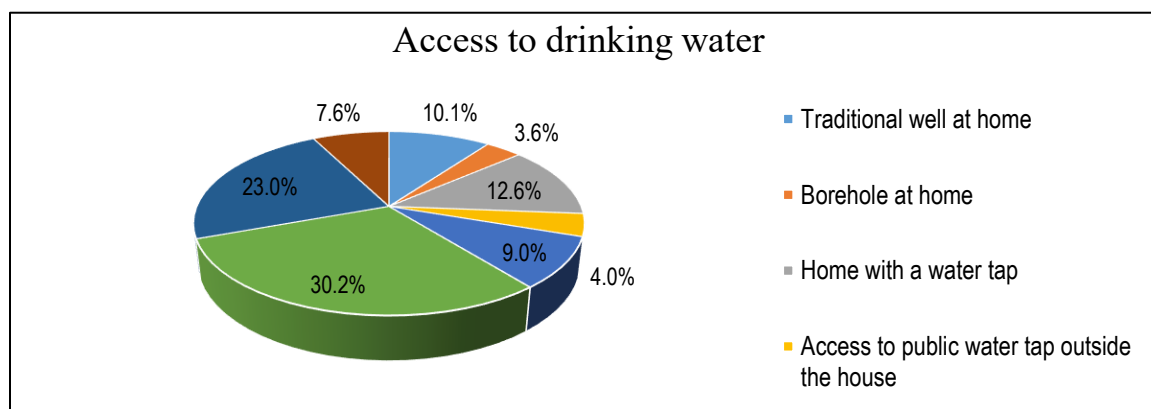
A lot of emphasis should be laid on the promotion of Medium and Small-Scale businesses (MSEs), the informal sector, Jua-Kali- retail and wholesale trade and the transport sector. These sectors create a lot of employment to the citizens especially for women and youth. The industrialization sub sector through the Economic Stimulus Programme has constructed and equipped Constituency Industrial Development Centres in four

constituencies in the county, namely Kuresoi South, Nakuru town, Rongai and Subukia Constituencies. These centres will give the community an opportunity to channel their creativity, innovation, and entrepreneurial competencies in economic activities like jua-kali. The pyrethrum processing plant which is a significant agro-based industry in the county have not been operating at full capacity due year of inefficiencies and declining raw materials.

#### 5.1.10.17 Water and Sanitation

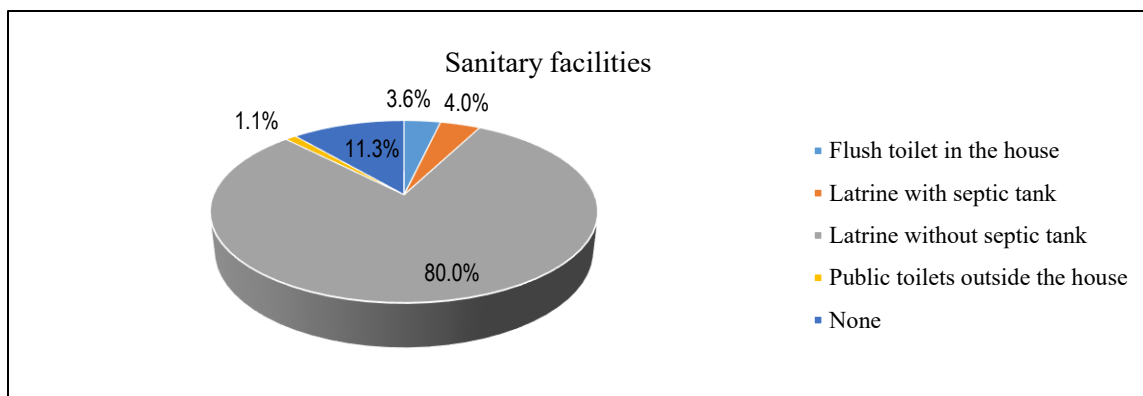
The main sources of water in Baringo County include dams, lake, water pans, streams, wells, springs, and boreholes; others include piped water or point sources. The average distance to the nearest water point is 5km which is way below the (SHERE) Standards on access to water.

Being an ASAL county, Baringo has prioritized the provision of water for human, livestock and for irrigation as a necessary requirement for the general development of the county. Water shortage is prevalent, especially around Lake Baringo and Lake Bogoria, parts of Kerio Valley, Mogotio, western slopes of Ng'elecha (Mochongoi) and the entire Tiaty (Kollosa to Tangulbei) sub-county. This is caused by the low rainfall received and cyclic droughts. This has hindered development in livestock production and farming activities, as people spend many hours daily looking for water. The socio-economic survey outcomes concluded that surface water was the most used source of water (30.2%) Traditional wells at home followed (23.0%), while water sourced from boreholes at home was third (6.25%). Water sourced at home from taps was at 12.6%. Other sources of water formed about 28.0%.



**Figure 5-38: Sources of Water**  
Source: EMC Consultants, 2019

The main sanitary facility used by the community interviewed was a latrine without septic tank (80.0%).



**Figure 5-39: Sanitation facilities**  
**Source: EMC Consultants, 2019**



## **Laikipia County**

Laikipia County is one of the 47 counties in the Republic of Kenya in the Central Rift Valley region. The County Headquarter is Rumuruti Town but it is temporarily hosted in Nanyuki since inception of devolution in 2013. Laikipia is a cosmopolitan County and largely rural in settlement. There are over 23 main communities settled in the county including Maasai, Samburu, Rendille, Somali, Pokots, Tugens, Asians, European, Meru, Kikuyu, and Turkana among others. “Laikipia” is a Maasai word equivalent to trees plain reflecting the large highland plateau. *The proposed transmission line traverses’ areas occupied by the Tugens and Kikuyus.* The total length of the transmission line in Laikipia County is 41.2kms.

### **5.2.1 Location**

Laikipia County borders Samburu County to the North, Isiolo County to the North-East, Meru County to the East, Nyeri County to the South East, Nyandarua County and Nakuru County to the South West and Baringo County to the West. It lies between latitudes 0° 18” and 0 ° 51” North and between longitude 36° 11” and 37° 24’ East. It covers an area of 9,462 km<sup>2</sup> and is ranked as the 15<sup>th</sup> largest county in the country by land size. Figure 33 below shows the map of Laikipia County and subcounties. *The proposed transmission line from Mochongoi on the Baringo side traverses Laikipia East Subcounty from Baringo it gets into Laikipia county at Kiambogo then passes through Gituamba, Muhotetu, Melwa then into Rumuruti substation.*

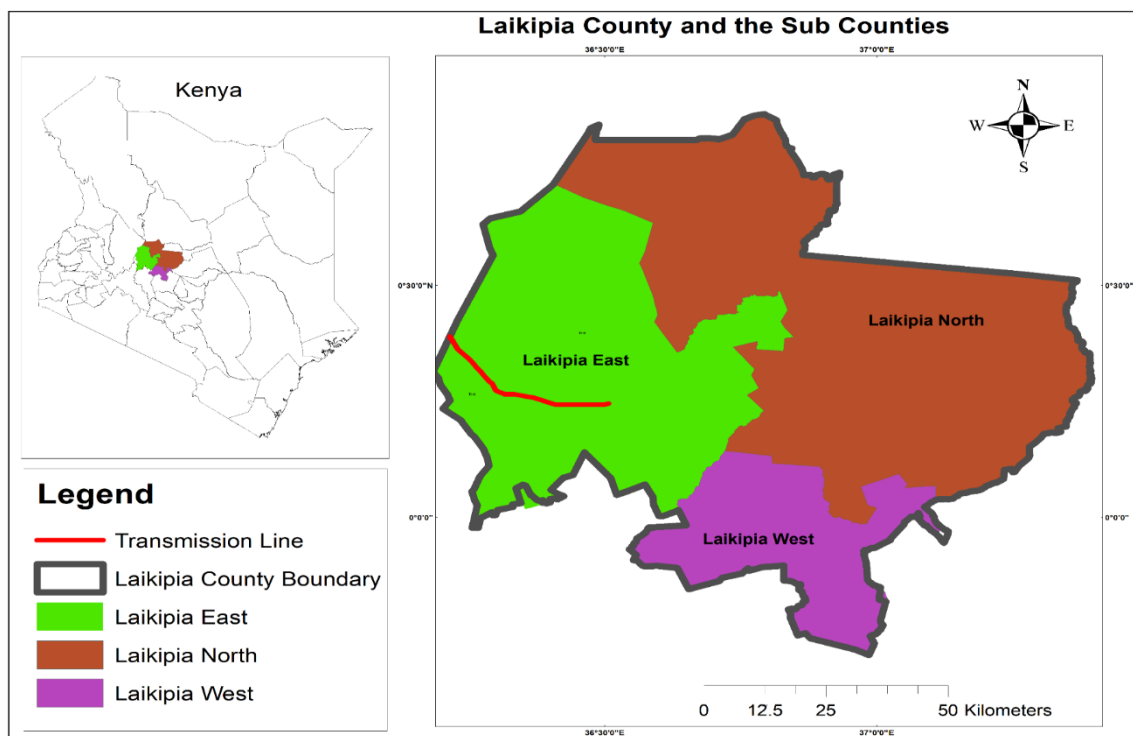


Figure 5-40: Laikipia County and Sub Counties

Source: EMC Consultants, 2019

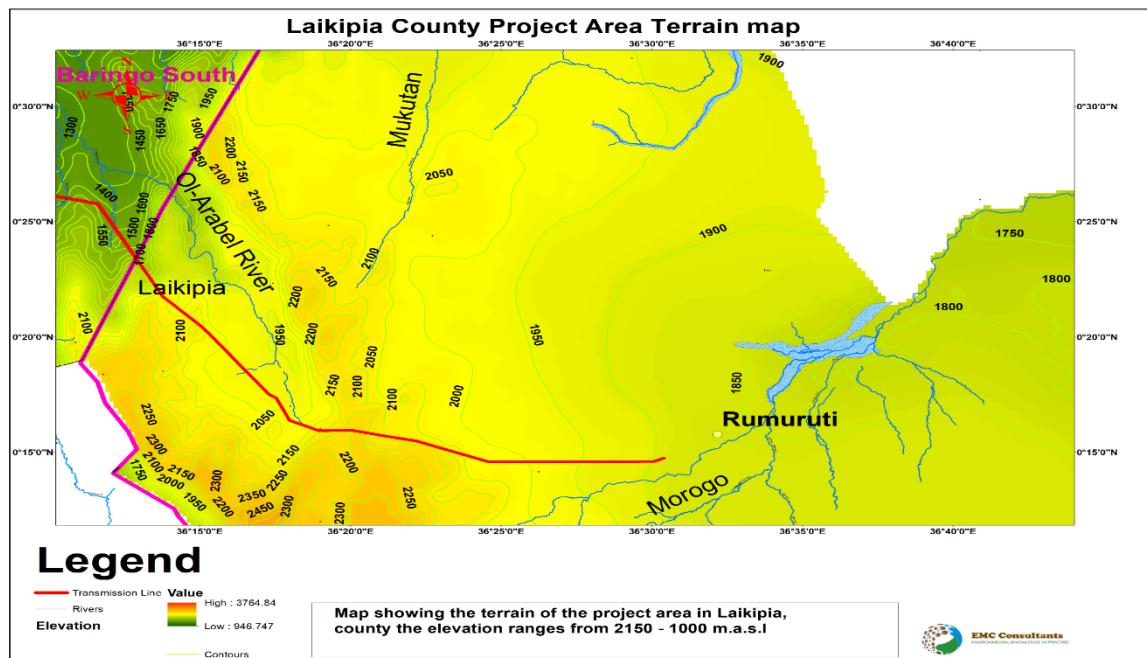
Table 24-Locations traversed by the Transmission Line in Laikipia County

LOCATIONS			
1	Sosian	10	Rumuruti
2	Olmoran	11	Muhotetu
3	Ildigiri	12	Marmanet
4	Mochongoi	13	Salama
5	Mukogondo	14	Mutitu
6	Kinamba	15	Sirrima
7	Mutara	16	Tigithi
8	Daiga	17	Nanyuki
9	Ilingwesi	18	Ngobit

### 5.2.2 Topography

The altitude of Laikipia County varies between 1,500 m above sea level at Ewaso Nyiro basin in the North to a maximum of 2,611 m above sea level around Marmanet forest. The other areas of high altitude include Mukogodo and Ol Daiga Forests in the eastern part of the county at 2,200 m above sea level.

The county consists mainly of a plateau bordered by the Great Rift Valley to the West, the Aberdares to the South and Mt. Kenya massifs to the South East all of which have significant effects on the climatic conditions of the county. The level plateau and the entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya and flow from South to North. The tributaries include Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok Pesi and Ngobit Rivers. The flow of these rivers matches the county's topograph which slopes gently from the highlands in the South to the lowlands in the North. The rivers determine to a large extent the settlement patterns, as they are a source of water for human and livestock consumption as well as irrigation activities.



**Figure 5-41: Laikipia County Project Area Terrain Map**

Source: EMC Consultants, 2019

There are two major swamps in the county namely: Marura Swamp which runs along the Moyot valley in Ol Pajeta Ranch and the Ewaso Narok Swamp around Rumuruti Township. The swamps have some agricultural potential if properly protected and managed. However, they are currently under pressure due to encroachment for human settlement and agricultural production. The South-western part of the county has the highest potential for forestry and mixed farming due to its favorable climatic conditions. These conditions have resulted in some areas especially around Marmanet being the most densely populated. The eastern and northern parts of the county are suitable for grazing while the plateau lying in the central and the northern parts of the county is suitable for ranching. *Laikipia West, especially the areas bordering Baringo County is a plateau. The*

*Section boarderring Baringo is a plateau from where the topography slants gently towards Rumuruti substation. Gituamba, Kiambogo, Muhotetu and Melwa areas have no mountains but is characterized with valleys and gentle slopes.*

### **5.2.3 Climate**

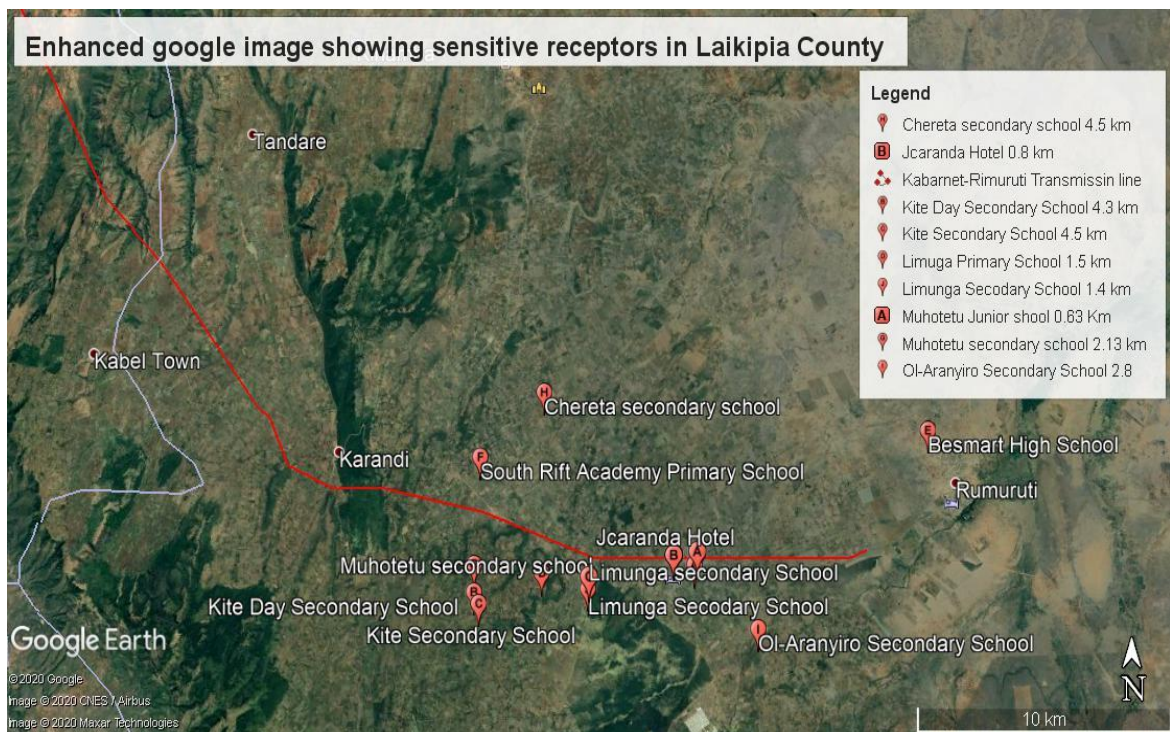
The county experiences a relief type of rainfall due to its altitude and location. The annual average rainfall varies between 400mm and 750mm though higher annual rainfall totals are observed on the areas bordering the slopes of Mt. Kenya and the Aberdare Ranges. North Marmanet receives over 900mm of rainfall annually; while the drier parts of Mukogodo and Rumuruti receive slightly over 400mm annually. The Laikipia plateau receives about 500mm of rain annually, while Mukogodo Forest receives an average rainfall of about 706mm annually. It further shows that the northern parts of the county represented by Dol Dol receive lower rainfall compared to the southern parts such as Nyahururu.

The long rains occur from March to May while the short rains are in October and November with slight variations of two to three weeks in some seasons. The parts neighbouring Aberdare Ranges and Mt. Kenya form an exception to this pattern as they receive conventional rainfall between June and August because of the influence of the trade winds. The annual mean temperature of the county ranges between 16o C and 26o C. This is as a result of relief and trade winds resulting to cooler conditions in eastern side which is near Mt. Kenya and hotter in the low-lying areas in the North. The western and southern parts of the county have cooler temperatures with the coolest month being April and the hottest month being February. The average duration of sunshine is between ten and twelve hours daily. The average wind velocity is in a general East to West

**Laikipia East Sub County is generally humid.**

### **5.2.4 Ambient Environmental Measurements**

Ambient environmental measurements were conducted Lab Works East Africa to understand the baseline situation of the project area specifically in areas with sensitive receptors that may be affected by the project construction activities. The results are in annex K. The tables shows the locations of the baseline measurements. *Laikipia East Subcounty is generally humid.*

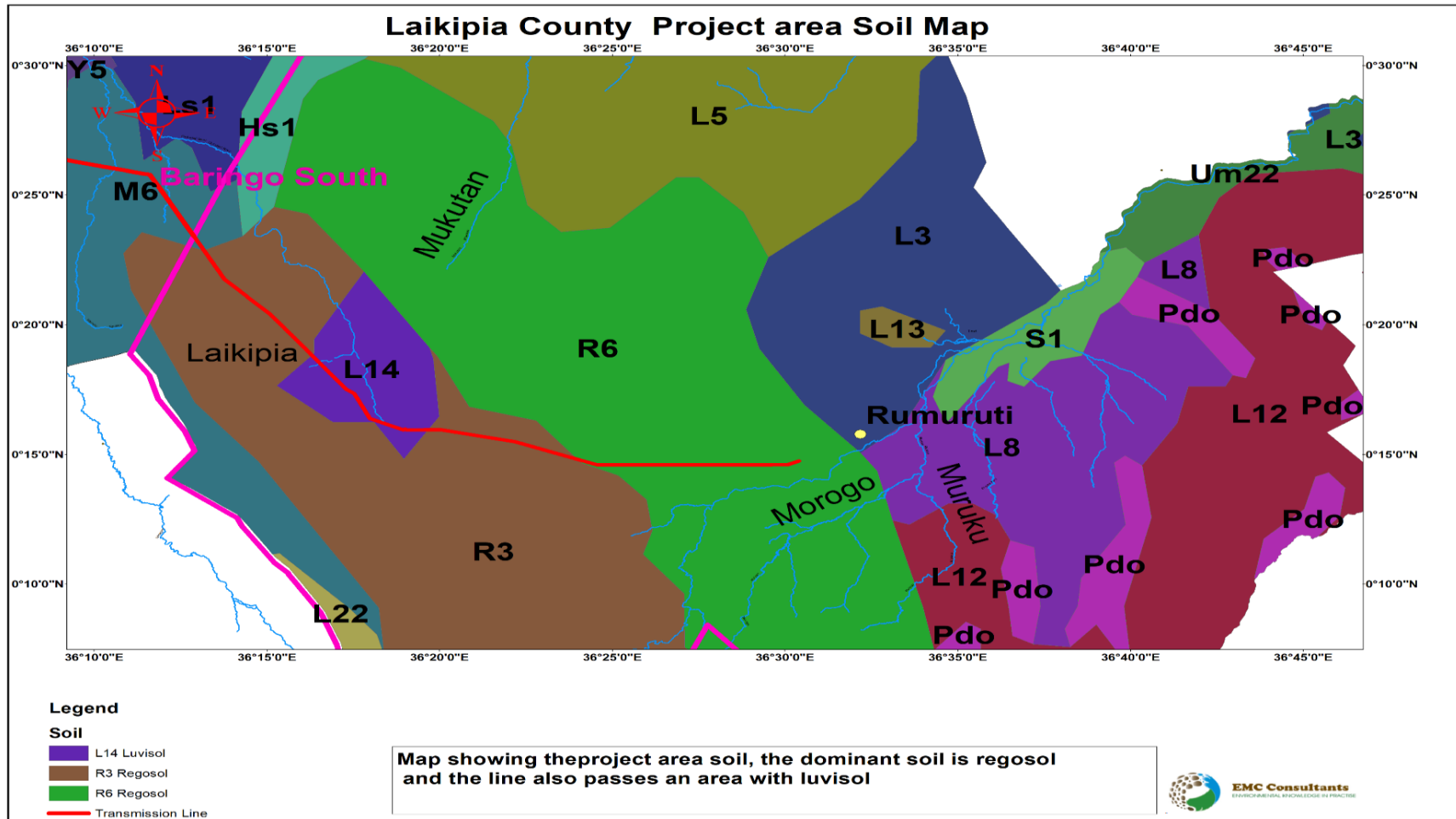


**Figure 5-42: Sensitive receptors in Laikipia County**

**Source: EMC Consultants, 2019**

### 5.2.5 Soils and Geology

The soils in the landscape can be grouped on the basis of the terrain under which they are developed. They have a high level of inherent fertility and the only limiting factors to agricultural production are poor weather characterized by frequent dry spells and poor rainfall distribution in terms of space and time. The landscape has red volcanic soils, clay loam, black cotton soil, sandy soils, and sandy loam soils. The most widespread soil type on the plains of Laikipia is ‘black cotton’, which is c. 50% clay and c. 24% sand (Young et al. 1998). The main soil types along the transmission line are regosol and luvisol.

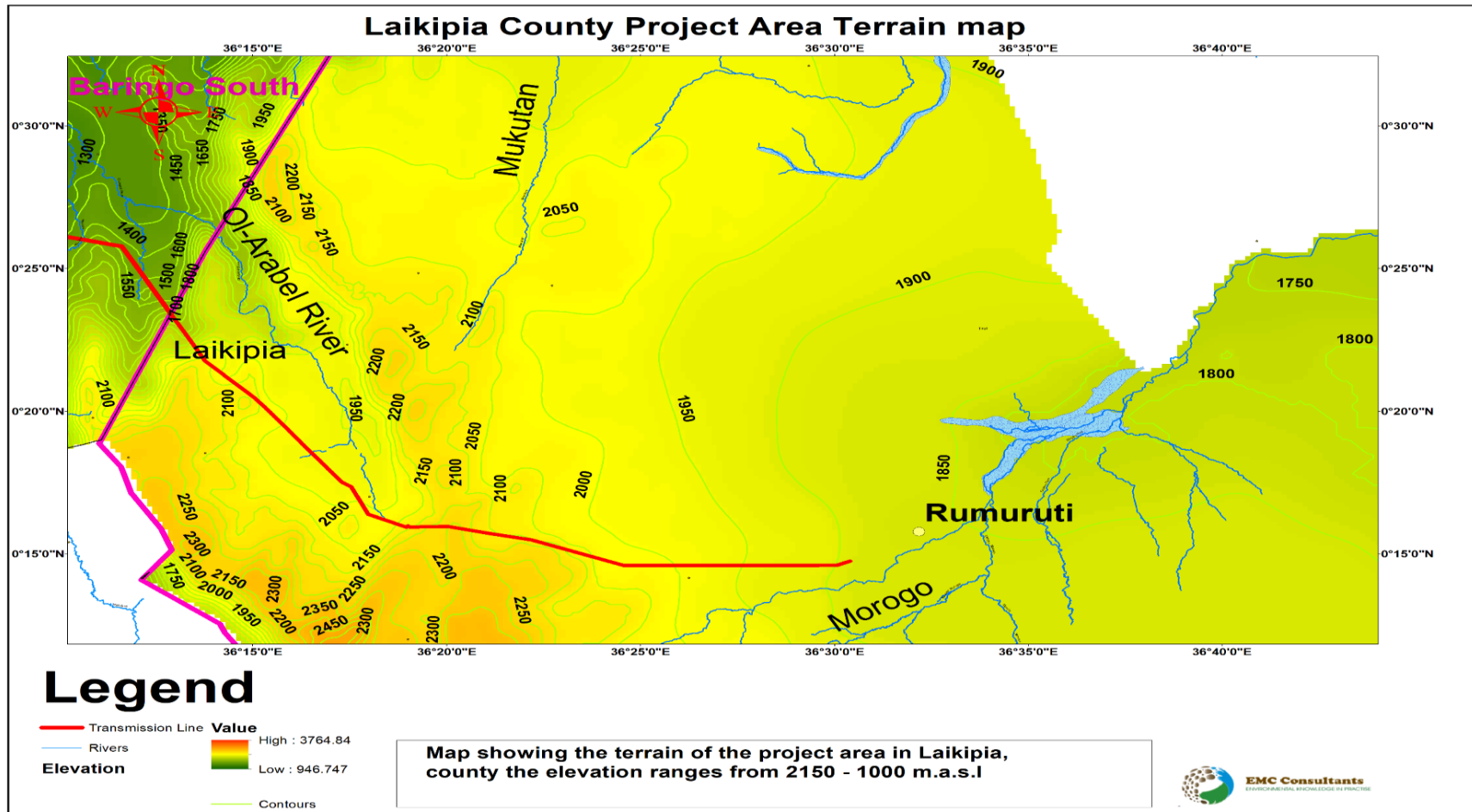


**Figure 5-43: Laikipia County AoI Soil Map**  
Source: EMC Consultants, 2019



### **5.2.6 Topography**

The altitude of Laikipia County varies between 1,500 m above sea level at Ewaso Nyiro basin in the North to a maximum of 2,611 m above sea level around Marmanet forest. The other areas of high altitude include Mukogodo and Ol Daiga Forests in the eastern part of the county at 2,200 m above sea level. The county consists mainly of a plateau bordered by the Great Rift Valley to the West, the Aberdares to the South and Mt. Kenya massifs to the South East all of which have significant effects on the climatic conditions of the county. Around the Ol Arabel area, the terrain is quite steep and unstable and prone to earth movement and soil erosion as depicted in figure below. Refer to figure 5-11 showing AP 013 as an area with steep terrain. The transmission line route slopes gently from Kapkechir through Melwa, Muhotetu, Kiambogo, Karandi, Gituamba and Rumuruti. Rumuruti area is generally flat.



**Figure 5-44: Laikipia County Area Terrain Map**

Source: EMC Consultants, 2019

### 5.2.7 Hydrology

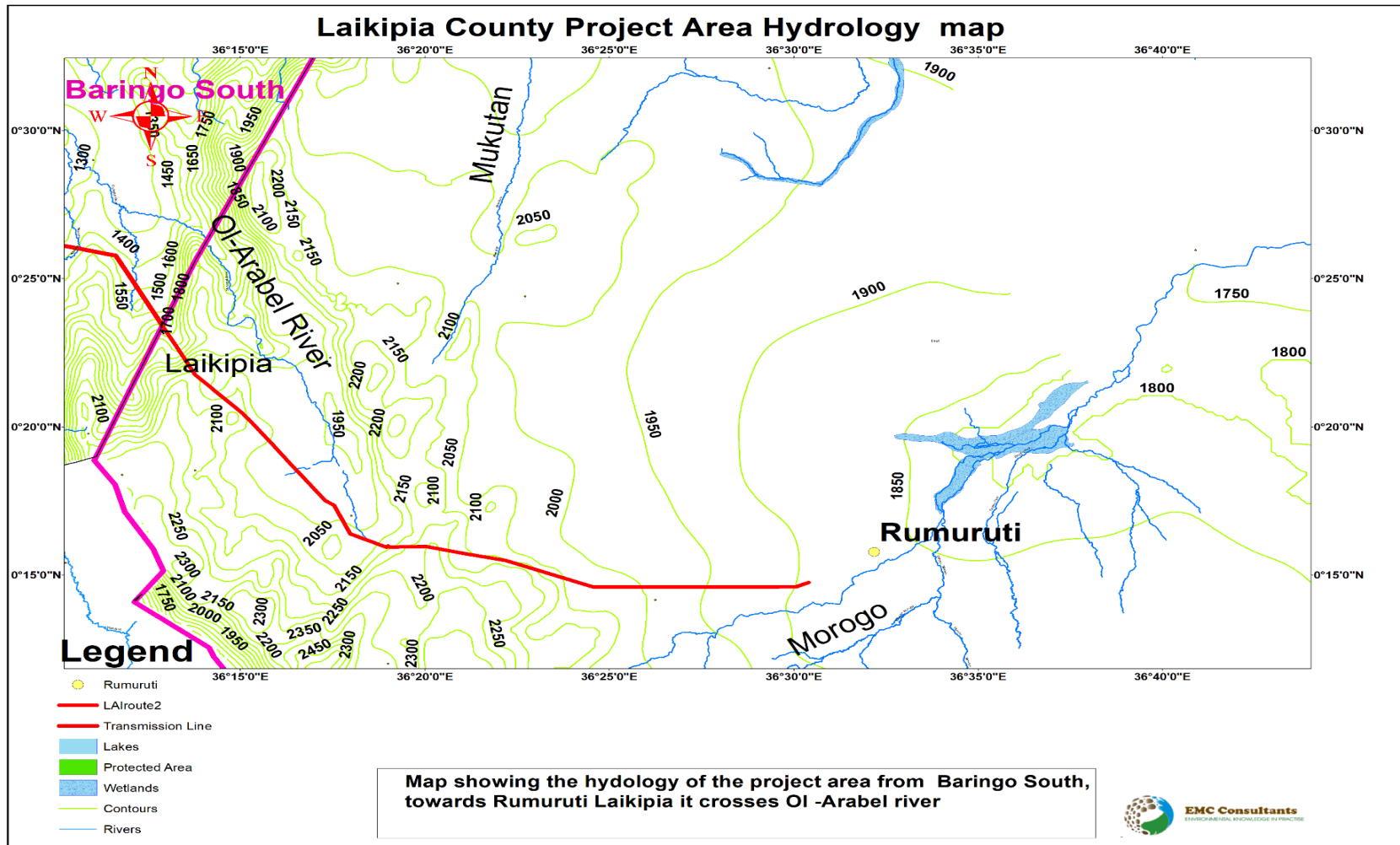
Laikipia County is lowland with numerous volcanic ridges cut into by two major rivers Ewaso Narok and Ewaso Nyiro with various tributaries flowing down from the Aberdares and Mt. Kenya

The main river catchments are the Aberdares range and Mount Kenya and Laikipia's water system composed of at least 25 permanent or semi-permanent rivers. The Ewaso Nyiro River is the lifeline of the County to the North. Laikipia is water scarce, it is mostly classified as arid and semi-arid. The lack of water in the dry season, due to high abstraction upstream has recently resulted in some perennial rivers becoming seasonal and created serious conflicts and life-threatening situations.

The main drainage feature is Ewaso Nyiro North basin with its tributaries having their sources in the slopes of the Aberdares and Mt. Kenya. These tributaries include Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyok, Ewaso Narok, Pesi and Ngobit rivers. The flow of these rivers matches the County's topography, which slopes gently from the highlands in the South to the lowlands in the North. The rivers determine to a large extent livelihood pattern in the county. The level plateau and the entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya and flow from South to North. The tributaries include, Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok, Pesi and Ngobit Rivers. The flow of these rivers matches the county's topography, which slopes gently from the highlands in the South to the lowlands in the North. The main river catchments are the Aberdares range and Mount Kenya and Laikipia's water system composed of at least 25 permanent or semi-permanent rivers. The Ewaso Nyiro River is the lifeline of the County to the North.

The level plateau and the entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya and flow from South to North. The tributaries include, Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok, Pesi and Ngobit Rivers. The flow of these rivers matches the county's topography, which slopes gently from the highlands in the South to the lowlands in the North. The rivers determine to a large extent the settlement patterns, as they are a source of water for human and livestock consumption as well as irrigation activities.

There are two major swamps in the county namely: Marura Swamp, which runs along the Moyot valley in Ol Pajeta Ranch and the Ewaso Narok Swamp around Rumuruti Township. *No tower spotting will be done with the riparian reserve.*



**Figure 5-45: Laikipia County Area Hydrology Map**  
**Source: EMC Consultants, 2019**

### 5.2.8 Water resource

The distribution of water sources is uneven across the county with the northern parts experiencing serious water shortages. There are 41 per cent households accessing water from within their dwelling while 12.9 per cent of the households take an average of 1-4 minutes to reach the nearest water point. Similarly, 20.3 per cent of households take an average of 5-14 minutes and 11.4 per cent of the households take an average of 15-29 minutes. The remaining 4.6 per cent of the households takes over an hour to reach the nearest water point. Laikipia is drained by the Ewaso Nyiro River and its tributaries which originates from Mt. Kenya and the Aberdares. The 6 main tributaries of Ewaso Nyiro are Ngare Naro, Pesi, Suguroi, Mutara, Nanyuki, and Burguret rivers. Households obtain water from permanent rivers, wells, springs and roof catchment. Boreholes, pans and dams are also a common feature in the county for domestic and irrigation purposes. Rock catchment in the northern Laikipia is yet to be fully exploited. The urban centres have adequate supply of water under the management of Water Services and Sanitation Companies in Nanyuki, Rumuruti, Wiyumiririe and Nyahururu. There are 10 irrigation schemes in the southern and western parts established through government and donor support. The overall supply of water is coordinated by the Northern Water Services Board which has also supported some of the community projects with pipes and masonry tanks. *Laikipia East subcounty households mainly rely on permanent streams, wells, springs and roof catchments.*

### 5.2.9 Biological Environment

There are six gazetted and one non-gazetted forest in Laikipia covering a total area of 580 square kilometres. Mukogodo is the main natural forest within the county. Artificial forests include Lariak, Marmanet, Ng'arua, Rumuruti and Shamaneik with sections of natural vegetation. *The proposed transmission line passes through Lariak forest in Laikipia East subcounty.* The county is endowed with several natural resources. These include pasture rangeland, forest, wildlife, undulating landscapes, and rivers among others.

#### Flora

Laikipia is in a transition zone for three major vegetation types; 'Somalia-Masai Semi-desert Grassland and Shrubland', 'Somalia-Masai *Acacia Commiphora* Bushland and Thicket', and 'Afromontane Undifferentiated Montane Vegetation'. Here, the savannahs of eastern Africa grade into both the semi-arid lands of the Horn of Africa and the montane elements of Mount Kenya and the Aberdares Range. The resultant great diversity of vegetation types, ecotones, and mosaics accounts, in part, for the high biological diversity of Laikipia.



**Figure 5-46: Sample flora around project area**



**Source: EMC Consultants Field Survey Photo**

The primary vegetation types are grassland, bushland, woodland, and, on the higher ground, dry forest. Dry forest is typically dominated by pencil cedar *Juniperus procera* (Cupressaceae), wild olive *Olea europaea* (Oleaceae), podocarp *Afrocarpus gracilior* (Podocarpaceae), euclea *Euclea divinorum* (Ebenaceae), acokanthera *Acokanthera schimperi* (Apocynaceae), and croton *Croton megalocarpus* (Euphorbiaceae). Riparian forest is a scarce, but biologically important, vegetation type in Laikipia. It is often dominated by fever trees *Acacia xanthophloea* (Fabaceae). Other large trees in the riparian forest include Gerrard's acacia *Acacia gerrardii* (Fabaceae), *A. gracilior*, water pear *Syzygium guineense* (Myrtaceae), water berry *Syzygium cordatum* (Myrtaceae), cape chestnut *Calodendrum capense* (Rutaceae), East African greenheart *Warburgia ugandensis* (Canellaceae), and figs *Ficus spp.* (Moraceae) (especially sycamore fig *F. sycomorus*).

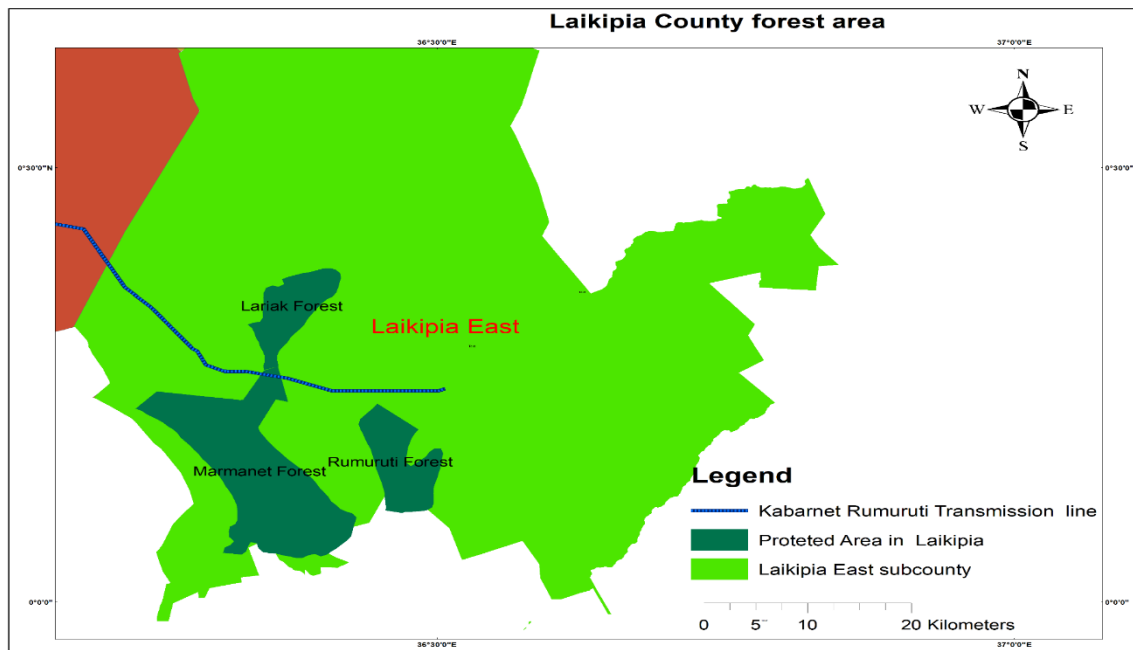
## Forests

The county has gazetted forest area totalling to 580 Km<sup>2</sup> comprising of both the indigenous and plantation forests. The indigenous forests include Mukogodo and Rumuruti, which are under threat from encroachment. The plantation forests include Marmanet and Shamaneik. Laikipia has a network of 10 main forests, which play important social and economic roles. Forests are under the responsibility of the Kenya Forest Service. Forest provides essential services to people, livestock, and wildlife in Laikipia, including watershed protection, dry season grazing, a wide range of traditional non-timber forest products (food and medicinal plants, fungi etc.), habitats and forage, and timber products such as firewood. They also provide a sink for carbon.

The transmission line traverses Lariak forest over a distance of 1.8kms (13.5 acres) between AP 019 to AP 020. Lariak Forest is a gazetted forest and is part of the broader Marmanet forests on the eastern escarpment of the Rift Valley under the management of Kenya Forest Service. The species of trees in the forest include *Juniperus procera*, *Premna*



*maxima*, *Dombeya goetzianii*, *Teclea noblis*, *Ekebergia*, *Celtis Africana*, *Olea hochstotterii*, *Prunus africanum*, *Podocarpus gracilior*, *Podocarpus milanjanus*.



**Figure 5-47: Laikipia County Forest Area**  
Source: EMC Consultants, 2019

The transmission line does not traverse Ol Arabel forest but runs adjacent to the forest which is a gazetted forest and under the management of Kenya Forest Service. The species of trees include *Juniperus procera*, *Premna maxima*, *Dombeya goetzianii*, *Teclea noblis*, *Ekebergia*, *Celtis Africana*, *Olea hochstotterii*, *Prunus africanum*, *Podocarpus gracilior*, *Podocarpus milanjanus* and the size of trees to be lost in acres as a result of the project is 17 acres. *The proposed transmission line traverses Lariak forest in Likipia West. The proponent will obtain authority from KFS before commencement of construction. KFS conditions shall be dully complied with by the proponent.*

### **Rangelands**

Rangelands cover more than 70% of Laikipia. They are characterised by a patchwork of conservation and grazing areas, which are under high pressures. 37 % of Laikipia is under large-scale ranching under extensive livestock production. Pastoralist communities use approximately 32% of the County land area including 10% of “abandoned land” (240,000 acres of land purchases in the 1970s and abandoned due to insufficient rainfall for cultivation). Intense land degradation threatening communities’ livelihood base has occurred in communally owned areas. *In Laikipia East Sub County , the land is individually owned and mainly comprises of farm land and pasture land.*

## Fauna

The County is recognised as one of the most important areas for conservation in east Africa for numerous reasons including the diversity of its wildlife, the number of endangered species it holds (including wild dogs, Grevy's zebras and half of the population of Kenya's black rhinoceros) and having one of the largest contiguous areas under conservation. The highest densities of wildlife are found in on what is referred as private protected areas (i.e., mixed ranches) with community protected areas acting as dispersal areas (AFD, 2013). Among the major wildlife species found in this county are the lion, leopard, elephant, buffalo, and the rhinoceros though there are other smaller species also in abundance particularly the African Wild dog and gazelles. According to classification, the endangered species in the region includes among others African wild dog (*Lycaon pictus*), Grévy's zebra (*Equus grevyi*), Lelwel hartebeest (including Jackson's hartebeest) *Alcelaphus buselaphus lelwel*. Vulnerable Species include: Savanna elephant (*Loxodonta africana*), Lion (*Panthera leo*), Cheetah (*Acinonyx jubatus*), Common hippopotamus (*Hippopotamus amphibious*), Reticulated giraffe (*Giraffa reticulata*), Chanler's mountain reedbuck (*Redunca fulvorufula chanleri*) and Eastern patas monkey (*Erythrocebus patas pyrrhonotus*). Near threatened species include Thomson's gazelle (*Eudorcas thomsonii*), White rhinoceros (*Ceratotherium simum*), Leopard (*Panthera pardus*) etc. Critically Endangered spp include Black rhinoceros (*Diceros bicornis*). Least Concern includes: Impala, Waterbuck, Greater kudu, Bushbuck, Spotted hyena, African clawless otter, Monkey, Hyrax. *The transmission line traverses as indicated above, Lariak Forest in Laikipia East subcounty, which is part of the broader of the Marmanet forests on the eastern escarpment of the Rift Valley. The transmission line does not traverse any wildlife migratory route.*

## Insects

Laikipia is home to insects of more species than all of its other creatures and plants combined. Laikipia's most conspicuous and colorful insects are butterflies, of which more than 150 species have been recorded. A commonly seen butterfly is the widely occurring *Citrus Swallowtail*, *Papilio demodocus*, whose dark upper wings bear flashy lemon-yellow markings. Other common butterflies are the *Pansies*, *Junonia spp.*, Blueeyed (*J. oenone*) and Yellow (*J. hierta*). The Guineafowl Butterfly, *Hamanumida daedalus*, dark grey and speckled like the bird from which it gets its name, is typically seen floating low over paths in Acacia woodland. *Orange Tips*, *Colotis spp.*, of several species frequent the Laikipia savannahs, sometimes in large numbers.

## Reptiles and Amphibians

The combination of a moderate climate (neither too hot and dry nor too cold and wet) with a diverse array of habitats ensures that Laikipia supports many species of reptiles and amphibians. Dangerous snakes that typically seek refuge in rock crevices and on kopjes in Laikipia include the Puff Adder, *Bitis arietans*, Africa's most dangerous snake, and the Black-necked Spitting Cobra, *Naja nigricollis*. The large, unmistakable African Rock Python, *Python sebae*, is most often seen near water. The Leopard Tortoise, *Geochelone pardalis*, is found in most habitat types.

The amphibians are nearly all nocturnal. Lizards typically seen basking on rocks or mounds, or in trees and bushes are by far the most conspicuous reptiles. Snakes, while abundant, are much more secretive, usually moving off before they can be seen. In the open grasslands, you can expect to see several terrestrial lizards, including the Variable Skink, *Mabuya varia*, typically brownish and speckled with a pale flank stripe. The Grass-top Skink, *M. megalura*, slender and brown with a dark lateral stripe, has tiny limbs and an extraordinarily long tail (accounting for as much as two-thirds of its length), allowing it to slide swiftly through and over clumps of grass. The Yellow-throated Plated Lizard, *Gerrhosaurus flavigularis*, a large, long-tailed brown lizard with paired yellow dorso lateral stripes, may be seen emerging from holes, while Speke's Sand Lizard, *Heliobolus spekii*, a small, mottled brown species with black barred pale dorsal stripes, typically darts about on more open ground. Fast-moving Sand Snakes, *Psammophis spp.*, often startled on grassland tracks into making off in haste, may include the sleek Northern Stripe-bellied Sand Snake, *P. sudanensis*, which has a brown back and two prominent yellow dorso lateral stripes. Larger species found on Laikipia's grasslands are the Olive Sand Snake, *P. mossambicus*, which is uniformly olive-brown, and the Speckled Sand Snake, *P. punctulatus*, often more than 1.5 m long, with black and yellow dorsal stripes and a striking orange head. Common in grasslands are the dark-striped, pale grey-brown Kenya Striped Skaapsteker, *Psammophylax multisquamis*, and the pale olive-grey-brown Mole Snake, *Pseudaspis cana*, a stout burrowing species with a short, pointed head.

### **Avi-Fauna**

As home to some 450 of Kenya's estimated 1,100 bird species, Laikipia is a birder's paradise. Majority of the birds found in the county are distributed within the various ecosystems around, some of the birdlife observed include among others: White-faced whistling duck, Knob-billed duck, African black duck, Madagascar pond heron, African spoonbill, Black stork, Great white pelican, Great cormorant, Lesser kestrel, Red-footed falcon, Sooty falcon, African fish eagle, Eastern chanting goshawk, Western marsh harrier, African hawk-eagle, Corncrake, Red-knobbed coot, white-throated-bee-eater, Black-winged stilt, Greater painted snipe, Wood sandpiper, Red-fronted parrot, Common cuckoo, Barn owl, Little bee-eater, Crowned hornbill, Jackson's widowbird etc. Along the transmission route, there is an Endemic Bird Area (EBA), Kenyan Mountains traversed by the transmission line. The bird species located in the EBA are described above.

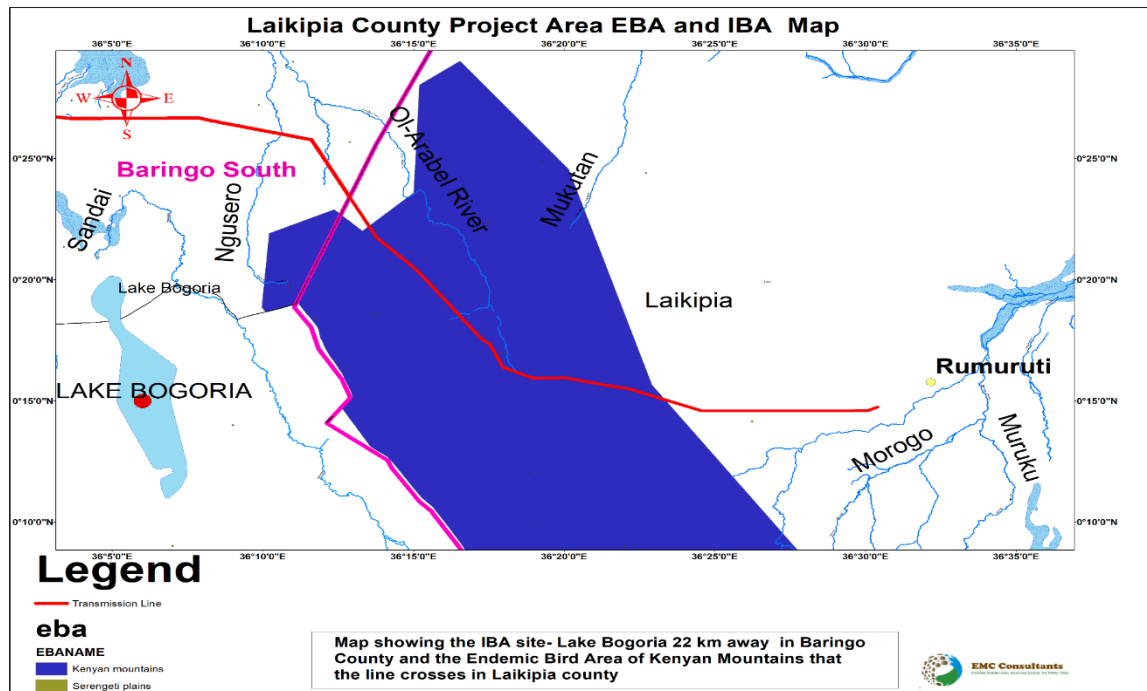


Figure 5-48: Laikipia County Project Area EBA and IBA Map

Source: EMC Consultants, 2019

## 5.2.10 Disasters and Environmental Threats

## 5.2.11 Socio Economic Environment

### 5.2.11.1 Population size and composition

According to the 2019 KNBS Housing and Population Census, the total population for the county stood at 599,227 people of which 259,440 were males and 259,102 were females. The ratio of men to women stands at almost one to one with need for efforts towards gender parity in provision of socioeconomic opportunities. The possible explanation for lower male population across the age cohorts across the age of 19 years are factors related to lower life expectancy amongst males. The table below shows the population density by gender in each sub-county.

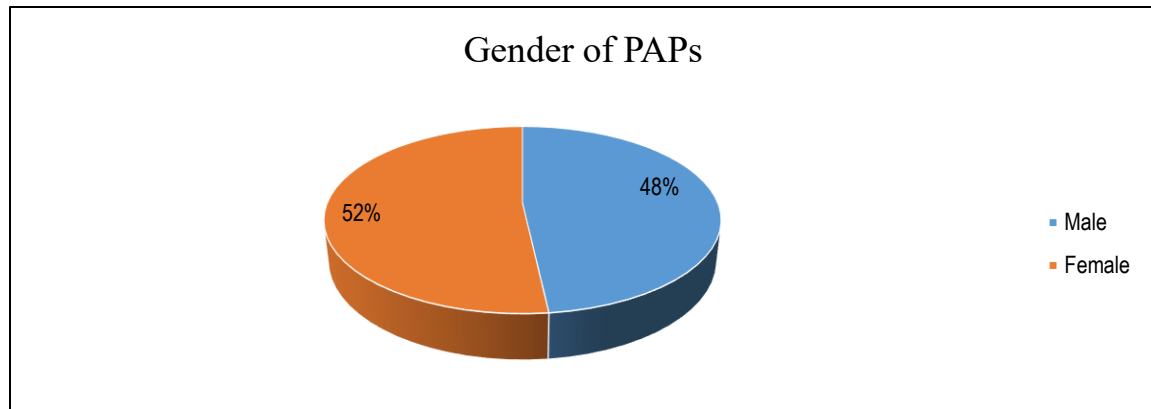
Table 25-Population and density by gender and sub-county

Sub County	Male	Female	Total
Laikipia Central	47,888	47,705	95,594
Laikipia East	52,078	50,732	102,815
Laikipia North	18,067	18,116	36,184

Source: KNBS population and census data 2019

Closer to the project, twenty two (22) number of households are directly affected by the project within Laikipia County.

Gender distribution of the affected households shows they are predominantly male headed

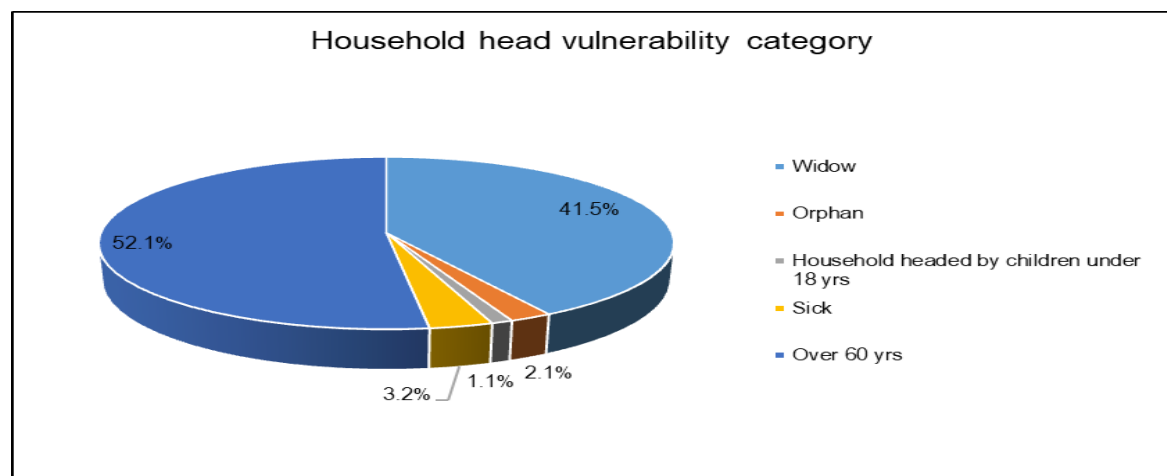


**Figure 5-49: Gender distribution of the Households in Laikipia County**

Source: EMC Consultants RAP Survey , 2019

Vulnerability identified during the survey within the sampled PAHs as shown below was composed of: -

1. The elderly over 60 years (41.5%)
2. Women headed households/widows (52.1%)
3. The sick/Chronic illnesses (3.2%)
4. Household headed children under 18yrs (1.1%)
5. Orphans (2.1%)



**Figure 5-50: Perceived level of Vulnerability**

Source: EMC Consultants RAP Survey , 2019

#### 5.2.11.2 Ethnicity

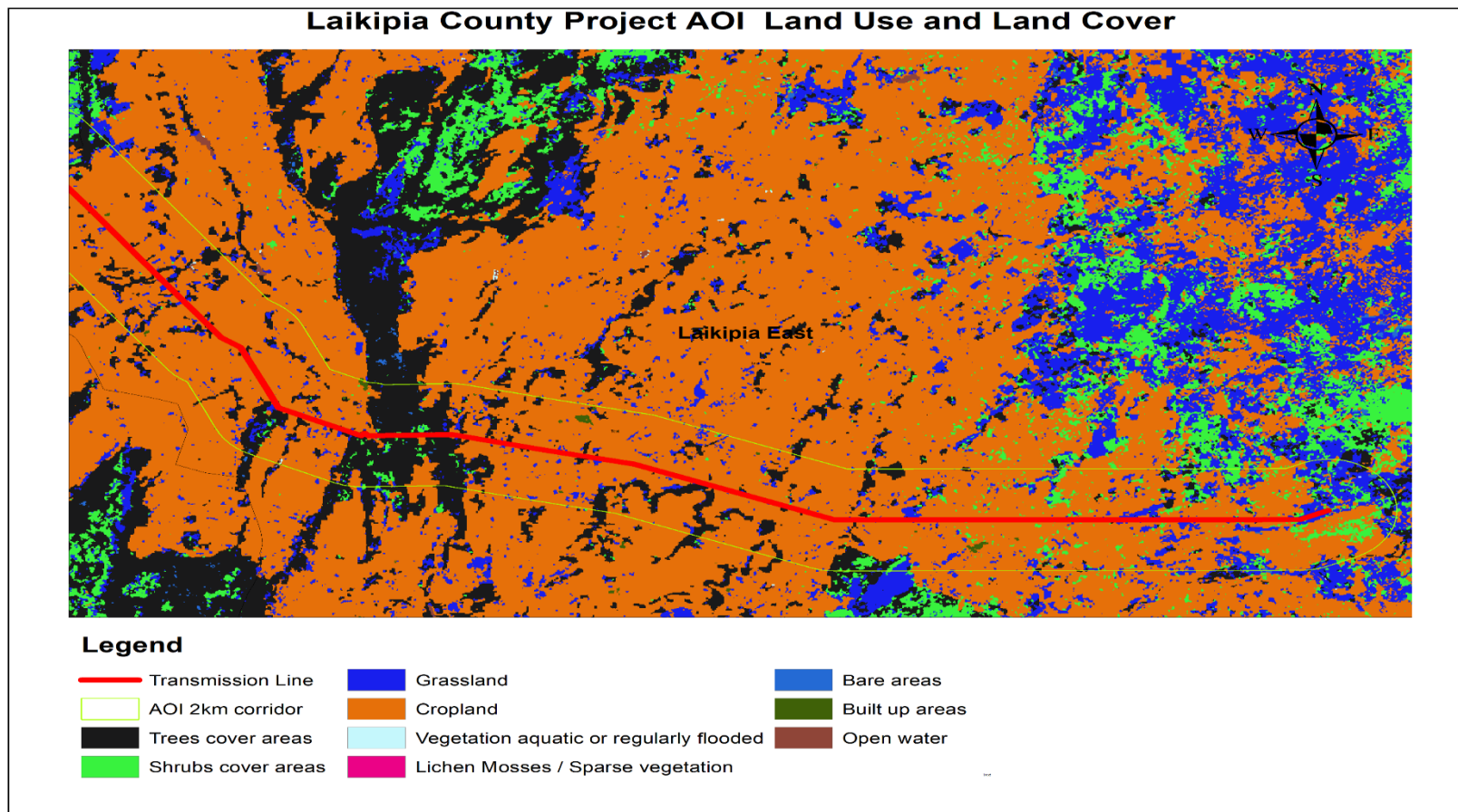
Laikipia is cosmopolitan with about 23 communities comprising of Maasai, Samburu, Rendile, Somali, Pokots, Kalenjins, Meru, Kikuyu, and Turkana among others. Majority (52%) of the household members in the project area were female, while the males formed 48%. Majority (52%) of the household members in the project area were females, while the males formed 48%. The communities where the transmission line is traversing are Kikuyu and Meru and are not categorized as vulnerable and marginalized groups according to World Bank's OP. 4.10 since they do not meet the criteria for the same.

Source : EMC Consultant, 2019

#### 5.2.11.3 Land Use and Land Tenure

Of the total land mass, arable land constitutes of 1,984 square kilometers. Non arable land constitutes of 7,456 square kilometers. The urban area constitutes 243.3 square kilometers. Gazetted forest land stands at 580 square kilometres. There are 6 distinct land use patterns heavily influenced by the climatic conditions and the ecological zones. These include among others; pastoralism, mixed farming, ranching, agro pastoral, marginal mixed farming and formal employment/trade/business. The average farm size for small scale holders is 2 acres while for large scale holders is 20 acres. The ranching community holds an average of 10,000 acres. Average land holding in the group ranches household is 23 acres. The percentage of land owners with title deeds is 65.3. The low percentage is partially attributed to the absentee landlords and long land adjudication and transfer processes. Laikipia has witnessed the emergence of squatters and new settlement schemes such as Solio. The squatters' problem hinders the realization of improved lives for all. There are about 4,712 squatters in the county with 1,021; 1,090; 400 and 2,201 squatters distributed in Kwa Mbuzi, Kahurura, Kandutura and Ontilili villages respectively. The three main types of land categories in Laikipia are private, community and public. The main types of land to be acquired within Laikipia East Subcounty are private and community land. In total, the project will acquire 226.8 acres categorized as private private and communal land. *Along the project line in Kiambogo, Gituamba, Muhotetu and Melwa locations locations , all PAHs affected by the project have title deeds (private) and therefore conflicts and grievances associated with lack of title deed that would hinder compensation for land loss is not expected. Land use by the PAHs is mainly for agriculture (crop production and animal husbandry).*





**Figure 5-51: Land Use along Transmission line route**  
**Source: EMC Consultants Field Survey, 2019**

#### 5.2.11.4 Settlement Patterns

Laikipia is a cosmopolitan county and largely rural in settlement. The settlement patterns in the county are uneven as and are influenced by the differences in land potential, livelihood zones, infrastructure development, land use system and availability of social amenities. Laikipia Central Sub-County has pockets of both high and low densities dictated by the differences in land potential. Laikipia North constituency is arid and semi-arid in nature and therefore the least populated arising from the limited economic activities such as livestock rearing and sand harvesting. The pockets of high population density include Nanyuki and Nyahururu towns, which are the commercial, administrative, and transportation hubs of the county. There are four major urban centers in the county namely: Nanyuki, Nyahururu, Rumuruti and Kinamba. The growth and expansion of Nyahururu and Nanyuki is attributed to their long-time role as the administrative headquarters for the former Laikipia and Nyandarua districts (in the neighbouring Nyandarua County). They are also major transport hubs for major routes namely: Nairobi-Isiolo-Marsabit, Nairobi-Meru, Nairobi-Mararal and Nakuru-Nyeri.

*The transmission line route has avoided major towns like Rumuruti town and market centres like Kinamba, Sipili, Kiambogo and Karandi. Churches and schools have been avoided. It was not possible to avoid all homesteads, owners of the affected homesteads will be compensated.*

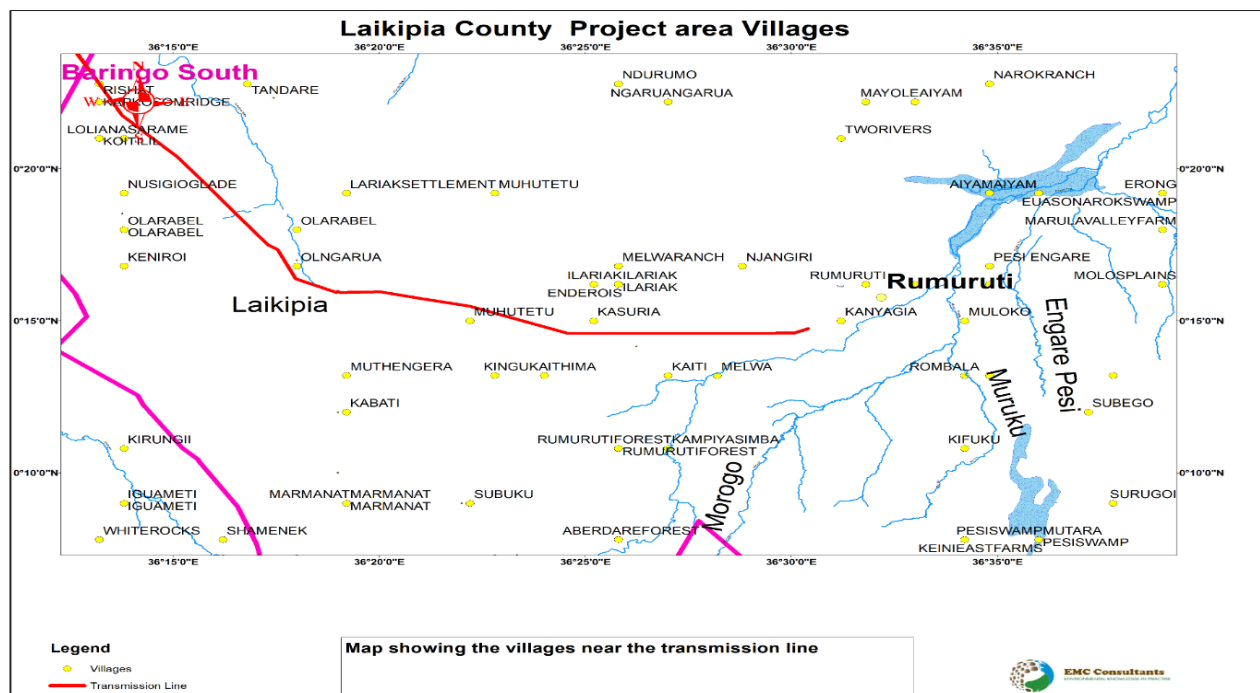


Figure 5-52: Laikipia County Project Area Villages

Source: EMC Consultants, 2019

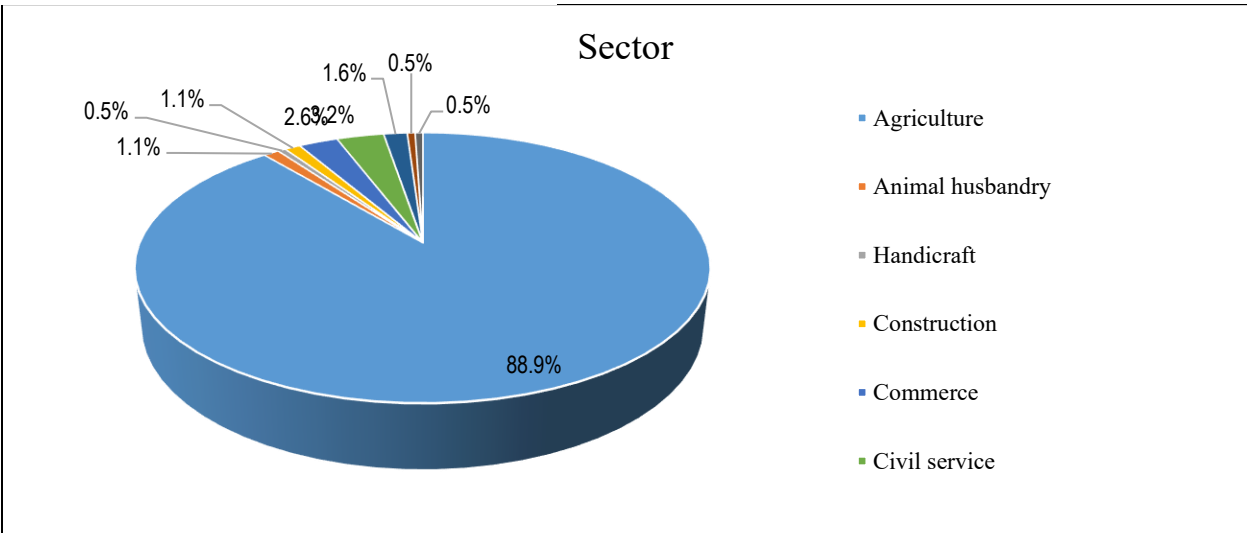
In total, the project will affect 125 structures within Laikipia County.

5.2.11.5 Economy and Livelihoods

The economy of the county is mainly agro-based. The main food crops grown are maize, pigeon peas, beans, Irish potatoes, sweet potatoes, sorghum, cassava and finger millet while the cash crops are coffee, cotton, macadamia and pyrethrum. Livestock products include honey, beef, mutton as well as hides and skins. However, little value addition is done to these products.

The agriculture sector employs up to 60 per cent of the total labour force in the county. The main source of livelihood includes, crop farming and livestock rearing. Figure 34 below shows a petrol station in Rumuruti town.

Economic Activities breakdown in Laikipia County



Source: EMC Consultants, 2019



**Source: EMC Consultants Field Survey, 2019**

*The main source of livelihoods within Kiambugo, Gitumamba, Muhotetu and Melwa locations which has been traversed by the transmission line's main source of livelihoods are businesses, crop farming and fish farming. No market centre has been traversed by the transmission lines, those whose farms have been traversed by the transmission line will be compensated for crop damages and land use loss.*

#### **5.2.11.6 : Information Communication Technology**

The county is served by four main post offices located at Dol Dol, Rumuruti, Nanyuki and Nyahururu and one substation at Kinamba. The percentage of households owning mobile as of

projections in 2014 was 69.9 per cent. Households with access to internet based are 4.8 per cent (Laikipia County 2018-2022 CIDP). The length of the National Fibre Optic Backbone infrastructure in the county is estimated at 80 km serving Nanyuki, Nyahururu and Rumuruti Towns. The courier services are mainly provided by G4S, EMS, Securicor, Wells Fargo and PSVs. Radio ownership is estimated at over 78.7 per cent whereas television sets ownership is estimated at 31.7 per cent of total households. There is one Huduma Center based at Nanyuki (Laikipia County CIDP, 2018-2022).

*Kiambugo, Gitumamba, Muhotetu and Melwa locations which has been traversed by the transmission line are well covered by both Safaricom and airtel mobile phone network.*

#### 5.2.11.7 Transportation Network

##### Road Network

The total classified road network is 1,038.1 Km of which over 80 percent are feeder roads. The bitumen surface in the county stand at 139.3 kilometers, covering mainly the Nyeri-Nanyuki, Nyeri-Nyahururu, and Nyahururu-Kinamba-Rumuruti roads. The gravel surface stand at 296.9 Km and the earth surface at 601.9 Km. Whereas the main urban centres are relatively well served by road communication network; the rural areas have low access hence movements to the major urban centres is hindered.

*The transmission line route will traverse the Nyahururu-Kinamba-Rumuruti road and authority will be obtained from the relevant roads' authority before construction commencement.*

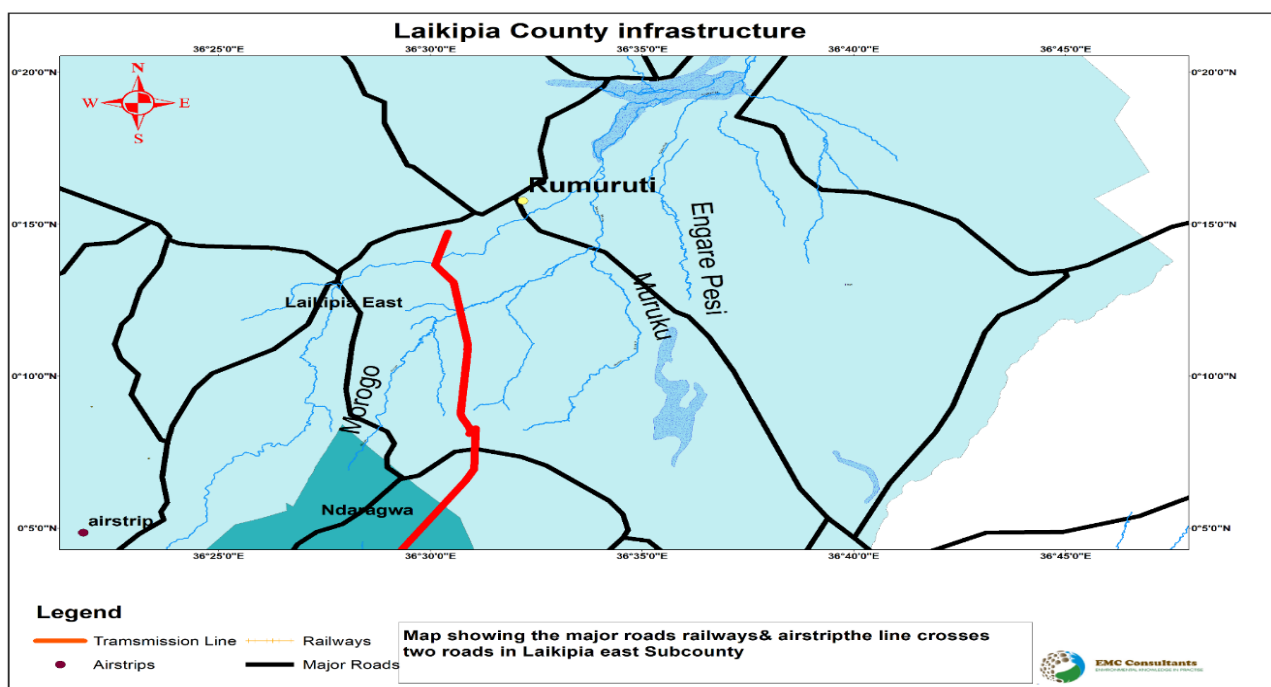


Figure 5-53: Laikipia County Infrastructure

Source: EMC Consultants, 2019





**Figure 5-54: Sample of road Network within Laikipia East Subcounty**  
Source: EMC Consultants Field Survey, 2019

### ***Rail Network***

The railway network in the county covers 23 kilometers serving Nanyuki Town and a small stretch of about 2 Kilometers in Nyahururu Town. There are 5 airstrips across the county majority of which are managed by the private ranching community. KCAA has issued approval for installation of the towers.

There exists an old railway network in covering 23 kilometers serving Nanyuki Town and a small stretch of about 2 Kilometers in Nyahururu Town. *The transmission line route does not traverse the railway line.*

### ***Airport***

The county is served by airstrip near Nanyuki Town. There are several landing grounds across the county majority of which are within main private ranches. *The proposed transmission line is not close to any airstrip, the proponent has already obtained KCAA approval. Refer to annex L*



#### 5.2.11.8 Tourism and Recreation

The major tourist attractions are the wildlife, the unique Maasai cultural practices and the Thomson Falls. The proximity to Mt. Kenya, Meru, Aberdares and Samburu game parks have greatly boosted tourism within the county through provision of hospitality services to the tourists. Laikipia County has the greatest number of wildlife outside of the gazetted protected areas in the country. The wildlife is mainly found in the private ranches, but they are also found in the group ranches of Laikipia North, Mukogodo forest and small-scale holdings in Laikipia West. The most abundant species are the elephants. Other predominant species include Burchelles zebras, Thomson Gazelles, Impalas, Buffaloes, Lions, Elands and Grevy Zebras. The importance of wildlife is manifested by existence of a strong ranching organization called the Laikipia Wildlife Forum. Most of the tourists are hosted in conservancy lodges. The county has four international standard classified hotels i.e., Sweet Waters Tented Camp at Ol Pejeta, Sportsman Arms Hotel at Nanyuki, Thompson Falls Lodge at Nyahururu and Illingwesi Lodge at Illingwesi Community Ranch with a total bed capacity of 306. The transmission line route has not traversed any tourist attraction site within *Kiambogo, Gituamba, Muhotetu and Melwa locations*.

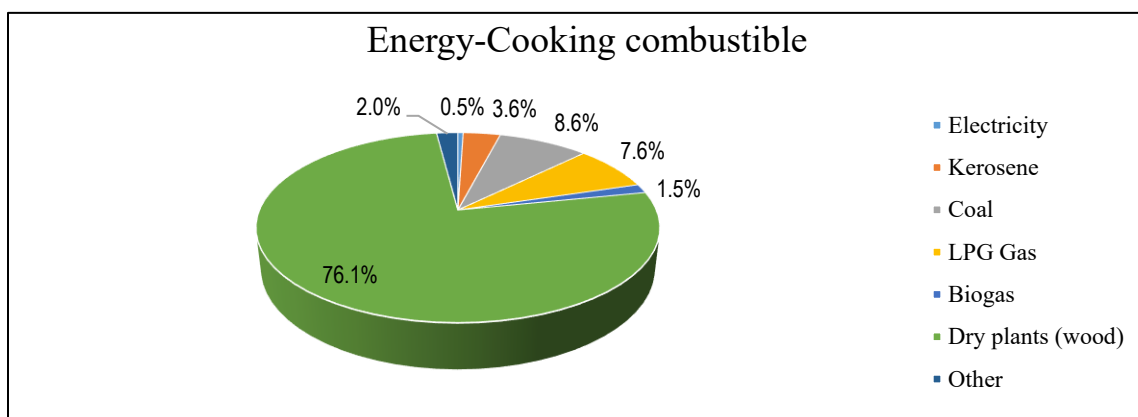
#### 5.2.11.9 Trade and Industry

The main commodity markets in the county are in Nanyuki and Nyahururu whereas main livestock markets are at Rumuruti, Doldol and Kimanjo. Other market centers include Olmoran, Sipili, Wiyumiririe, Lamuria and Debatas. Industrial zones are established within Nanyuki and Nyahururu towns. Rumuruti town has planned industrial zones with no activities. There are seven jua kali associations with a membership of 344 artisans who are involved in welding, fabrication, carpentry among other activities. Industrial processing is minimal with milk plants and grain milling being the major firms. Storage and distribution of petroleum products is also undertaken at a low scale. Alcoholic drinks processing/packaging is also an activity in Nanyuki. The transmission line route has not traversed any market centre within *Kiambogo, Gituamba, Muhotetu and Melwa locations*

#### 5.2.11.10 Energy sources and conservation

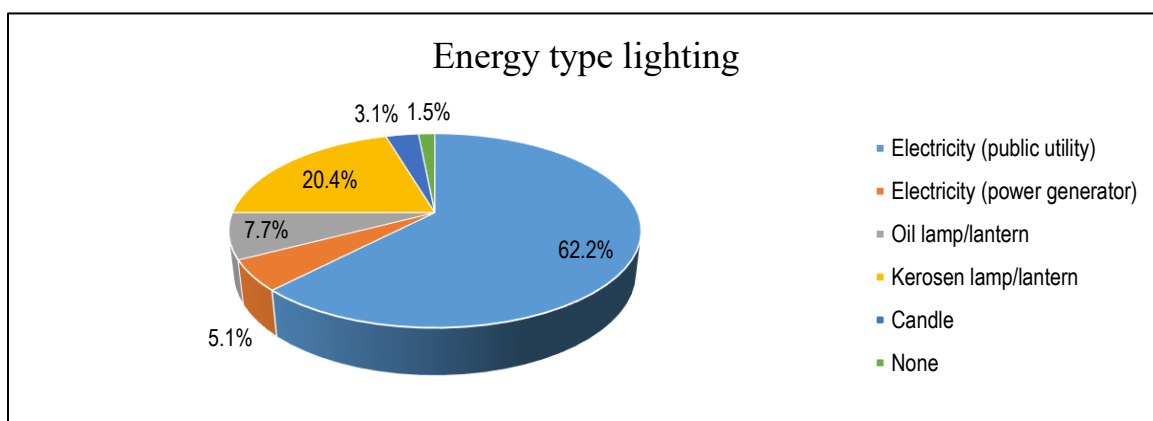
The national power grid serves 156 trading centres and is yet to reach the other 24 centres. The households using electricity for lighting constitute 17.7 percent of the total households. The Last Mile Connectivity Programme has helped to upscale access for the rural households. The county has several learning institutions, health facilities and boreholes supported by solar energy. Being a semi-arid county, reliable sunshine throughout the year provides high potential for harnessing of solar energy. There are also opportunities of up scaling biogas and wind energy. It is expected that once the proposed transmission line is constructed and completed, it will be energised, and the additional power will alleviate some of the gaps that are present at the moment.

The main PAP household sources of energy for cooking were dry plants/wood (76.1%), LPG Gas (7.6%) and Kerosene (3.6%). Other sources of energy for cooking included electricity and biogas as shown in figure below(RAP Survey, 2019)



**Figure 5-55: Source of Energy for cooking**  
**Source: EMC Consultants RAP Field Survey, 2019**

Electricity (62.2%) is the main source of energy used in lantern lumps for lighting; the other sources of energy for lighting formed 37.8%.

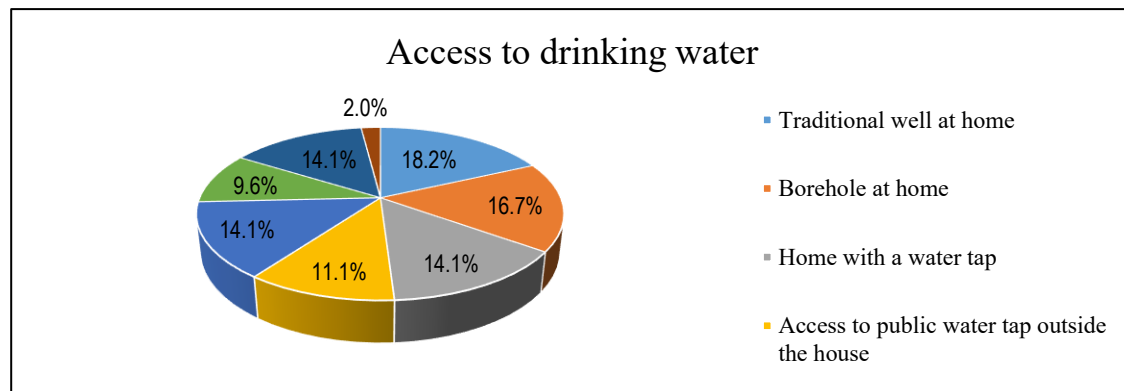


**Figure 5-56: Source of Energy for Lighting**  
**Source: EMC Consultants RAP Field Survey, 2019**

#### 5.2.11.11 Water and Sanitation

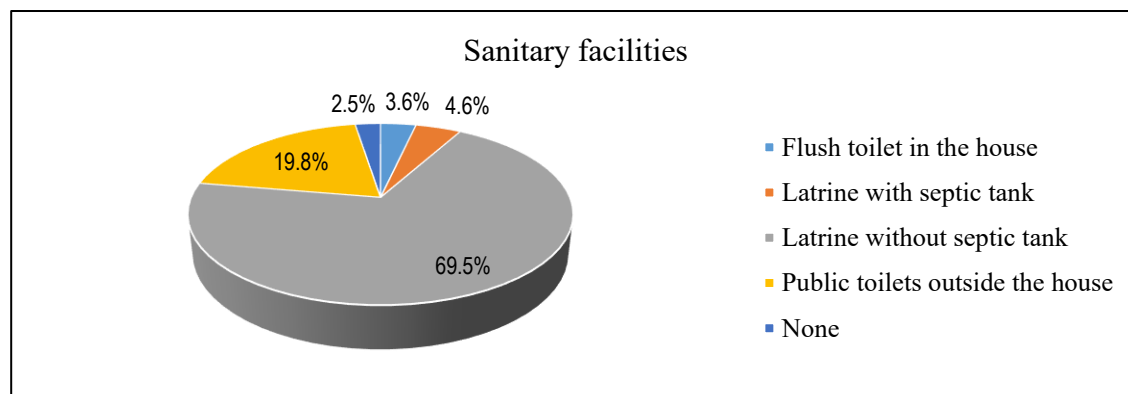
Laikipia is drained by the Ewaso Ng'iro River and its tributaries, which originate from Mt. Kenya and the Aberdares. The main tributaries are Ewaso Narok (Ngare Naro), Narumoru, Likii, Sirimon, Ontulili, Ngare ndare, Melwa, Ngare Naro, Ngobit, Rongai, Timau, Moyak, Pesi, Suguroi, Mutara, Nanyuki, and Burguret rivers. Boreholes, pans, dams, shallow wells, springs and sub surface dams are also a common feature in the county for domestic and irrigation purposes. Rock catchments in the northern parts of Laikipia are increasingly being exploited.

The survey outcomes concluded that traditional well at home was the most used source of water (18.2%) boreholes at home followed (16.7%), while water sourced from boreholes within the community; rainwater and taps within the homestead were at (14.1%). Other sources of water formed about 22.8% (RAP Survey, 2019)



**Figure 5-57: Sources of Water**  
**Source: EMC Consultants RAP Field Survey, 2019**

The main sanitary facility used by the community interviewed was a latrine without septic tank (69.5%). Those who use public toilets outside the house constituted 19.8%, while PAPs with latrines with septic tanks formed 4.6%



**Figure 5-58: Sanitation Facilities**  
**Source: EMC Consultants RAP Field Survey, 2019**

#### 5.2.11.12 Health.

The health infrastructure consists of five sub county hospitals at Kimanjo, Ndindika, Lamuria, Doldol, Rumuruti and two County referral hospitals; Nanyuki and Nyahururu. The county has six public health centres and four FBO managed health centres. There are

64 public dispensaries, 12 FBO managed dispensaries, 10 NGO managed dispensaries and 36 private run clinics. In addition, there are four private hospitals, one nursing home; one private health centre, six private dispensaries and 35 private clinics. The County government has 425 nurses, 71 public health officers, 76 clinical officers, 13 nutritionists 111 Doctors and 51 laboratory technologists. The doctor-population ratio stands at 1:4432 while the nurse-population ratio is 1:1157.

The five most prevalent diseases for under 5 in the county include; Respiratory Tract Infections (RTI), diarrhoea, clinical malaria, eye infections and Pneumonia. The leading diseases for the population of over 5s include; Respiratory Tract Infections (RTI), diseases of the skin, rheumatism and joint pains, diarrhoea and hypertension. The HIV prevalence rate stands at 3.2 percent.

#### *5.2.8.11: Poverty and Income*

##### **Work force**

According to the Kenya national bureau of statistics (Population and census, 2019) the labor force of Laikipia country stood at 260,859 persons (comprising of 119,047 males and 220,213 females) representing 43.5 percent of the county population. Based on 2019 national population census, 24.4 per cent of the labour force was employed in the formal sector whereas 42.8 per cent was employed in the informal sector. Most of the labour force under this category runs micro and small enterprises in both the formal and informal sector.

##### **Unemployment**

In Laikipia County, 16% of the residents with no formal education, 22% of those with a primary education and 32% of those with secondary level of education or above are working for pay. Work for pay is highest in Nairobi at 49% and this is 17 percentage points above the level in Laikipia for those with a secondary level of education or above (RAP Survey, 2019)

*The transmission line has not traversed the compound of any health facility, hence no negative impact on health centres and dispensaries.*

#### *5.2.11.13 Education*

##### **Pre-school Education**

There are 518 ECDE centres, 340 primary schools of which 265 are public across the county. There are also 96 secondary schools of which 70 are public. The average distance to the nearest primary school stands at 1.1 to 4.9 kilometers.

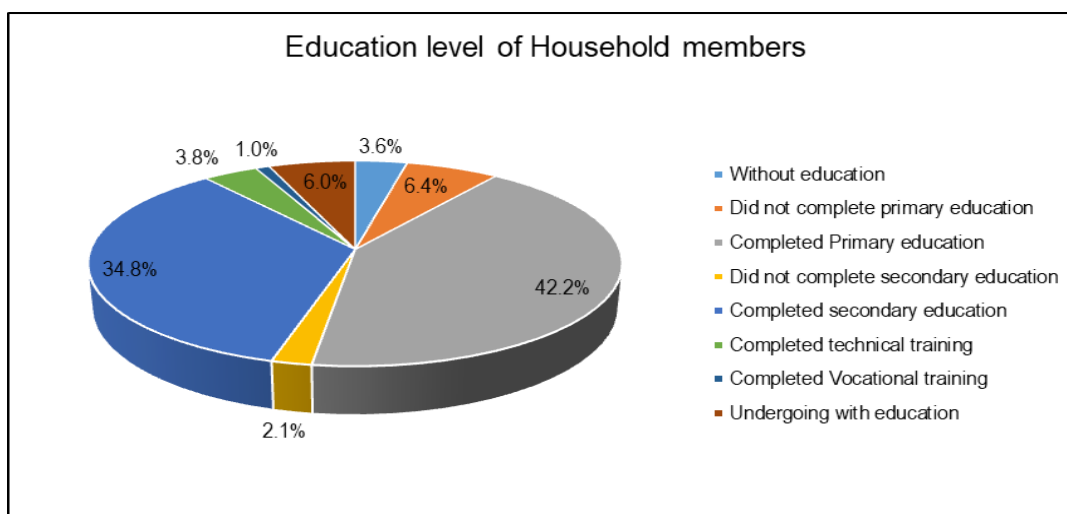
There are 340 primary schools with a total enrolment of 89,018 pupils. The number of primary school teachers is 2,303 giving a teacher pupil ratio of 1:38. The gross enrolment rate is 94.5 per cent and a net enrolment of 69 per cent. The completion rate is 92 per cent. Primary education is readily accessible as reflected by the fact that 90 per cent of the population is located between 0 and 4.9 kilometers from the nearest primary school with

only 10 per cent located over 5 kilometres. The population of 15 years and above consists of 86.1 per cent persons who can read and write. The percentage of population above three years who are at school stands at 36.5% while those who have left school stand at 25.2 per cent. Only 10.7 per cent of the population above three years have never attended school.

In 2019, there were 96 secondary schools with a total enrolment of 22,939 students. The number of teachers is 857 giving a teacher student ratio of 1:27. The gross enrolment rate, retention rate and the completion rate stand at 62 per cent 80 per cent and 79 per cent respectively. Secondary education is not readily accessible as reflected by the fact that 60 per cent of the population is located between 1.1 and 4.9 kilometers while 35 per cent is located over five kilometers from the nearest secondary school. Only five per cent of the population lies between zero and one kilometers.

There are 5 operational youth polytechnics in the county (Nanyuki, Wiyumiririe, Nyahururu, Marmanet and Salama). The county hosts one University College namely Laikipia University College. There are 3 University campuses namely Laikipia University College Town Campus in Nyahururu, Kenya Methodist University in Nanyuki and Karatina University Campus in Nanyuki. The middle level colleges include Kenya Institute of Management, St Anne Catholic College, Nanyuki Institute of Communication, Accountancy and Technology (NICAT) and Nanyuki Commercial College.

Most of the PAP household heads could read and write (90.4%). Only 9.6% per cent of PAP household heads could not read and write in English or Swahili. Kikuyu language was the most spoken language at home. About 42.2% of the PAHs had attained primary level of education and 21.6% achieving secondary levels of education. These percentages are inclusive of household heads and other members of the household. In the survey conducted 3.8% of the PAHs had completed technical training, while 2.1% and 6.0% respectively did not complete Secondary and Primary level education. A further 3.6% of the PAHs had no formal education. (RAP survey, 2019).



**Figure 5-59: Literacy level**

Source: EMC Consultants RAP Survey, 2019

*In Laikipia East Subcounty, the transmission line route has not traversed any ECD.*

### **Primary School Education**

There are 286 public and 87 private primary schools with a total enrolment of 74,965 and 16,813 pupils respectively in 2017. The number of primary school teachers is 1,562 giving a teacher pupil ratio of 1:52. The net enrolment rate is 93.4 per cent. Primary education is readily accessible as reflected by the fact that 90 per cent of the population is located between 0 and 4.9 kilometres from the nearest primary school with only 10 per cent located over five kilometres mainly in Laikipia North. *In East Subcounty, the transmission line route has not traversed any Primary school.*

### **Non-Formal Education**

Organized learning for children in Laikipia is mainly through madrassa in urban centres. *In Laikipia East Subcounty, the transmission line route has not traversed any urban centre or non formal education centre.*

### **Vocational Training Centers**

There were 10 public vocational training centers in 2017 with trainee enrolment of 617 and 59 instructors. There are also 3 private vocational training centers run by faith-based organizations. *In Laikipia East Subcounty the transmission line route has not traversed any vocational training centre.*

### **Secondary Education**

In 2017, there were 83 public secondary schools with a total enrolment of 23,118 students. There were 16 private secondary schools with a total enrolment of 1,593. The number of teachers in public schools was 881 giving a teacher student ratio of 1:26. The net enrolment



rate was 61.5 per cent. *In Laikipia East Subcounty the transmission line route has not traversed any secondary school.*

### **Tertiary Education**

The county has limited facilities for tertiary education. There is one University, one university campus, one branch of management institute, one KMTC branch, and a host of middle private level colleges. According to the 2009, Kenya National Bureau of Standards (KNBS) Housing and Population Census only per cent of the county's population had attained tertiary level education. *In Laikipia East Subcounty, the transmission line route has not traversed any tertiary institution.*

#### **5.2.11.14 Religion**

According to 2018-2022 Laikipia county CIDP, the county has 147,752 catholics, 152,699 protestants, 108,701 evangelicals, 64,738 other Christians, 8,475 muslims, 205 Hindus, 7,127 traditionalists, 7,238 belong to other religion while 15,695 have no religion. *The transmission line route has not traversed any church compound or any cultural site within Laikipia East Subcounty.*

#### **5.2.8.14: Gender Based Violence**

Domestic violence is rampant in Laikipia and despite interventions, notably by civil society actors; there has been a steady increase in the number of cases and the severity of domestic violence. According to the Police Administration, women suffer more in domestic disputes caused by their spouses than in any other circumstance. Domestic abuse accounted for 48% of all violations (RAP Survey, 2019). Women are most likely to suffer abuse from their husbands. The primary research indicates that the most prevalent form of abuse of women is usually a combination of physical assault followed by emotional stress, sexual violence, and neglect, both financially and otherwise. However, is still not treated with the same gravity as other cases when they are reported. Often the victim reporting the incident is asked what she did to provoke the violence and is encouraged to resolve the issue at home

#### **5.2.11.15 Archaeological Sites**

##### ***Mau Caves – Monument***

The Mau Mau caves located at the foot of the Mount Kenya and along the Nanyuki – Nyeri Highway prevail as a solemn reminder of one of British Empire's bloodiest struggles in East Africa and a beacon of some significant steps to the independence of Kenya. Located at the foothills of Mount Kenya, the Mau Mau Caves were utilized by the infamous Mau Mau fighters as a military rendezvous point, between 1953 to 1959.

##### ***Rock Gongs of Lewa Downs Wildlife Conservancy***

This wildlife paradise is a place with an ancient past including a lakebed where many hand axes have been found dating back several hundred thousand years. When struck in different places with a hammer gong produce different tones just like a musical instrument.

Rock gongs were likely used for divining purposes and ritual communication in the past. It is believed that the paintings have been made by Twa hunter-gatherer people between 1000 and 3000 years ago.

*The transmission line corridor is not at close proximity to any of these archeological sites in Kiambugo, Gituamba, Muhotetu and Melwa locations including graves.*

## 6 STAKEHOLDERS CONSULTATIONS

This chapter provides a description of the main stakeholders of relevance to the Project and a summary of stakeholder engagement activities undertaken in 2019 and 2021 during the preparation of the ESIA.

Two years have elapsed since the initial ESIA was done in 2019 necessitating an ESIA update. As such, there was need to re-sensitize the public.

### 6.1 STAKEHOLDER ENGAGEMENT PRINCIPLES

KETRACO understands that effective stakeholder engagement and public consultation is a cornerstone of successful Project development, and is committed to free, prior, and informed engagement with stakeholders throughout the Project lifecycle. The key principles guiding KETRACO's approach to stakeholder engagement on this Project are:

- To be open and transparent with stakeholders.
- To be accountable and willing to accept responsibility as a corporate citizen and to account for impacts associated with the Project activities.
- To have a relationship with stakeholders that is based on trust and a mutual commitment to acting in good faith.
- To respect stakeholders' interests, opinions and aspirations.
- To work collaboratively and cooperatively with stakeholders to find solutions that meet common interests.
- To be responsive and to coherently respond in good time to stakeholders.
- To be pro-active and to act in anticipation of the need for information or potential issues.
- To engage with stakeholders such that they feel they are treated fairly and their issues and concerns are afforded fair consideration.
- To be inclusive and accessible to stakeholders so that they feel able to participate; to receive and understand information; and to be heard
- To engage stakeholders using culturally appropriate languages and formats and techniques, in accessible locations, considering mobility, literacy and disability challenges, and in a timely manner to ensure meaningful consultations.

### 6.2 STAKEHOLDER ENGAGEMENT OBJECTIVES

The objectives of this stakeholder engagement were as follows;

- To identify and map all relevant stakeholders, their context, interests and concerns;
- To establish a two-way dialogue to understand concerns, management options and external perspectives;
- To promote and secure participation of PAHs by building their capacity for informed participation with special attention given to vulnerable PAHs in key decision making;
- To build and maintain trust between stakeholders;
- To support the resolution of emerging tension and maintain the project's social license to operate;
- To manage stakeholders' expectations;

- To facilitate the collection of quality primary and secondary information relevant; to the project processes including monitoring;
- To triangulate data collected and analysis done to inform decision making;
- To document information disclosed and public consultation efforts;
- To comply with regulations and requirements on disclosure and consultation;
- To provide information about the project and its potential impacts to those interested in or affected by the project, and solicit their opinion in this regard;
- To identify additional impacts/issues and possible mitigation measures;
- To inform the process of developing appropriate mitigation measures and facilitate consideration of alternatives and trade-offs (if any);
- To reduce chances of conflict through early identification of contentious issues;
- To ensure transparency and accountability of decision-making; and
- To increase public confidence in the project.

### **6.3 STAKEHOLDER MAPPING AND IDENTIFICATION**

Stakeholders include individuals or groups that may influence or be impacted by the Project, as described in Box 6-1 below.

#### **Box 6-1: Definition of a Stakeholder**

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses.”

The level of interest and impact of any given group of stakeholders is dependent on a number of factors including level of authority, socio-economic context, influence, education and cultural factors. Stakeholder identification began at Project inception and planning and has continued through the various stages of the Project development.

Stakeholders identified to date represent the organizations and individuals who may be directly or indirectly (positively or negatively) affected by the Project or who may have an effect on how the Project is implemented. Stakeholders identified for inclusion in engagement activities meet one of the following criteria:

- Have an interest in the Project;
- Would potentially be impacted by or have an influence on the Project (negatively or positively); and/or,
- Could provide commentary on issues and concerns related to the Project.

## 6.4 APPROACH AND METHODS OF STAKEHOLDER ENGAGEMENT

Below is a summary of the approaches and strategies adopted throughout the stakeholder consultation exercise.

### 6.4.1 Mobilization

- **Introduction letters:** KETRACO provided the consulting team with official letters of introduction informing all stakeholders about the proposed project, introducing the ESIA consultant, informing about the planned consultation activities and requesting them to support the consultants wherever possible.
- **Mobilization through local administration:** KETRACO and the consulting team visited the offices of the local administrators and informed them about the proposed project and the upcoming consultation activities. Other than information sharing, these meetings were aimed at requesting the administrators to further mobilize the concerned stakeholders. Local administrators consulted included the local chief, sub chief, ward administrator and the village administrator.
- **Mobilization by phone and emails:** Other key stakeholders who were not available due to conflicting obligations were contacted either through email or by phone. This mainly applied to custodians of relevant data and literature for the ESIA study.
- **Confirmation of appointments:** Prior to the appointment dates, the ESIA consultant reconfirmed the appointments by contacting the focal persons at each venue at least one day prior to the meeting to verify whether the proposed schedule was still valid for the expected audience.

### 6.4.2 Interviews and Socio-Economic Surveys

Enumerators were employed during the RAP stakeholder consultation period in 2019 to undertake socio-economic surveys with key community members and stakeholders. A quantitative survey (targeting 100% of the PAHs along the ROW) was conducted using structured questionnaire designed to generate the required information. The information gathered was used to answer questions related to social and economic parameters of the communities within the project site including, the availability or lack of social service facilities, existing levels of access to education, health, potable water, and related services. Consultations were held using both formal and informal meetings with carefully selected members of the communities and all PAHs.

### 6.4.3 Focused Group Discussions and Public Barazas

Stakeholders were further consulted in two ways; through public barazas where members of the community were called to a meeting with the agenda of discussing the proposed Project and through Focus Group Discussions (FGDs), where different groups were isolated and interviewed in a culturally appropriate setting. The FGD groups included women, youth, and men. The views and recommendations expressed during the consultation meetings were incorporated in the ESIA report. Generally, the result of the



participation showed support for the proposed project, with the community looking forward to the anticipated socio-economic developments associated with the project (See minutes of consultaion meetings, annex B) The photos below were taken by KETRACO ESIA team during public consultation meetings.



**Figure 6-60: Consultation with stakeholders in Baringo County\_2019**



**Figure 6-61: Consultation with stakeholders in Kasiela**





**Figure 6-62: Focused Group Discussion with women in Baringo County**



**Figure 6-63: Stakeholder consultations in Muruku & Muhotetu, Laikipia County**

The table below presents an overview of the main stakeholder groups of relevance to the Project.

**Table 26-Overview of stakeholder groups\_2019\_2021**

<b>Year</b>	<b>Stakeholder Category</b>	<b>Stakeholder Group</b>	<b>Connection to the Project</b>	<b>Stakeholders</b>
2019	National Government	Key Ministries National Regulatory bodies Government Agencies	National government is responsible for establishing policy, granting permits or other approvals for the Project, and monitoring and enforcing compliance with Kenyan Law throughout all stages of the Project life cycle.	<b><u>Interested Parties</u></b> Ministry of Petroleum and Energy County Commissioner, Laikipia County County Commissioner, Baringo County Deputy County Commissioner, Baringo County Deputy County Commissioner, Laikipia County Chiefs and Assistant Chiefs in affected locations and sub locations
2021		Key Ministries National Regulatory bodies Government Agencies	National government is responsible for establishing policy, granting permits or other approvals for the Project, and monitoring and enforcing compliance with Kenyan Law throughout all stages of the Project life cycle.	<b><u>Interested Parties</u></b> PA to the County Commissioner, Baringo County Deputy County Commissioner, Baringo County Deputy County Commissioner, Laikipia County Chiefs and Assistant Chiefs in affected locations and sub locations
2019	County Government	County Governments	County Governments are responsible for approval of development plans	<b><u>Interested Parties</u></b> Governor of Laikipia County Governor of Baringo County

2021				Interested Parties CECM- Lands, Housing, Physical Planning and Urban Development Chief Executive Committee Member (CECM)- Water, Energy, Forestry and Natural Resources
2019	Parastatals	Government funded private enterprises in charge of managing specific activities.	Parastatals may have land or other assets which could be affected by the Project.  KETRACO is the owner of the transmission line and electricity network that the Project will connect to KETRACO is responsible for all the Very High Voltage Transmission assets.	<b><u>Interested Parties</u></b> KETRACO, Kenya Forest Service, Kenya Wildlife Service, National Museums of Kenya, Water Resources Authority and Kenya Civil Aviation Authority.
2021	Parastatal /Community Based Organisations (CBO)	Ministries, Departments and Agencies (MDAs)	The various parastatals are responsible for granting approvals within their relevant sectors. County Government also grants approvals within their areas of jurisdiction	<b><u>Interested Parties</u></b> Kenya Forest Service, Kenya Wildlife Service, Water Resources Authority, Baringo County Government and NEMA(Baringo),

2019	Civil Society Organizations	Leading authority on the status of the world's birds and issues and problems affecting them	<b>Advocates and carries out priority conservation actions</b>	<b><u>Interested Parties</u></b> Birdlife International
2019_2021	Project Affected Communities	Project affected communities along the 1,000m buffer including:  Landowners and users; Residents Community members who use access roads to access nearby natural resources; social/public infrastructure and services.	Households and communities that may be directly or indirectly affected by the proposed Project and its activities.  This includes people living on land affected by the Project, through direct land take or by social and environmental impacts, and other people who visit or use land or resources that may be affected.  Primary stakeholders include landowners and land users. These communities need to be engaged around Project impacts anticipated through the project cycle Land affected households will need to be informed	<b><u>Directly Affected:</u></b> Affected Community Members and Infrastructures Households losing access to land Households losing access to livelihood resources Households with houses at risk of displacement

			about land acquisition and restrictions to land, to participate in the finalization of agreements around compensation and livelihood restoration and take active ownership of the resulting implementation of these measures.	
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Source: EMC Consultants & KETRACO RAP Survey data, 2019/2021

**Table 27-Baringo County Stakeholder Consultations Venues, Dates and Number of Participants\_2019**

DATE	VENUE	PARTICIPANTS	MALE	FEMALE
19 <sup>th</sup> 2019	June Kabarnet Deputy County Commissioner's Office	5	4	1
20 <sup>th</sup> 2019	June Marigat Deputy County Commissioner's Office	3	3	0
	Chief Officer Land's Office	3	2	1
	Kituro Location Chief's Office	6	5	1
	Kapropita Location Chief's Office	5	5	0
	Land Adjudication Officer's Office	3	3	0
21 <sup>st</sup> 2019	June Kimalel Location Chief's Office	3	2	1
24 <sup>th</sup> 2019	June KFS Office-Kabarnet	3	3	0
	NEMA Office-Kabarnet	4	3	1
25 <sup>th</sup> 2019	June Logumum Location Chief's Office	4	4	0



	Iingarua Location Chief's Office	4	4	0
	Eldume Location's Chief's Office	4	4	0
<b>Total</b>		<b>50</b>	<b>45</b>	<b>05</b>

Source: EMC Consultants RAP Survey data, 2019

**Table 28-Baringo County Stakeholder Consultations Venues, Dates and Number of Participants\_2021**

<b>Date</b>	<b>Venue</b>	<b>Participants</b>	<b>Male</b>	<b>Female</b>
30/11/2021	PA to Baringo County Commissioner, Baringo County	6	5	1
30/11/2021	County Environmental Officer, NEMA	6	5	1
1/12/2021	Water Resources Authority (WRA)	6	5	1
1/12/2021	Baringo DCC's Office	6	5	1
1/12/2021	Kenya Forest Service (KFS)	6	5	1
1/12/2021	Kenya Wildlife Service (KWS)	6	5	1
14/12/2021	CECM- Lands, Housing, Physical Planning and Urban Development	4	3	1
14/12/2021	CECM- Water, Energy, Forestry and Natural Resources	4	2	2
14/12/2021	Baringo County Conservancies	4	2	2
<b>Total</b>		<b>48</b>	<b>34</b>	<b>12</b>

Source: KETRACO RAP Survey data, 2021

**Table 29-Baringo County Public Consultations, Dates and Number of Participants\_2019**

<b>DATE</b>	<b>VENUE</b>	<b>PARTICIPANTS</b>	<b>MALE</b>	<b>FEMALE</b>
14 <sup>th</sup> August 2019	Arabal Location, Chemorongon Center	29	21	09
16 <sup>th</sup> August 2019	Kapkechir Location, Lomoiwe Dispensary Grounds	27	17	10
16 <sup>th</sup> August 2019	Karandi Locations, Ol Ngarua Primary School	34	30	04
7 <sup>th</sup> August 2019	Kasoiyo Location, Kasoiyo Dispensary	19	09	10
9 <sup>th</sup> August 2019	Kituro Location, Chief's Office/Dispensary	25	16	09
5 <sup>th</sup> August 2019	Marigat Location, Rabai Primary School	45	31	14
8 <sup>th</sup> August 2019	Logumgum Location, Logumgum Primary School	33	20	13
<b>Focus Group Discussions (Participants randomly selected from the public baraza)</b>				
14 <sup>th</sup> August 2019	3 FGDs at Arabal Location, Chemorongon Center	72	36	36
16 <sup>th</sup> August 2019	3 FGDs at Kapkechir Location, Lomoiwe Dispensary Grounds	72	36	36
16 <sup>th</sup> August 2019	3 FGDs at Karandi Locations, Ol Ngarua Primary School	72	36	36
7 <sup>th</sup> August 2019	3 FGDs at Kasoiyo Location, Kasoiyo Dispensary	72	36	36
9 <sup>th</sup> August 2019	3 FGDs at Kituro Location, Chief's Office/Dispensary	72	36	36
5 <sup>th</sup> August 2019	3 FGDs at Marigat Location, Rabai Primary School	72	36	36
8 <sup>th</sup> August 2019	3 FGDs at Logumgum Location, Logumgum Primary School	72	36	36
<b>Total</b>		<b>212</b>	<b>144</b>	<b>69</b>

Source: EMC Consultants RAP Survey data, 2019

**Table 30-Baringo County Public Consultations, Dates and Number of Participants\_2021**

<b>Date</b>	<b>Venue</b>	<b>Participants</b>	<b>Males</b>	<b>Females</b>
7/12/2021	Arabal Location, Chief's office	41	25	16
10/12/2021	Kiserian Location, Area church	37	30	7
10/12/21	Iingarua & Elchamis locations, Chief's office-Iingarua	37	35	2
11/12/2021	Marigat Location, Chief's office	23	16	7
11/12/2021	Kimalel Location, Chief's office	44	39	5
13/12/2021	Kituro Location, Chief's office	42	34	8
14/12/2021	Kapropita Location, Kasoyo Dispensary	20	16	4
15/12/2021	Chebininy Location, Chief's office	40	39	1
<b>Total</b>		<b>284</b>	<b>234</b>	<b>50</b>

**Source: KETRACO RAP Survey data, 2021**

**Table 31-Laikipia County Stakeholder Consultations Venues, Dates and Number of Participants\_2019**

DATE	VENUE	PARTICIPANTS	MALES	FEMALES
26th June 2019	County Commissioner's Office – Laikipia County	03	03	00
26 <sup>th</sup> June 2019	Deputy County Commissioner's Office – Nyahururu	03	03	00
25 <sup>th</sup> June 2019	Deputy County Commissioner's Office – Rumuruti	03	03	00
20th June 2019	Deputy County Commissioner's Office – Laikipia West Sub County	03	03	00
<b>Total</b>		<b>12</b>	<b>00</b>	<b>00</b>

Source: EMC Consultants RAP Survey data, 2019

**Table 32-Laikipia County Stakeholder Consultations Venues, Dates and Number of Participants\_2021**

Date	Venue	Participants	Males	Females
1/12/2021	Deputy County Commissioner- Laikipia County	5	4	1

Source: KETRACO RAP Survey data, 2021

**Table 33-Laikipia County Public Consultations Venues, Dates and Number of Participants\_2019**

DATE	VENUE	PARTICIPANTS	MALES	FEMALES
<b>Focus Group Discussions (Participants randomly selected from the public baraza)</b>				
15 <sup>th</sup> August 2019	3 FGD at Melwa Chiefs Camp-Melwa Location	72	36	36
15 <sup>th</sup> August 2019	3 FGD at Mohotetu Chiefs Camp – Mohotetu Location	72	36	36

<b>Total</b>		<b>66</b>	<b>49</b>	<b>17</b>
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Source: EMC Consultants RAP Survey data, 2019

**Table 34-Laikipia County Public Consultations Venues, Dates and Number of Participants \_2021**

<b>Date</b>	<b>Venue</b>	<b>Participants</b>	<b>Males</b>	<b>Females</b>
7/12/2021	Kiambogo location, Chief's office	12	8	4
8/12/2021	Gituamba Location, Chief's office	23	17	6
8/12/2021	Rumuruti Location, Chief's Office	20	17	3
9/12/2021	Melwa location, Chief's office	41	19	22
9/12/2021	Muhotetu Location, Chief's office	38	26	12
<b>Total</b>		<b>134</b>	<b>87</b>	<b>47</b>

Source: KETRACO RAP Survey data, 2021

The comments and concerns raised by the community during stakeholder consultation and the responses given by both the consultants and the client are highlighted table 6-10 below. **Annex A** contains the list of participants consulted along the project route and minutes of the meetings.

**Table 35-Summary of Concerns raised by the Project-Affected Persons\_2019\_2021**

<b>Theme</b>	<b>Comments and Issues</b>	<b>Response</b>
<b>Waste Generation</b>	Stakeholders were concerned about waste generation and methods of waste disposal. Specifically, they wanted to know the types of wastes that would be generated and the mode of disposal.	Wastes streams would include solid and liquid including emissions i.e., air and noise. Waste would be managed in accordance with the NEMA waste management regulations and contractor will be required to prepare a Waste Management Plan.
<b>Biodiversity</b>	Stakeholders expressed concern about the routing of the transmission line into Lariak Forest and wondered if there was any other alternative. Further, stakeholders wanted to know would happen to all the trees that would be cut down to clear the project area	<p>There was an analysis undertaken to determine the best route by engineers and the most optimal route was determined to cut through the forest. There would be off-set program to be implemented to compensate for the trees that would be cut down for the ROW.</p> <p>Communities would be given the right to salvage for the trees that are cut and existing in their personal land/property.</p>
<b>Air Pollution</b>	Some of the community members feared that the project will generate emissions and generate dust leading to air pollution.	<p>The community was informed that the proponent shall undertake measures to mitigate this, including:_</p> <ul style="list-style-type: none"> <li>• Control speed of constructin vehicles</li> <li>• Prohibit idling of vehicles</li> <li>• Sprinkle water on acess road during construction phase</li> </ul>



		<ul style="list-style-type: none"> <li>• Regular maintenance of plant and equipment</li> <li>• Provide dust masks to employees working in dusty conditions</li> </ul>
<b>Noise and Vibration</b>	<p>Questions concerning potential air and sound pollution arising from excessive noise and vibration also arose from community members</p>	<p>The community was informed that the proponent shall undertake measures to mitigate this, including:-</p> <ul style="list-style-type: none"> <li>• Contractor to work only during the day, 8:00am-5:00pm</li> <li>• Service machines and equipment regularly</li> <li>• Switch off machines and equipment when not in use</li> <li>• Provide employees with ear plug</li> </ul>
<b>Employment</b>	<p>Community members enquired if there will be employment opportunities, and what would be the criteria for employment.</p> <p>They asked to be given first priority whenever employment opportunities arise.</p>	<p>The client informed the community members of their intention to hire locally whenever possible and further that there are plans to develop a community engagement plan which will cover all employment issues.</p> <p>However, he cautioned that where specialist skills are required for the project and the skills are not locally available, specialist would be hired from other jurisdictions.</p> <p>The stakeholders were informed of the requirement by contractor to develop a</p>

		Labour Recruitment Plan to guide recruitment.
<b>Land Use and Compensation</b>	There were fears that the transmission line would pass through private and community land. Stakeholders wanted to know if they would be compensated.	Community members were informed that they would be compensated for land acquired for the ROW and any other associated facilities e.g., camping sites; access roads etc. Compensation would be undertaken in accordance with the NLC Act. Stakeholders were informed that a RAP would be prepared to inform the category of PAPs and entitlement.
	Stakeholders were further concerned whether they would be compensated for loss of beehives as a result of felling of trees for ROW.	Stakeholders were informed that the compensation would include all assets including livelihoods and would ensure that there is livelihood restoration as part of the RAP.
	What is the approach that will be utilized to compensate those persons who are residing in group ranches (communal land)?	Community group ranches are governed under the Community Land Act 2016. All affected persons who reside on group ranches will still be compensated in accordance with the provisions of the AfDB's OS 2 on involuntary resettlement and Kenyan laws.
	Will it be possible for Kimalel Group ranch to be dissolved in order for members to be compensated individually for loss of land?	The proponent informed members that they will need to meet as a group ranch and agree that every affected individual to be compensated a prorated amount as per the percentage of his parcel of land affected. The group ranch will have to write a letter

		together with the minutes annexed to KETRACO. The letter should be forwarded by the area Chief.
<b>Project Benefits</b>	The communities inquired as to the nature of benefits that they would receive from the project. Would their houses be connected to the national grid? Would they get opportunities for employment? etc.	<p>The client informed the community members that there will be both direct and indirect benefits arising from the project such as employment (guided by local recruitment plan to be developed by contractor and reviewed by KETRACO), improved roads since they will need to be upgraded to facilitate transportation of project equipment's and other opportunities etc.</p> <p>Electrification plans for the project area in line with the national electrification strategy will be communicated to PAPS in consecutive consultation sessions e.g., during the disclosure of the RAP, ESIA etc.</p>
<b>Health and Safety Issues</b>	<p>Communities wanted confirmation from the client that their safety will be considered at all times during project operation.</p> <p>There were concerns about possibility of electrocution by the transmission line.</p> <p>The community also inquired about the issue of radiation affecting those near the power line during operation</p>	<p>The community was informed that the proponent shall undertake measures to mitigate this, including : -</p> <ul style="list-style-type: none"> <li>• Sensitise the community on potential dangers i.e. electrocution</li> <li>• Place danger signs</li> <li>• Design the towers per international standards to mitigate against any safety risks i.e. ensure the standard clearance distance is observed</li> </ul>

		<ul style="list-style-type: none"> <li>• Ensure physical integrity of the structures are maintained</li> </ul>
<b>Social impacts</b>	Is the project likely to affect our livestock especially those that may graze under the transmission line?	Livestock can be grazed below the transmission lines upon completion. However, extended exposure of livestock to the EMF could be hazardous and therefore, it is important to limit the duration of grazing the livestock under the lines.
	Foreign workers from outside of the area may introduce foreign culture and influence our children negatively including spread of public health diseases. How will this be addressed in your ESIA study?	This is a key aspect that will be captured in the ESIA, and associated impacts identified and assessed. The mitigation measures in the ESIA will address how to mitigate the impacts associated with labour influx. The contractor will develop a Labour Influx Management Plan and a GBV (SEA/SH) Management Plan as well as measures to minimize the spread of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and other Sexually Transmitted Diseases (STDs).
	After the erection of the transmission line, can one continue growing crops and trees on the corridor and under the transmission line?	Certain crops are allowed to be grown under the transmission lines for as long as they are within the required height of not more than 1.8metres. Crops or trees above the required height will not be allowed as they can cause health and safety hazards.
	Is there a probability of contractors establishing camp sites along the project route? What guidelines are	It is not known whether the contractors will establish camp sites along the route or

	going to be used in case this happens? Construction camps are known to lead to social ills including conflict and tension with local communities.	utilize existing accommodation facilities. However, the impacts associated with establishment of camp sites (wastes, social ills, resource use conflict) etc. have been flagged out and this ESIA report as a mitigation measure includes the requirement for the contractor and client to prepare a separate ESIA report for every camp site once a determination is made by the contractor and prior to commencement of construction activities.
Water Quality	The community raised concerns on impact of the project on water quality. They stated that water resources may be contaminated by project waste rendering it unfit for human consumption. They were also concerned about over abstraction during project implementation.	<p>The consultants informed the community that the ESIA will propose that a waste management system be put in place.</p> <p>Stakeholders were also informed that the project had taken into account the estimated water usage for the project and made plans for alternative water sources to ensure adequacy of water for the project without depleting local resources.</p>

Source: KETRACO/EMC Consultants Field data, 2019/2021

#### **6.4.4 Post ESIA Consultations**

KETRACO is aware that public consultation is a key component of project implementation and will therefore put in place a Stakeholder Engagement Plan (SEP). This is a continuous process; the SEP is usually shared with the chiefs once the proponent has worked on the logistics including finances and is just about to go the field. During construction phase, KETRACO wayleave officer is usually based in the field and do engage with individual PAPs on a daily basis. The contractor's EHS officer, KETRACO's project environmentalist and OSH officer ensures that ESMP is implemented and handles grievances from stakeholders which might arise. The overall aim of SEP will be to address the concerns and opinions of the stakeholders with the ultimate view to assuring a smooth project implementation. KETRACO shall welcome suggestions and information from relevant stakeholders, contractors, visitors, and the general public. Community Liaison Officers (CLOs) will also be appointed by the contractor and will address complaints and suggestions from the communities. Further, consultations, which began during the ESIA process, will continue throughout the project life cycle in line with the SEP.

#### **6.4.5 Data Management**

In order to record activities, assess the effectiveness of the Stakeholder Engagement Plan and associated community dialogue activities, KETRACO will implement a data management and monitoring process. Stakeholder engagement activities will be documented and filed in order to track and refer to records when required and ensure delivery of commitments made to stakeholders. The following stakeholder community dialogue records and documentation will be used and maintained by KETRACO during pre-construction and construction phase:

- Stakeholder list
- Stakeholder engagement log
- Commitments register
- Meeting minute template
- Grievance log
- Media monitoring of press and radio stories relevant to the project and unconventional related issues and activities.

#### **6.4.6 ESIA Study Report Disclosure**

This ESIA study report will be disclosed in accordance with the country's disclosure requirements as well as AfDB's disclosure policy. The report upon approval by NEMA will be disclosed on KETRACO's website and NEMA's website, as well as on the AfDB's external website. Hard copies will also be made available at the Contractor's office, Chief and NEMA county offices. Summaries of the ESIA will be disclosed to PAPs in culturally appropriate languages and formats using feasible engagement techniques such as FGDs and public barazas, in accessible locations and in a timely manner that ensures meaningful consultations and considering any mobility, literacy and disability challenges.



## 7 ANALYSIS OF PROJECT ALTERNATIVES

This chapter describes the analysis of technically and financially feasible alternatives considered in the development of the Kabarnet-Rumuruti 132 kV transmission line project, and provide a systematic rationale for selecting the desired development option, technologies and materials to be adopted. The purpose of the alternatives analysis is to identify feasible alternatives that could improve the sustainability of the Project's design, construction, and operation.

### 7.1 No Project Alternative

No project alternative is the option of not constructing the proposed power transmission line project at the identified routing i.e., from Kabarnet to Rumuruti. This alternative would result in no environmental and social impacts in the project area. Whilst this would without doubt result in complete avoidance of impacts, this needs to be balanced with the strategic need for the development of new electricity generation capacity in Kenya.

The Electricity and Petroleum Regulatory Authority undertakes long-term planning for the country's electricity generation and transmission system through the Least Cost Power Development Plan (LCPDP), a 20-year rolling plan updated every year. The most recent version of this study was completed in 2013 and plans for the period 2013 to 2033. The update involves review of the load forecast in light of changed pertinent parameters, commissioning dates for committed projects, hydro data, costs of generating plants and transmission system requirements. Electricity consumption is forecasted to grow in the long term by an average of 7.3% per year (reference scenario), 9.6% Vision and 5.6% Low scenario. This would lead to consumption figures 50% above (vision) and 25% below (low) the values in the reference scenario by 2035. The annual peak load is expected to grow at slightly higher rates from 1,600 MW in 2015 to 6,700 MW in 2035, (with Vision rate of 10,000 MW and low case of 5,000 MW).

The 2011 updated LCDP for Kenya projects a capacity need in the range of 12,739-22,995 MW by 2031, with an intermediate projection of 3,751 MW by 2019. Projected energy demand is expected to increase from 7,296 GWh in 2010 to 22,695 GWh in 2019 and 91,946 GWh in 2030. 2,700 MW in generation capacity could come online by 2030 to reach 5,000MW and a leap from 4,150km in transmission lines to double by 2030. 20-30% of population could be connected to off grid access to electricity (primarily solar) by 2020. This will bring 70-80% of the Kenyan population to on-grid electricity by 2020 from 46% in 2015. These projections are based on an array of planned infrastructural, mining and manufacturing projects including an electrified standard gauge railway (SGR) line, the establishment of a steel smelting plant in Meru, Konza Techno City and several other major energy intensive undertakings. Kenya has only 33% electrification and devolution of energy is on an online plan. Reticulation of energy by county governments is a role expanded in the new energy bill 2018.

Kenya's long term PGTMP master plan 2015-2035, identifies and models the expansion paths of the Kenya power system for the period, complying with the defined planning

criteria and scenario framework. The plan includes a scenario in which RE is significantly upscaled and another scenario in which Energy Efficiency (EE) significantly affects supply. The PGTMP investment modelling compares energy investments (including nuclear) by aspects of technology like capacity and also uses PESTEL to rank different investment over the long term for prioritization and scheduling.

This projected growth rate in electricity demand will require corresponding increases in capital outlay to provide the needed incremental generation capacity and associated supply and distribution infrastructure. It is envisaged that the private sector will play a key role in providing the required capital either on its own or through Public Private Partnerships. The government of Kenya has in this course created a platform to entice investors in the energy sector, KETRACO being one of them. This makes the do-nothing option not viable as it would not result in additional infrastructure in this critical sector

If the power line is not constructed and commissioned:

1. The region would be negatively affected by an inadequate and unreliable supply of electricity (basic service) which would inhibit future development in western region and mainly south rift
2. It would jeopardise the success of the regions Integrated Development Plans and Spatial Development Frameworks, all of which identify the lack of reliable and quality electrical services as inhibitors to future development and quality of life.
3. The existing powerline networks supplying the towns and villages between Kabarnet and Rumuruti areas are highly constrained in terms of capacity and are unable to supply additional electrification load growth in the area. The risk for electrical faults and associated power outages, which are currently occurring in the area on a relatively frequent basis, will increase significantly. In addition, the ability to supply new customers would be severely limited in that it is anticipated that the demand for electricity in the study area will soon exceed the capacity of existing 33kV electrical system.

From the analysis above, it becomes apparent that the 'No Project' Option is not a feasible alternative to KETRACO, the local people, Kenyans, and the government of Kenya. Subsequently, the do-nothing alternative is not a preferred alternative and will not be assessed in further detail in this ESIA study report.

## **7.2 Alternative Transmission Line Route**

The analysis of alternatives route involved the evaluation of certain sensitivities associated with the various options. Table 7-1 below summarizes the sensitivity criteria used for the alternative analysis. Each sensitivity aspect was assigned a score and the score was used as a basis for comparison between options.

**Table 36-Social and Economic Sensitivity**

Social Sensitivity									
Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
High	4	Dense permanent Housing (larger populations) or areas highly significant for livelihoods which are not available elsewhere.	Substantial or highly Significant infrastructure present (e.g., school, hospital, medical centre etc.).	Area is essential for principal livelihoods.	Presence of large number/highly sensitive intangible / living cultural heritage sites. e.g., graves or cemeteries or religious buildings.	Landscapes that: feature concentrations of biological diversity Including endemic species, and rare, threatened or endangered species, that are significant at global, regional or national levels; and Feature ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable	Major changes affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view. Contrast may dominate the view and be the major focus of	A high implementation cost factor due to a substantial increase in associated construction materials. This is due to factors such as unsuitable terrain, transmission length changes with the aim of avoiding environmentally and socially sensitive areas etc	Severe health effects for a large portion of the community

						populations of naturally occurring species in natural patterns of distribution and abundance; and Feature rare, threatened, or endangered ecosystems, habitats refuges.	viewer attention		
Medium	3	Small-medium groups of houses, priority areas used frequently for livelihoods, or businesses potentially requiring economic Resettlement.	Some infrastructure present with some alternatives available.	Area is significant for principal livelihoods.	Individual grave sites.	Landscape features that Include ecosystems and ecosystem mosaics that are significant at global, regional, or national levels, and that contain viable populations of naturally occurring species in natural patterns of distribution and abundance.	Clearly perceptible changes in views at intermediate distances, resulting in a either a distinct new element in a significant part of the view, or a more wide ranging, less concentrated change across a	A moderate implementation cost factor due to a perceptible increase in associated construction materials. This is due to factors such as unsuitable terrain, transmission length changes with the aim of avoiding environmentally and socially sensitive areas etc	Moderate Health effects for a larger portion of the community and severe health effects for a small portion of the community

							wider area. Contrasts may attract attention but should not dominate the view of the casual observer.		
Low	2	Individual houses or Small communities, Non-priority areas used for livelihoods.	Some infrastructure Present although Typically accessed at Alternatives sites.	Area is used for livelihoods.	Intangible cultural heritage sites known to be used, e.g., views or landscapes.	Ecologically important areas that do not form part of recognized protected areas	Minor changes in views, at long distances or visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view. Contrasts may be seen but should not attract the attention of	A low implementation cost factor due to a negligible increase in associated construction materials. This is due to factors such as unsuitable terrain, transmission length changes with the aim of avoiding environmentally and socially sensitive areas	Non-permanent Health effects for a Larger portion of The community and moderate health effects for a small portion of the community

							the casual observer.		
Negligible	1	No significant human land use for livelihoods / housing.	No significant areas used to collect resources or House infrastructure.	Area only occasionally used for Livelihood activities.	No significant Culturally sensitive areas.	Other areas not considered sensitive.	Change which is Barely visible, at a very long distances, or visible for a very short duration, perhaps at an oblique angle, or which blends with the existing Acceptable contrasts are primarily natural ecological changes.	No significant changes on the project implementation cost factor	Non-permanent Health effects for small portion of the community .



**Table 37-Preferred Route**

<b>Topic</b>	<b>Option 1: Transmission Line in accordance with KETRACO's Coordinates – Preferred route</b>		<b>Option 2. Transmission line Route in accordance with ESIA Team Analysis (Avoiding the Forests)</b>	
	<b>Analysis</b>	<b>Scoring</b>	<b>Analysis</b>	<b>Scoring</b>
<b>Environmental Sensitivity</b>	This option would include the construction of the transmission line which will cross inside/into Lariak Forest (1.8km) long and which is considered sensitive. Due to the traversing of the route transmission line into the Lariak Forest the potential impacts on flora and fauna can be tentatively considered as high. Potential noise and air quality sensitive receptors are also high.	<b>3</b>	This option would include the construction of the transmission line avoiding Lariak Forest which is a sensitive ecosystem.	<b>1</b>
<b>Physical and Economic Displacement</b>	No significant human land use for livelihoods/housing as the line is optimized to avoid settlements	<b>1</b>	No significant human land use for livelihoods/housing as the line is optimized to avoid settlements.	<b>1</b>
<b>Community Infrastructure and Resources</b>	No significant areas used to collect resources	<b>1</b>	No significant areas used to collect resources.	<b>1</b>
<b>Socio-Economic and Income Generating Livelihoods</b>	Project route and areas along the 2 Counties used for livelihood activities.	<b>1</b>	Project route and areas along the 3 Counties used for livelihood activities.	<b>1</b>
<b>Socio-Cultural Characteristics and/Living Cultural Heritage</b>	As per the ESIA baseline, no culturally-sensitive areas.	<b>1</b>	As per the ESIA baseline, no culturally- sensitive areas.	<b>1</b>

<b>Aesthetics</b>	There are no other overhead transmission lines in the area, hence moderate impacts.	<b>2</b>	There are no other overhead transmission lines in the area, hence moderate impacts.	<b>2</b>
<b>Community Health and Safety</b>	Overhead transmission structures are clearly marked and have security mitigation measures to prevent harm to the community, both during construction and operation phases. The line snapping and causing injury is a potential risk (although considered to be low). The line hardware used on the overhead transmission line is rated or designed higher than the conductor ultimate tensile strength and the conductor is only pulled to 20% of its ultimate tensile strength. Therefore, the likelihood of a transmission line snapping is possible but unlikely. Specifically, during operation, due to the transmission servitude being maintained, this risk is not material.	<b>1</b>	Same as Option 1.	<b>1</b>
<b>Construction cost</b>	A 1.7km section of the proposed kabarnet-Rumuruti TL will traverse through the Lariak forest. This stretch will traverse the southern end of the forest. Further, a 1 km section of the proposed kabarnet-Rumuruti TL will traverse through the Kinyo forest and a 1.4 km section of the proposed kabarnet-Rumuruti TL will traverse through the Kinyo forest. These cumulatively have a minimal impact in relation to the overall project cost.. Thus a low scoring factor.	<b>1</b>	Rerouting this line to avoid the forests will lead to an 11 km outbound stretch around the Lariak forest, a 3 km outbound stretch around the Kinyo forest, and a 5 km outbound stretch around the Kapkechir forest. Cumulatively, this lengthening of the transmission line will significantly increase the overall project cost as well as pose other technical challenges	<b>4</b>

			due to unsuitable terrain.. Thus, a high scoring factor	
<b>Total Score</b>		<b>11</b>		<b>12</b>

### **Preferred Transmission Line Route A:**

In proposing the above line route, consideration was given to social, environmental, technical and financial implications. The transmission line will generally follow open ground with minimum settlement to avoid areas of dense settlement and where impacts on environment and local people e.g., from loss of farmland or grazing land are minimal. The proposed route of the Kabarnet-Rumuruti transmission line will traverse ecologically sensitive areas such as Lariak, Kinyo and Kapkechir forests. This proposed line routing was done in consideration of technical viability and cost-effectiveness by avoiding as much as possible excessively steep areas such as hills' escarpments and areas with high population. The following statements summarize the lengths traversed within the 3 forests and the alternative outbound line options around the respective forests:

1. Lariak Forest is traversed by approx. **1.7km** while the outbound option would be **11km**.
2. Kinyo Forest is traversed by approx. **1km** while the outbound option would be **3km** with challenges of finding the route due to Laikipia escapement.
3. Kapkechir forest is traversed by approx. **1.4km** while the outbound option would be **5km** with challenges of finding the route due to Laikipia escapement.

Therefore, there would be no added benefit of rerouting the route as all important parameters were considered in mapping the current route. However, the project proposes concrete mitigation measures to address the impacts on the forest which will be implemented in consultation with KFS.

### **Alternative Transmission Line Route B: Avoid Forest**

This ESIA is proposing an alternative route (Route B) which would primarily avoid the transmission line crossing into Lariak Forest as shown in figure 7-1 below. This option would thereby ensure that the adverse impacts associated with clearing the vegetation in Lariak Forest is avoided. This option was deemed unfavorable due to the additional implementation cost associated with increase in length of the transmission line to orient the line around and outside the Lariak forest

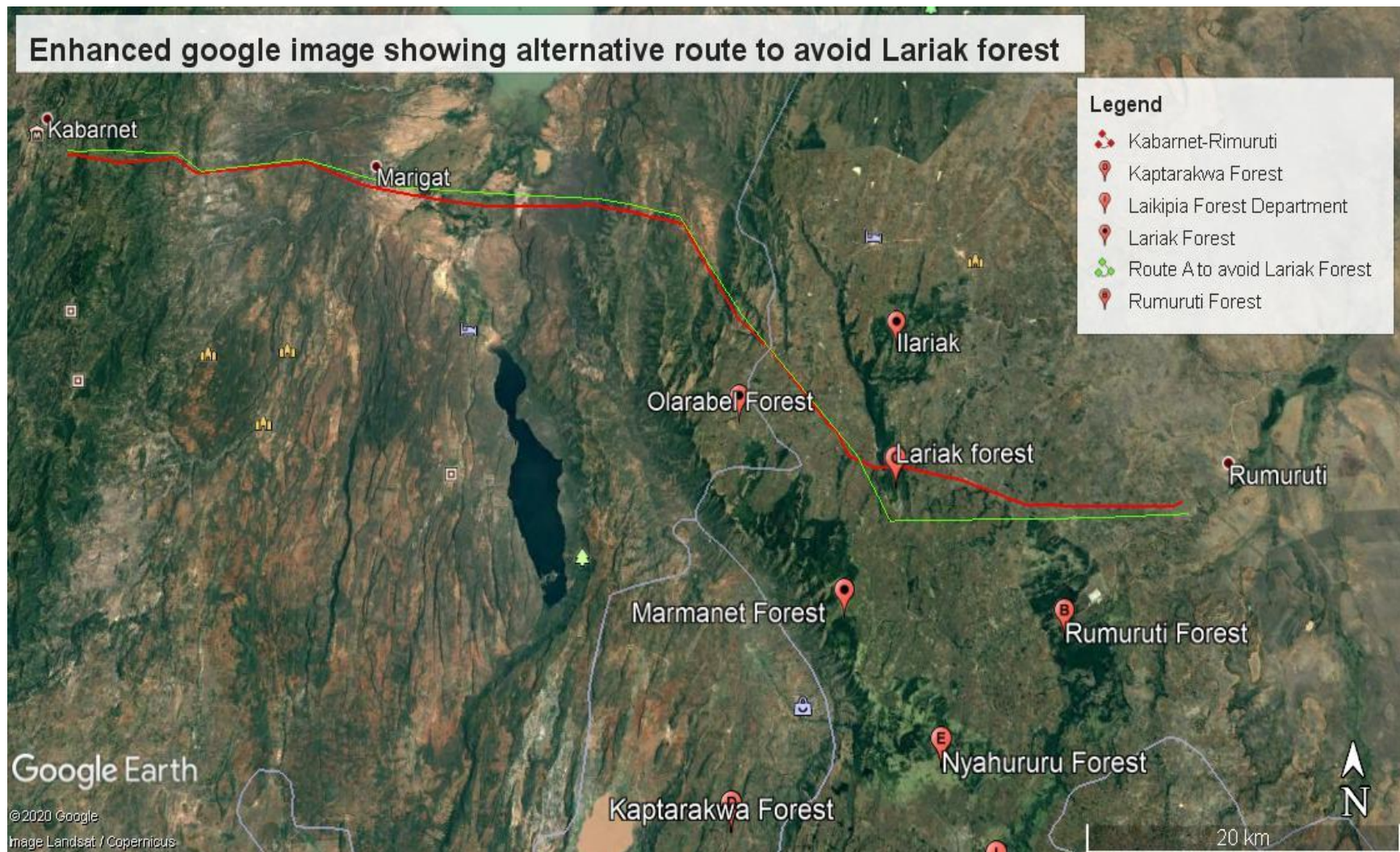


Figure 7-64-. Alter native Route



### **7.3 The Proposed Development Option**

The existing network in Rumuruti and Kabarnet area is characterized by overloaded 33kV feeders which lead to numerous outages and subsequent loss of supply to customers. There is also expected load growth in Rumuruti for new industrial activities (meat processing facility). Kabarnet suffers poor voltage profiles and load shedding due to the long 33KV lines that currently supply the area. Even with the completion of Lessos – Kabarnet. The proposed Kabarnet -Rumuruti transmission line will

1. Increase system reliability by enabling supply of hydro power from the hydros in Mt. Kenya to the Western Kenya region which has limited generation sources.
2. Improve the overall voltage profile and minimizing load shedding.

This desired development option was subjected further to the following criteria to further narrow down on the optimal option considering:

- Evacuation/ Transmission options
- Alternative powerline corridor routes
- Tower designs alternatives

#### **7.3.1 Evacuation/ Transmission options**

##### **7.3.1.1 Single/ Double Circuit Overhead Powerline**

The use of single/ double circuit overhead power lines to transmit electricity is considered the most appropriate technology and has been designed over many years for the existing environmental conditions and terrain as specified by KETRACO Specifications and best international practice. Based on all current technologies available, single/Double circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

- More cost-effective installation costs
- Less environmental damage during installation minimal area is disturbed during construction and operation (maintenance)
- More effective and cheaper maintenance costs over the lifetime of the power line

##### **7.3.1.2 Underground Cabling**

Underground cabling of high voltage power lines over long distances is not considered a feasible or environmentally practicable alternative for the following reasons:

- Underground cabling will incur significantly higher installation and maintenance costs
- It is more difficult and takes longer to isolate and repair faults on underground cables.
- There is increased potential for faulting at the transition point from underground cable to overhead power line.
- Underground cables require a larger area to be disturbed during construction and maintenance operations and hence have a bigger environmental disturbance footprint.



- Underground cabling requires the disturbance of a greater area when it comes to agriculture and other compatible land uses as the entire right of way becomes available for use as opposed to just the area around the towers.

Overhead power lines have been determined to be the most feasible option for the Kabarnet-Rumuruti 132kV line for the following reasons:

- Underground cabling will incur significantly higher installation and maintenance costs given the length of the power line;
- Overhead lines are far quicker and easier to repair should faults occur; and
- Relative to overhead lines, underground cables require a larger area to be disturbed during construction and maintenance operations.

Various options in terms of tower types and designs for the Kabarnet – Rumuruti line were investigated by KETRACO. Based on the characteristics of the project area (i.e. topography, vegetation), it was determined that self-supporting type steel lattice transmission line towers will be utilized for the power line.

### 7.3.2 Alternative Powerline Corridor Routes

In proposing the transmission line route as per coordinated presented in table 32, consideration was given to social, environmental, technical, and financial implications of the project. The transmission line will generally follow open ground with minimum settlement and hence the need for relocation/resettlement has substantially been reduced. The transmission line and substation sites have been located to avoid areas of dense settlement and where impacts on environment and local people e.g., from loss of farmland, grazing land, or environmentally sensitive areas are minimal.

#### 7.3.2.1 Entry to the Kabarnet 132/33 kV Substation

The route used by the consultant during ESIA study proposed that the transmission line is either:

1. Directed to pass over the transformers located within the substation in order to avoid the incoming existing Lessos- Kabarnet transmission line. This is not technically possible as the 132 kV line will have to overfly the substation 33 kV switchyard. Or
2. Oriented to pass over the neighbouring Kasoiyo shopping centre. This was not technically possible due to the high impact on the existing structures and the high compensation costs resulting from the large number of sub-divided land parcels along this route.

Therefore, a reroute was necessitated by the ESIA update team. The team considered cost of construction (EPC), RAP, number of parcels, structures, operation, and maintenance challenges. The EPC cost and RAP for the transmission line was sourced from the LCPCP 2021-2040. The Underground cable cost was sourced from the recent EPC quotation from bidder.

As a result, the ESIA team considered the Four (4) options as detailed below:

- Option 1: Overhead line reroute

This option considers an overhead line reroute towards the Northwest of the substation and approach the station in a North-west orientation. The OHL route is 1.8 km. The resultant total line is 94.43 KM

- Option 2: Overhead line reroute

This option considers an overhead line reroute towards the South-East of the substation and approach the station in a Northwest orientation. The Lessos - Kabarnet line will be rerouted and re-terminated on a new bay in the substation. The OHL route is 1 km. The resultant total line is 93.63 KM. Option 2, OHL reroute into Kabarnet is preferred on EPC cost, maintenance, and RAP consideration.

- Option 3: Original route and underground cable

This option considers the original route with a 150 m underground cable to enter the 132 kV substation and terminate in the substation. The OHL route is 0.8 km.

- Option 4: Overhead reroute and underground cable

This option considers an overhead line reroute towards the Southeast of the substation with a 250 m underground cable to enter the 132 kV substation in a Northwest orientation and terminate in the substation. The OHL route is 0.75 Km

The table below summarises the findings for the 132 kV transmission line entry at Kabarnet

Table 38-Comparison of Rumuruti line entry options at Kabarnet 132/33 kV substation

No	Option	Length (KM)	EPC cost (MKES)	Technical challenge	No of parcels	No of structures	RAP concern	Recommendation
1	OHL Long reroute	1.8	77	None	14	9	Highly populated area	Not preferred as path is in densely populated area.
2	OHL reroute	1	51	Outage of Kabarnet during relocation. The area will look congested as the tower spacing is about 35 meters at the entry	12	2	Possible PDP 1	preferred since it is lowest cost with least RAP effort and displacement impacts
3	Original OHL with cable	0.9	66	Lengthy repair time for cable, likely vandalism	19	20	Highly populated area	Not preferred because of difficulty of obtaining ROW and the disturbance caused in terms of displacement
4	Reroute OHL with cable	1	77	Lengthy repair time for cable, likely vandalism	12	2	None	Not preferred High cost and maintenance difficulty

No	Option	Length (KM)	EPC cost (MKES)	Technical challenge	No of parcels	No of structures	RAP concern	Recommendation
1	OHL Long reroute	1.8	77	None	14	9	Highly populated area	Not preferred as path is in densely populated area.
2	OHL reroute	1	51	Outage of Kabarnet during relocation. The area will look congested as the tower spacing is about 35 meters at the entry	12	2	Possible 1 PDP	preferred since it is lowest cost with least RAP effort and displacement impacts
3	Original OHL with cable	0.9	66	Lengthy repair time for cable, likely vandalism	19	20	Highly populated area	Not preferred because of difficulty of obtaining ROW and the disturbance caused in terms of displacement
4	Reroute OHL with cable	1	77	Lengthy repair time for cable, likely vandalism	12	2	None	Not preferred High cost and maintenance difficulty

**Source: KETRACO ESIA team, 2021**

### 7.3.2.2 Entry to the Rumuruti 132/33 kV Substation

The 132 kV Kabarnet line has to be rerouted as the initial routes was passing through the substation land and approaching the gantry at 0 degrees as opposed to the required 90 degrees

- Reroute between AP 1 and AP2

Three new angle point AP1B, C and D were introduced to avoid a settled area

- Adjustment to AP 21

AP 21 was pushed by 11 metres to avoid encroaching to a road.

- Flood plain area around AP 12 and AP 14

The area was relatively flat. Information from the locals was that the area floods during the rainy season. The line is away from the riparian reserve of the stream. Special tower foundations are thus recommended.

### 7.3.3 Tower Design Alternatives

#### 7.3.3.1 *Alternative 1 (preferred alternative) – Steel Lattice Towers*

A lattice steel pylon is an electricity pylon consisting of a steel framework construction. Lattice steel pylons are used for power lines of all voltages. For lines with operating voltages over 50kV, lattice steel pylons are the form of pylon used most often. Lattice steel pylon is usually assembled from individual parts at the place where it is to be erected. This makes very high pylons possible (generally up to 100 meters-in special cases even higher).

The steel lattice towers provide the following advantages over the other tower types available:

- Enables multipath earthing which enhances the overall electrical performance of the power line.
- Is visually less obtrusive than the mono-pole options
- Is more practicable than other options i.e. more cost effective and more practical to construct and maintain.
- Is safer to work on than the monopole and wood pole structures.
- Is more durable than the woodpole structures

These towers are structurally stable and time-tested solutions and is the **preferred** option.




#### 7.3.3.2 *Alternative 2 – Steel Monopoles*

The steel monopole is considered less suitable than the steel lattice towers for the following reasons:


- Is visually more intrusive than the lattice towers.
- Is more expensive than the lattice towers
- Requires more steel than the lattice towers
- Is more difficult to erect
- Is not as safe to work on as the lattice towers



### 7.3.3.3 : Alternative 3 – Wooden poles

Type of pylon by material used	
<p><b>Wood pylons:</b> Wooden pole structures are only used in extreme circumstances where a visual impact needs to be avoided. For support pylons a straight trunk impregnated with tar is usually used, which carries one or more cross beams with the conductor cables on the top. For anchor pylons constructions looking like a V or an A are used, because these can stand higher forces.</p> <p>Wood pole structures may be cheaper to produce and to construct, but they have one tenth of the lifespan of the metal counterparts and are far more susceptible to weather conditions which makes them less efficient and practicable. The wood pole structure are also more susceptible to having the cross arms burnt off by electrical faults as well as being susceptible to deformation with height.</p> <p>Due to the limited height of available trees, the maximum height of wood pylons is limited (approx. 30 metres).</p> <p>This alternative was considered and <b>rejected</b>.</p>	

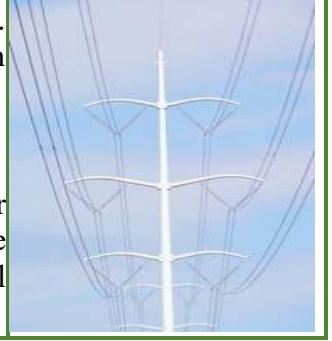
### 7.3.3.4 : Alternative 4 – Concrete pylon

<p><b>Concrete pylon:</b> or concrete pole, is an electricity pylon made from reinforced concrete. Concrete pylons are manufactured at the factory and put up at the power line's right of way. Concrete pylons, which are not prefabricated, are also used for constructions taller than 60 meters.</p> <ul style="list-style-type: none"><li>• Concrete pylons hold several disadvantages, which makes them a less preferred option over steel lattice towers leading to their rejection as a tower design option: Site accessibility and logistics to the site is a critical factor. Difficult terrain poses a challenge in the set-up of this tower type.</li><li>• More difficult to adapt because of the increased height and reinforcement.</li><li>• Cannot see through a concrete pole, which can be an obstacle from a visual standpoint.</li></ul> <p>Concrete weighs significantly more than other structure types.</p>	
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### 7.3.3.5 : Alternative 5– Steel tube pylon

Steel tube pylon: is a pylon, which is manufactured from a steel tube. This type of pylon is generally assembled at the factory and set up on the power line's right of way with a crane.

This alternative was considered and **rejected** due to this particular requirement of using cranes for the pylons' set up. This would prove challenging in steep and hilly sections of the transmission line, as well as increasing the overall construction cost



## 8 ASSESSMENT OF POTENTIAL RISK AND IMPACTS

### 8.1: Introduction

This chapter presents the assessment of the issues likely to arise as a result of implementation of the proposed project and possible mitigation measures. For each issue, the analysis is based on its nature, the predicted impact, extent, duration, intensity and probability, and the stakeholders and/or values affected.

### 8.2: BENEFICIAL IMPACTS

#### 8.2.1: Pre-Construction and Construction Phase

##### 8.2.1.1 *Compensation Benefits*

The construction of the transmission line will lead to acquisition of land and the private land owners will receive cash compensation for loss of land and other assets.

##### 8.2.1.2 *Expected Impact on Poverty Alleviation*

With the implementation of the project, the power supply will be stable and reliable hence more customers will be connected to the system. The people under power supply will engage in income generating activities in order to improve their economic status.

##### 8.2.1.3 *Employment*

The construction of the transmission lines including operation and maintenance activities will provide employment opportunities—directly and indirectly—to skilled as well as unskilled manpower primarily to local manpower. During construction, the project will be beneficial through creation of employment opportunities for the local communities. The income, thus enhanced, of the local skilled and unskilled work force would also bring out a multiplier effect to other sectors of the economy.

##### 8.2.1.4 *Knowledge/Skills Transfer*

Local workers will benefit in terms of knowledge transfer especially from external skilled workers who when paired with the local workers will transfer on-the-job skills to them. Further, local workers may undergo certain training as part of skill enhancement prior to employment.

##### 8.2.1.5 *Local Material Supplies*

Another positive impact of the project involves local material sourcing mainly sale of materials for use in the project. Some of these can be expected to be sourced locally and the rest through

importation. It is expected that the project will generate new income revenues for the local population across the Country in harvesting and transportation of sands, ballast, stones, concrete/wooden poles, and gravel. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy.

### **8.2.2: Operation Phase**

#### **8.2.2.1 *Up Scaling Electricity Access to the Poor***

According to Kenya Power's Annual report and Financial Statements of 30<sup>th</sup> June 2021, electricity access stood at 8,278,203 households. The project will increase electricity access to the residents on the 2 Counties.

#### **8.2.2.2 *Project Health Benefits***

Use of kerosene for cooking and lighting poses health problems as reported by World Bank report 2008 on the Welfare of Rural Electrification. The report notes that kerosene lamps emit particles that cause air pollution; these are measured by the concentration of the smallest particles per cubic meter (PM10). The health risks posed by this indoor air pollution mainly include acute lower respiratory infections, but also low birth weight, infant mortality, and pulmonary tuberculosis. Additionally, available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain and reading in these conditions over long periods of time may have the potential to increase the development of near sightedness (myopia) in children and adults. The project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

#### **8.2.2.3 *Education Benefits***

Access to constant and reliable electricity supply at the household level and schools will create opportunities for children to study. For example, children from homes with electricity have an advantage because they have more time for study and doing homework in the evening as opposed to children from homes without electricity. This benefit will in the end translate to better results.

#### **8.2.2.4 *Improved Living Standard***

Access to stable and reliable electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridges, television sets, washing machines to mention but a few. Use of electricity for lighting implies that the people will not be exposed to smoke arising from use of kerosene lamps which predisposes people to respiratory diseases.

#### **8.2.2.5 *Security***

There will be enhanced security arising from well-lit social, commercial, individual premises and use of electrical surveillance gadgets that use broadband data services. With the implementation of the project, the level of security will improve across the county.

#### **8.2.2.6** *Communications*

Access to reliable electricity will lead to improved communication. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and TV will provide opportunity for people to access a wide range of information which is useful for decision making. Some of information beneficiaries receive include information on markets, farm inputs, livestock and crop management and local affairs, nutrition, diseases, investments and entertainment among others.

#### **8.2.2.7** *Gender Considerations*

Access to modern electricity will go a long way towards alleviating time drudgery spent on activities such looking for firewood and other the daily household burdens of women, giving them more time to spend on productive activities, improving their health and enhancing their livelihoods. Available literature on gender and energy suggests that providing electricity to communities and homes promotes gender equality, women's empowerment, and women's and girls' access to education, health care, and employment. Lighting and television will improve access to information, the ability to study, and extend the effective working day. This is more so because children can have extended time of study. The women will also benefit more due to access of information especially on health and nutrition since they also spend more time at home. The project will also enhance security in the rural areas as most homes will be lit up, a benefit that is more appreciated by women.

#### **8.2.2.8** *Reduced GHG Emissions*

The proposed project may contribute to reduction in Green House Gaseous (GHGs) emissions due to the fact that beneficiaries may not continue to rely on biomass as a main source of energy at the domestic level which leads to felling of trees and hence contributing to the green-house effect.

### **8.3: ADVERSE IMPACTS**

Following a scoping process, this impact assessment was focused on interactions between the Project activities and various resources/receptors that could result in significant impacts.

#### **8.3.1: Pre-Construction Phase**

##### **8.3.1.1** *Land Acquisition and Involuntary Displacement*

The construction of the transmission line will lead to loss of land or restrictions on land use and land-based livelihoods during construction. Potential impacts include: -

- Physical displacement.
- Economic displacement.

## **Baseline Conditions**

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

- The transmission lines cross primarily rural and peri-urban areas where subsistence agriculture and animal husbandry are predominant. Other economic activities such as small-scale trading/street vending, informal temporary jobs (including farm labour, construction-related work, etc.), informal businesses, and employment in the public sector, are also observed in the peri-urban areas.
- Small-scale agriculture of seasonal crops and some permanent crops as well as animal husbandry activities are mainly practiced for self-consumption and small-scale commerce of surplus agricultural production.
- Most families in rural areas have animals that are free to roam around settlements, mainly chicken, goats, pigs, and ducks for subsistence.
- Charcoal and wood are the main sources of energy for cooking in the settlements
- Vulnerable groups include households with particularly low incomes and high land dependency for subsistence and income generation. These households can be found throughout the Study Area and are prevalent in the rural settlements where agriculture is the primary livelihood activity. Households with disabled and elderly household members as well as female or child-headed household are also particularly vulnerable to potential loss of livelihoods related to land access restrictions.
- The average parcel size was reported to be less than 5 acres. Households may share the use of different plots to grow different crops.
- In urban/peri-urban areas, land access is less dependent on inheritance and is generally transferred through sale
- Physical structures found along the Study Area mainly includes residential houses and business structures (beehives). Most houses are mud walled with fewer being built with concrete block. Block houses are mostly found in established urban and peri-urban settlements.

## **Impact Assessment – Pre-Construction**

### **Loss of Livelihoods as a result of Loss of Agricultural Resources.**

The loss of agricultural land, grazing land agricultural crops, and beehives (livelihood sources) (PAPs practise crop production and animal husbandry) will be as follows:

- Temporary tower site working areas inside of the 30m Overhead Transmission line (OHTL) RoW:
- Temporary loss of access of land for the establishment of the temporary tower sites working areas (average 40m x 50 m). These construction sites will be located entirely inside the 30m OHTL RoW.
- Permanent loss of access to land in the 30m OHTL RoW.
- Removal of all trees and crops.

The loss of access to land associated with the 30m OHTL footprint corridor, temporary tower sites working areas, and maintenance corridor will result in the loss of land used for seasonal crops, removal of trees, and restrictions to animal grazing. With respect to animal grazing activities, potential impacts during the construction phase stem from farmers having restricted access to grazing land due to the establishment of the tower sites working areas and access roads.



Regardless of the fact that animal grazing is usually undertaken over a wide area; affected farmers will be compensated in line with the AfDB's OS 2 on involuntary resettlement. In the case of land compensation, KETRACO will ensure to provide land with higher or equal productive potential and locational advantages-

The total size of land to be acquired by the project to include area for erecting the transmission line as well as RoW is approximately **694.67** acres in size based on the Resettlement Action Plan report (see separate report) which was prepared based on the ESIA scoping that determined the likelihood of involuntary resettlement and recommended development of RAP report. Land losses in terms of severity will be experienced in the following sub-locations namely Muhotetu, Kiambugo, Melwa, Kipkoech, Kituro, Eldume, Logumgum, Kapkechir and Kasiela where the number of PAPs losing land is significant. The number of PAHs losing over 90% of their land is only 5% of the number of PAPs. The loss by the PAPs is mostly economic in terms of displacement accounting for over 90%, with physical displacement accounting for only 10%. The project will adversely affect **78** households (62 Male-led Household heads, 16 Female-led households) consisting of **562** individuals (PAPs) and 2 public institutions.

The PAHs along the proposed project route include those with formal rights to land (private landowners mainly in Laikipia County) and those who do not have formal rights (communal landowners mainly in Baringo County) to the land but either own structures or trees and crops and beehives. The proposed transmission line route has been designed by KETRACO to avoid the displacement of physical structures to the extent possible. The proposed route avoided densely populated settlements, town centres, schools, churches and market centres hence significantly reducing the number of structures within the 30m ROW. These structures include a mix of residential and non-residential structures, farms, animal shelters, and commercial buildings.

**Table 39-Pre-Mitigation Impact Assessment- Land Acquisition and Involuntary Displacement**

Impact				
Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land during construction				
Impact Nature	Negative	Positive		Neutral
	The temporary land take during construction activities may lead to a temporary loss of livelihoods and household income.			
Impact Type	Direct	Indirect		Induced
	Potential loss of livelihoods and household income due to a direct interaction between the Project (i.e., land taken) and land users/owners.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The majority of the construction land take will be reinstated after construction (18-24 months). Permanent impacts are expected on livelihoods related to fruit trees removal in the 30 m OHTL footprint corridor.			

Impact Extent	Local		Regional		International	
	Impact limited to the Study Area					
Impact Scale	Total land required for the project in the construction phase (695ha).					
Frequency	The impact is expected to be continuous over the 18-24 months of construction. Some permanent impacts such as the restriction will also extend to the operation phase.					
Impact Magnitude	Positive	Negligible	Small	Medium	Large	
	Based on the parameters above and the embedded measures in place to minimize land take and land clearance the magnitude is considered small.					
Resource/ Receptor Sensitivity	Low	Medium		High		
	The sensitivity of the receptors is considered high considering the dependence on agriculture as a main source of livelihood in the area.					
Impact Significance	Negligible	Minor		Moderate		Major
	Considering the magnitude is small and sensitivity is high, the impact on livelihoods and household income during construction activities is considered of Moderate significance.					

**Source: EMC Consultants, 2019**

#### 8.3.1.2 Displacement of Physical Structures and Potential Resettlement (Pre-Construction)

The proposed transmission line route has been designed by KETRACO to avoid the displacement of physical structures to the extent possible. The proposed route has reduced the number of sensitive receptors at risk of removal inside the 30m OHTL footprint corridor. From the RAP approximately **325** structures will be affected. These structures include a mix of residential and non-residential structures, farms, animal shelters, and commercial buildings.

Considering the measures in place to minimize the number of structures at risk of being physically resettled, the magnitude of the impact is considered **medium**. The receptors sensitivity is considered **high** given the low incomes and presence of households with disabled and elderly household members as well as female or child-headed households. Impact significance is therefore considered **Major**.

**Table 40-Pre-Mitigation Impact Assessment- Displacement of physical structures and potential resettlement**

ImpactDisplacement of physical structures and potential resettlement during construction					
Impact Nature	Negative		Positive		Neutral
	The temporary land taken during construction activities may lead to the permanent relocation of residential and non-residential structures.				
Impact Type	Direct		Indirect		Induced
	Potential relocation of physical structures and potential loss of employment and livelihoods related to economic structures due to a direct interaction between the Project (i.e., land taken) and land users/owners.				
Impact Duration	Temporary		Short Term	Long Term	Permanent
	Although land take for construction is temporary, the displacement of physical structures is considered permanent.				
Impact Extent	Local		Regional		International
	Impact limited to the Study Area.				
Frequency	The impact is expected to be a one-time impact occurring before the start of construction activities.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the measures in place to reduce the number of physical structures at risk of displacement, the magnitude is considered to be medium.				
Resource/ Receptor Sensitivity	Low	Medium		High	
	The sensitivity of the receptors is considered high given the low incomes and presence of households with disabled and elderly household members as well as female or child-headed households				
Impact Significance	Negligible	Minor		Moderate	Major
	Considering the medium impact magnitude and medium sensitivity of receptors, the impact related to the displacement of physical structures is considered to be of major significance.				

Source: EMC Consultants, 2019

## **Mitigation Measures**

### **Pre-Construction**

As introduced previously, the main embedded measures for land and livelihood related impacts developed by KETRACO were first delivered through avoidance through detailed routing and design which was aimed at: -

- Avoiding or minimizing the number of towers sites working areas in agricultural areas or areas of community resources.
- Minimizing clearance of the maintenance road as in some cases clearance may not be necessary since other access roads are available.
- Minimizing as far as possible tree cut-off and tree trimming in the temporary tower sites working areas.

In addition, KETRACO has developed a Resettlement Action Plan (RAP) to ensure that Project Affected Persons (PAPs) receive adequate compensation for the loss of land, crops and related loss of income and, when required, are provided with access to alternative land of equal productivity. Compensation will also take into account the investment required to prepare new agricultural plots (for alternative land) and to return the reinstated land to initial productivity levels for seasonal and permanent crops. In addition, all affected structures will be compensated for owners to re-establish them out of the RoW. The objectives of the RAP are as follows:

- To provide compensation for loss of assets at replacement cost and for the loss of income opportunities from seasonal and permanent crops. This also includes community-level compensation for the loss of community resources inside the 30m footprint corridor and related livelihood and subsistence losses.
- To provide compensation for PAPs who lose their pasture grounds or are restricted from grazing grounds due to project activities
- Ensure that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- Resolve conflicts related to land ownership by supporting PAPs resolve succession related conflicts, supporting registration process for unregistered community land for PAPs in community owned land and converting group ranch land into community land in accordance with Community Land Act 2016 in order to facilitate smooth compensation and relocation. Engage a legal consultant to support in resolution of succession cases; support grievance redress committees to resolve land related conflicts etc.
- Improve or, at a minimum, restore the livelihoods and standards of living of displaced persons to pre-project levels, so as to facilitate sustainable improvements to socio-economic status (including the provision of alternative land for cultivation with equal or better soil productivity, and the provision of improved replacement housing). The provision of improved assets and alternative land constitutes a positive outcome that contributes to offsetting the inconvenience and disturbance and potential risk to livelihoods of the economic and physical displacement.
- Pay particular attention to the needs of vulnerable groups, identifying additional compensation and livelihood restoration measures as necessary.

## Operations

### Permanent Loss of Livelihoods and Household Income Due to Permanent Land Restrictions

The following restrictions will apply during operations to ensure access for the maintenance of the transmission lines and towers:

- Crop trees: planting of trees is not allowed inside the 30 m footprint corridor.
- These restrictions will result in reduced areas available for cultivation and other livelihoods.
- The permanent land take and restrictions to trees is a direct negative impact which is permanent in nature. The amount of land where restrictions will apply are relatively small in the overall context of the land around the settlements. Given the verbal confirmation of local leaders that adequate replacement land is available the magnitude of the impact is considered low. Receptor sensitivity is considered high considering the level of dependence on agriculture as the primary source of subsistence and livelihoods. The potential impact is therefore considered moderate.

**Table 41-Pre-Mitigation Impact Assessment- Permanent Loss of Livelihoods and Household Income during operations**

Impact	Permanent Loss of Livelihoods and Household Income during operations			
Impact Nature	Negative	Positive		Neutral
	The permanent land restrictions will lead to a permanent loss of livelihoods and household income. Permanent restrictions to the planting and cultivation of crop trees in the 30m footprint corridor may also result in livelihood losses considering the amount of time and money required for new crop trees to bear fruit and reach maturity.			
Impact Type	Direct	Indirect		Induced
	Potential loss of livelihoods and household income due to a direct interaction between the Project (i.e., land taken and restrictions) and land users/owners.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The loss of livelihoods and income associated to the restrictions for operation activities is considered to be permanent during the project operational life.			
Impact Extent	Local	Regional		International
	Impact limited to the Study Area			
Impact Scale	The scale of the impact is considered low as the amount of land where restrictions will apply are relatively small in the overall context of the land around the settlements.			

Frequency	The impact will be felt continuously throughout the 50 years of operation as the restrictions will apply throughout.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and the relatively small amount of land permanently required for the project, the magnitude is considered small.				
Resource/ Receptor Sensitivity	Low		Medium	High	
	The sensitivity of the receptors is considered high given the levels of dependence over agriculture for subsistence and livelihoods and their vulnerability to potential losses of livelihoods.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the magnitude and sensitivity are small and high, the impact on livelihoods and household income during operation activities is considered to be of moderate significance.				

Source: EMC Consultants, 2019

## Mitigation Measures

### Operations

Impacts during the operations phase will be managed by KETRACO as operator of the line. Mitigation measures will include the following:

- Responsibilities will include monitoring and providing the necessary follow-up to support households to restore their livelihoods throughout the operations phase.
- The grievance mechanism established during the construction phase will be maintained during operations to ensure that local communities and stakeholders have an adequate channel to voice concerns.

### Residual

Provided the above mitigation measures are implemented, the residual impact related to temporary land taken during construction and permanent restrictions and land take during operations is reduced to **minor** levels.

**Table 42-Residual Impact Significance**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Temporary loss of livelihoods and household income as a result of temporary land take and loss of access to land	Construction	Moderate	Minor
Physical displacement of PAPs during construction	Construction	Major	Minor



Permanent loss of livelihoods and household income due to permanent land take and restrictions	Operation	Moderate	Minor
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Source: EMC Consultants, 2019

### 8.3.2: Construction and Operations Phase

#### 8.3.2.1 Construction Air Pollution Impacts

Air pollution during construction include gaseous and dust emissions which may have an impact on air quality. Project activities that have potential to impact air quality include emissions of air pollutants from temporary power generators, construction equipment and vehicles. The construction of the transmission line will entail the use of motorized machinery and vehicles which will lead to air pollution which will impact human health and the environment in general. Pollutants from motorised equipment during construction will include:

1. CO – Carbon monoxide;
2. HC–unburned hydrocarbons generated through combustion processes and fugitive fuel evaporation, including benzene, a known carcinogen;
3. CO<sub>2</sub> - Carbon dioxide;
4. NO<sub>x</sub>– Nitrogen oxides including NO<sub>2</sub> - nitrogen dioxide and NO – nitric oxide;
5. PM<sub>10</sub> – fine particulate matter including soot/black; and
6. Sulphur dioxide (SO<sub>2</sub>): SO<sub>2</sub> is of concern because of its impacts on health and vegetation.
7. Dust is defined as all particulate matter up to 75 µm in diameter and comprising both suspended and deposited dust, whereas PM<sub>10</sub> is a mass fraction of airborne particles of diameter 10 µm or less. Dust and PM<sub>10</sub> emissions arise from a number of sources, so both construction activities and emissions from vehicles associated with the construction site need to be considered.

Construction vehicles are generally fueled with diesel, and thus, SO<sub>2</sub>, PM<sub>10</sub>, NO<sub>x</sub>, VOC and CO emissions are expected to occur along the route. In addition to these mobile source emissions, there will be also stationary emissions from the activities in the camp site (if decided upon by contractor). These emissions will be mostly due to power generations in diesel generators if used. Most site equipment (bulldozers, diggers, etc.) can be considered as similar to medium or heavy-duty trucks. Vehicles are used for the transport of materials and equipment on and off site as well as carriage of personnel to and from site using minibuses and cars. Since the project construction phase duration will be about 18-24 months long, air quality impact generated from these activities will not be static. Although the general terms of the construction of phases are similar, their application locations will follow each other. The quantities of motorized equipment (trucks, excavators) etc. will be minimal due to the short length of the transmission line. In addition, quantities of material to be loaded and unloaded, number and type of construction equipment and machinery all which are contributors to air emissions are also expected to be minimal due to project limited scope and footprint.

The above pollutants are only likely to be significant where coal or heavy fuel oil are in use. As these fuels will not be used for the Project, significant impacts on air quality from these pollutants

are therefore considered unlikely. The above pollutants are of concern due to the adverse effects on human health and natural ecosystems in the local environment.

Construction activities will also create dust in particular where vehicles are using unpaved roads close to properties and agricultural areas. Dust emitted from excavation, earth moving, loading, handling, and transportation of materials. Dust deposition from road traffic is not likely to be a more significant issue than exhaust emissions, as many of the roads used by construction vehicles are paved. The construction of the proposed transmission line has the potential to cause emissions of dust Total Suspended Particles (TSP) from land clearing, earthworks, movement of vehicles over unpaved surfaces and roads, handling of friable materials etc. These sources have the potential to increase ambient concentrations of particulate matter, resulting in nuisance at nearby settlements and to affect crops and natural vegetation through dust deposition.

**Table 43-WHO reference standards and guidelines for NO<sub>x</sub> PM, SO<sub>x</sub>.**

Parameter	WHO Air Quality Guidelines
Sulphur Dioxide, SO <sub>2</sub>	20 µg/m <sup>3</sup>
Nitrogen Oxides, NO <sub>x</sub> as NO <sub>2</sub>	200 µg/m <sup>3</sup> (1hr)
Suspended Particulate Matter	200 µg/m <sup>3</sup>
PM <sub>10</sub>	100 µg/m <sup>3</sup>
PM <sub>2.5</sub>	25 µg/m <sup>3</sup>
Ozone	100 µg/m <sup>3</sup>

Source: World Health Organisation

## Baseline Conditions

### Pollutant Levels

Based upon the potential impacts, the pollutants of interest are oxides of Nitrogen, and particulate matter. Baseline dust and PM<sub>10</sub> is influenced by a wide range of emissions, including man-made and natural sources. Along the route it is anticipated that there will be locations where the dust and PM<sub>10</sub> baseline is elevated and close to and frequently above air quality standards due to existing levels of human activities including vehicle traffic. This includes the urban areas and in settlements where there are unpaved roads, at individual properties close to unpaved roads and properties close to agricultural activities. On this basis, the baseline dust and PM<sub>10</sub> airshed is considered to be degraded but only on a localized basis.

NO<sub>2</sub> is emitted from combustion sources, and these are almost exclusively man-made. In the absence of significant local sources, NO<sub>2</sub> concentrations are not expected to approach or exceed air quality standards. On this basis, existing levels of NO<sub>2</sub> will be below air quality standards throughout the route and the airshed is considered to be undegraded. The net impact of the project on air quality is not significant and temporary and will be limited to construction period.

### Receptor Sensitivity

The sensitivity of receptors in the Area of Influence are defined as follows: For sensitive human receptors:

- High locations where there are particularly vulnerable receptors, including hospitals with high dependency and intensive care wards;
- Medium locations where people are generally present permanently, including dwellings, schools and settlements; and
- Low—where people are only present for short periods, such as agricultural areas and fishing areas.

For sensitive ecological and agricultural receptors:

- High—habitat sites with international designations, such as Ramsar sites;
- Medium—habitat sites with statutory national protection, and sites where agricultural activities are producing particularly sensitive crops, such as fruit or green vegetables; and
- Low—local or national habitats sites with no statutory protection, and other agricultural areas

Based on a review of the proposed route and the access roads the following specific sensitivities have been identified:

- Sensitive human receptors are defined as Medium where there are permanent settlements of dwellings, and low elsewhere; and
- Sensitive ecological and agricultural receptors are defined as **Low** in all locations, as there are no protected habitats with the exception where the line crosses protected Lariak Forest all in Baringo County.

The transmission line is not within close proximity of key sensitive receptors including educational and health facilities therefore, the emissions from the construction activities are not expected to significantly affect such sensitive receptors.

## **Impact Assessment**

### **Exhaust Emissions**

No detailed traffic data is available at this stage. However, the numbers of Heavy-Duty Vehicles (HDV) and Light Duty Vehicles (LDVs) are expected to be well below the thresholds for potentially significant impacts. On this basis, the magnitude of impacts associated road traffic exhaust emissions are predicted to be Negligible. Combined with the Medium and Low receptor sensitivities identified the overall significance of impacts is Negligible at all locations.

### **Dust and PM10**

These are the potential for impacts to arise from:

- Traffic on unpaved roads;
- Earthworks;
- Construction activities; and
- Track out

The Project will generate traffic on unpaved roads close to dwellings and within settlements. As this is expected to be more than five HDVs/day, and at some locations for more than four weeks, the magnitude is large. The Project will require earthworks along the length of the route. These works will include stripping vegetation from the route, construction of access roads and the route

haul track, excavations for the concrete bases for the pylons. Due to the scale of these activities, the Magnitude is Medium. Due to this, the Magnitude is Negligible.

The exact number of HDVs that will be generated is unknown. However, this is expected to range from 10 to 15 HDVs per day category using unpaved site roads. On this basis, the magnitude of trackout is medium. Combined with the Medium and Low receptor sensitivities identified the significance of unmitigated impacts is:

- Traffic on unpaved roads is **Major** where there are receptors within 50m of unpaved roads used by construction traffic, or the haul route.
- Earthworks are **Major** where there are receptors within 350m of locations where earthworks are being undertaken, including route stripping, construction compounds and excavations;
- Construction activities are **Negligible** at all receptors; and
- Track out are **Major** at receptors within 50m of routes used to access the construction route where these are within 500m of the access point to the route or construction compounds.

On this basis there is a need for mitigation to be implemented to reduce dust emissions/impacts.

**Table 44-Pre-Mitigation Impact Assessment- Degradation of the Airshed during Construction**

Impact		Degradation of the Airshed during Construction			
Impact Nature	Negative	Positive		Neutral	
	Increase in airborne pollution.				
Impact Type	Direct	Indirect		Induced	
	Impact is a result as a direct interaction between project activities and the environment along the footprint of the project.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is expected to be temporary as emissions arise throughout the construction phase.				
Impact Extent	Local	Regional		International	
	The impact will arise locally in the footprint of the project and immediate surrounds. Impacts will also arise further afield close to unpaved public roads used to access the work sites during construction.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Intermittent – impacts will typically only arise during working hours				
Likelihood	Inevitable				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				

Resource/ Receptor Sensitivity	Low	Medium		High
	The sensitivity of human receptors is Medium in dwellings and settlements, Low elsewhere. The receptors of agricultural activities is Low.			
Impact Significance	Negligible	Minor	Moderate	Major
	Dust emissions have the potentially to have Major significant impacts at nearby sensitive human receptors.			

Source: EMC Consultants, 2019

### Mitigation Measures

Mitigation measures are split into general considerations for all construction activities, and specific mitigation measures for traffic on unpaved roads, earthworks and track-out. As general measures for all locations:

- Develop a Dust Management Plan;
- Record all dust and air quality complaints, identify cause (s), take appropriate measures;
- Liaise with local communities to forewarn of potentially dusty activities;
- Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring
- Undertake inspections to ensure compliance with the Dust Management Plan;
- Plan potentially dusty activities so that these are located as far from receptors as feasible;
- Erect solid screens if feasible around stockpiles and concrete batching;
- Avoid run off of mud and water and maintain drains in a clean state;
- Remove dusty materials from site as soon as possible if not being re-used. If being re-used, cover or vegetate if possible;
- Impose speed limits on haul routes and in construction compounds to reduce dust generation;
- Minimise drop heights when loading stockpiles or transferring materials; and
- Avoid waste or vegetation burning.

To mitigate against exhaust emissions, the proponent/contractor shall ensure: \_

- Idling of vehicles is prohibited
- Regular maintenance of plant and equipment
- Use serviceable vehicles and machinery to avoid excessive smoke emission

For traffic on unpaved roads:

- Undertake watering to attenuate dust near sensitive receptors. The duration and frequency of this should be set out in the **Dust Management Plan** and will consider water availability and any stakeholder grievances; and
- On unpaved roads in use for more than 1 month, consider use of surface and sealants to reduce the use of water and water trucks. Use of lignin-based sealants recommended due to low environmental toxicity.

For earthworks:

- Revegetate exposed areas as soon as feasible

- Revegetate or cover stockpiles if feasible;
- Expose the minimum area required for the works and undertake; and exposure on a staged basis to minimise dust blow.

For trackout:

- Where trackout is onto paved roads, use wet road cleaning methods to remove dirt and mud build up;
- Avoid dry sweeping of large areas; and
- Where feasible, undertake wheel washing and vehicle clean down prior to accessing public roads.

### Decommissioning Air Pollution Impacts

Air pollution during decommissioning include gaseous and dust emissions from temporary power generators, equipment and vehicles. The pollutants include Carbon Dioxide (CO<sub>2</sub>), Volatile Organic Compounds (VOC), carbon monoxide (CO), Nitrogen Oxides (NO<sub>2</sub>) and particulate matter (PM). Excavation, earth moving, loading, handling and transportation of materials will also give rise to fugitive dust. The significance of the impacts on air quality from the decommissioning activities is considered minor. The numbers of vehicles and mobile equipment are expected to be well below the thresholds for any significant impact associated with traffic exhaust emissions. The traffic management plan developed during construction will be used during this phase. The impact on air quality is predicted to be negligible.

### Residual Impact

The residual impacts associated with road traffic exhaust emissions are **Negligible**. With the implementation of suitable mitigation and with adequate monitoring, residual impacts associated with dust and PM<sub>10</sub> from construction activities are **Negligible**.

**Table 45-Residual Impact Significance- Degradation of the Airshed during Construction**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Dust and PM 10 from construction activities.	Construction	<b>Major</b>	Negligible

Source: EMC Consultants, 2019

#### 8.3.2.2 Noise Emission and Vibration Impacts

Potential noise impacts may arise as a result of the construction activities associated with the transmission line. There will be risks and impact of noise and vibration resulting from the construction equipment and machinery on people. Potential sources of noise and vibration during construction will include clearing and grubbing of the transmission corridor, excavations, earthmoving, construction traffic etc. Construction activities and equipment are not expected to result in significant levels of vibration. Equipment that might cause high levels of vibration (such as impact piling or vibratory compaction) will not be used. There are very minimal chances of blasting taking place during the construction phase, but in the event that blasting is done in



rocky areas during tower foundation excavation, the contractor will comply with Environmental Management and Coordination (Excessive Noise & Vibrations) Regulations, 2009. The equipment used in construction will generate minimum noise during construction of the transmission lines and will not adversely affect communities and fauna.

It is expected that existing access roads can be utilized. Before construction begins, it may be necessary to carry out maintenance work on these roads. Typically, this would involve minor re-grading using a grader. This is not expected to give rise to significant noise impacts and has therefore been scoped out of further assessment. Few if any new access roads will be required. Where required, basic access tracks will be established to each structure position by moving obstacles such as rocks, levelling high points and filling in holes. This is not expected to give rise to significant noise impacts and has therefore also been scoped out of further assessment.

### **Baseline Conditions**

The ambient noise environment at settlements along the transmission line corridor is influenced by activities within settlements including people activities, animals (such as birds), occasional cars, vegetation blowing in the wind, and weather (wind, rain). The noise baseline survey conducted for the ESIA determined that daytime noise levels, LAeq, were generally low and in the range 35 to 41 dB. Noise monitoring was not carried out during the night as significant night-time noise effects from the construction and operation of the Project are not expected.

The transmission lines extend approximately 95km in total. Concrete foundations will be used to support the steel lattice tower structures, which will be installed using a mobile crane. A sound power level of 105 dB (A) has been assumed for the noisiest phase of construction, which is expected to be foundation works. This includes a concrete mixer truck, a tracked mobile crane, a compressor, and a poker vibrator working simultaneously.

When assessing effects from noise, impact significance is not determined in the same way that it is for most other technical disciplines i.e., using a matrix of impact magnitude and receptor sensitivity. Consideration of receptor sensitivity is made at the start of the assessment, and impacts are only assessed where sensitive receptors are identified. Receptor sensitivity is represented by impact criteria determined by reference to appropriate standards or guidelines. The significance of an impact is derived from the impact magnitude but takes account of other factors such as the duration of the impact and the design of the receptor.

Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009 provides acceptable permissible noise levels for construction sites as shown in table 52 below

**Table 46-Maximum Permissible Noise Levels for Construction Sites**

Facility		Maximum Noise Permitted (Leq) in dB(A)	
		Day	Night
	Health facilities, educational institutions, homes for disabled etc.	60	35
	Residential	60	35
	Areas other than those prescribed in (i) and (ii)	75	65

Source: Environmental Management & Coordination (Excessive Vibration & Noise) Regulations, 2009

### Time Frame

**Day: 6.01 a.m. – 8.00 p.m. (Leq, 14h)**

**Night: 8.01 p.m. – 6.00 a.m. (Leq 10h)**

The transmission line is not within close proximity of key sensitive receptors including educational and health facilities as well as residential areas and therefore, the emissions from the construction activities are not expected to significantly affect such sensitive receptors.

### Impact Assessment

#### Construction

Although the overall construction program may last for up to 18-24 months, construction works to install each tower will affect individual Noise Sensitive Receptors (NSRs) for approximately one month. Installation work will be carried out during the day only. Noise levels exceeding the daytime criterion for a medium magnitude impact are predicted at distances of 19m or less. However, the predictions conservatively assume all equipment will always be located at the closest part of the site to the receptor which is unlikely to be the case in practice. In addition, contractors are required to safeguard the work site to protect the safety of people and animals which may include erecting a temporary fence around the site. Most towers will be located well away from such that impacts would be negligible. Small magnitude impacts of minor significance may affect a small number of the closest receptors during the daytime only.

**Table 47-Pre-Mitigation Impact Assessment- Noise during Construction**

Impact		Noise during Construction	
Impact Nature	Negative	Positive	Neutral
	Elevated noise levels from operation of construction equipment.		
Impact Type	Direct	Indirect	Induced
	Impact is a result of noise generated by construction activities.		

Impact Duration	Temporary	Short Term	Long Term	Permanent
	Impacts are expected to be short term (up to one month) at any individual NSR in the vicinity of a proposed steel lattice tower worksite			
Impact Extent	Local	Regional	International	
	The impact will be limited to the NSRs within the immediate surrounds of each tower worksite.			
Impact Scale	Local			
Frequency	Impacts may occur during daytime periods over a short-term duration at each tower worksite.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the above the impact magnitude is considered negligible to small.			
Resource/ Receptor Sensitivity	Low	Medium	High	
	Dwellings are considered to have a high sensitivity to noise.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the impact magnitude is small to negligible and the sensitivity is high, the overall significance is considered to be negligible to minor.			

Source: EMC Consultants, 2019

There will be noise and vibrations generated during the construction phase, but it will be typical of any construction site, unless where blasting will be needed. The noise impact during construction is expected to be negative and short-term. The major receptors are expected to be the construction workers as well as any immediate neighbouring residential premises. Sources of noise will be trucks and the off-road vehicles in transit, use of compressor to break hard ground and the use of motorized chain saws for vegetation clearing. The noise from the project vehicles is only significant in areas where the proposed line passes through dense settlements such as close to the towns' neighborhoods. The noise from compressors will only be significant where hard ground-breaking is carried out close to settlements. Noise from the motorized chain saws will only be experienced in the wooded areas but it will not be a significant impact since the density of settlements is not very high. Impacts of noise include noise-induced hearing loss for the project employees and nuisance for the affected settlements.

### Operation

During the operational phase, high voltage overhead power transmission lines can generate noise by a phenomenon known as 'corona discharge'. The associated noise levels are weather related, and the transmission lines are normally quiet during dry weather with corona noise sometimes

occurring during wet weather conditions. However, ambient noise levels also increase significantly during periods of rain. This increased ambient noise level is expected to mask effects from corona discharge noise and this impact has been scoped out of further assessment.

### **Mitigation**

Mitigation measures are set out below, which have been assumed for the base case assessment. They are assumed to result in a 5 dB (A) reduction in the overall noise from construction plant teams. The following standard mitigation measures will be employed:

- Siting noisy equipment as far away as possible from NSRs, and use of barriers (e.g., site huts, acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever practicable;
- Where practicable noisy equipment will be orientated to face away from the nearest NSRs;
- Working hours for significant noise generating construction work (including works required to upgrade existing access roads or create new ones), will be daytime only;
- Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable;
- Where practicable, stationary equipment will be located in an acoustically treated enclosure
- For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also, that the doors close properly against the seals;
- Throttle settings will be reduced, and equipment and plant turned off, when not being used;
- Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked; and
- Fitting of mufflers or silencers of the type recommended by manufacturers

In the event blasting is carried out during construction process to create foundations for the pylons in rocky sections, it is a contractual obligation for the contractor and KETRACO to protect the communities from these impacts and restore the sites upon closure. The following mitigation measures will be employed:

- The contractor must ensure a licenced blasting contractor is engaged to carry out the blasting activities.
- A reconnaissance study must be carried out prior to any blasting work commencing within the area. The study shall determine the proximity of buildings within the blast radius, which must be assessed for any visible cracks, with the length of these cracks measured and recorded.
- All requisite permits from the Department of Mining and Geology, NEMA and county government in Baringo and Laikipia counties must be obtained prior to the blasting activity.
- The neighboring communities in and around the blasting radius must be notified at least 14 days prior to the blasting activity.
- The area must be well barricaded during the blasting exercise. All blasting explosive and materials must be stored in a restricted area when on site.

- The blasting exercise must be carried out between 8am and 5pm.
- After the blasting exercise, a second study should be done to investigate damage/elongation of cracks in the buildings measured prior to the blasting. The contractor should cover any damage done to buildings if any.
- All blasted rock materials should be disposed off the site in accordance to the developed Waste management plan and Waste management regulations, 2006

### **Decommissioning Noise Emission and Vibration Impacts**

Potential sources of noise and vibration include excavations, earthmoving, and traffic. The equipment generates noise levels below values that will adversely affect communities and fauna. To further minimize exposure to noise, work will be carried out during the day only. The significance of the noise impacts during decommissioning has been rated as negligible.

### **Residual Impact**

Standard mitigation measures listed above have been assumed for the base case noise assessment. No impacts above small are predicted and therefore no further mitigation is required. Consequently, the residual impacts are the same as those presented above.

**Table 48-Residual Impact Significance-Noise during Construction**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Noise from construction activities affecting nearby dwellings	Construction	Minor	Minor

**Source: EMC Consultants, 2019**

#### *8.3.2.3 Soil Erosion and Contamination Impacts*

Construction activities will have direct physical impacts to soil. Possible direct physical impacts to soil include erosion resulting from activities such as excavation of foundations for electricity pylons, clearing of vegetation for infrastructure such as roads, laydown areas, construction zones and workers camp (if applicable).

The excavation of soil for the construction of pylon foundations will disrupt the soil cohesion and also may result in surplus soil due to the use of concrete for the foundation. If not properly restored or managed, this soil may erode and wash into nearby surface water bodies adversely impacting these. Any temporary soil stockpiles established during construction of infrastructure will be at risk of erosion from wind and rainfall. Impacts to soil from unplanned events, such as accidental release of hazardous materials is discussed elsewhere.

### **Baseline Conditions**

The potential for soil erosion to occur during the construction phase is based on a number of factors including the type and physical properties of soil, the topographic slope, the vegetation cover, and the nature and duration of construction activities which disrupt the soil.

The proposed transmission line traverses the 2 Counties, which is characterized by different soil types as reflected in the baseline description chapter. The sensitivity to erosion of soils along the proposed transmission line depends on the type and properties of the soils.

### **Impact Assessment**

The excavation of foundations and the construction of temporary roads and equipment laydown areas will have a direct negative effect on soil cohesion, thereby increasing the risk of erosion along the entire footprint of the project. The impact is likely to occur, but the extent of the impact is likely to be limited to the footprint of the activities, particularly the construction and use of access roads, laydown areas (i.e., local extent).

The impacts of construction activities on soil erosion are anticipated to last for the duration of the construction phase only (i.e., short term). Given the subtropical location of the Project and the nature of vegetation present, it is anticipated that cleared areas will revegetate naturally and relatively quickly (assuming rainfall patterns similar to the current averages persist), minimizing the risk of erosion.

During construction there is the potential for spills of fuels and oils during construction activities, fueling, maintenance of machinery and vehicles. Spills could occur in a number of locations along the transmission line RoW. Spills have the potential to affect terrestrial environments and could lead to the deterioration of soil, water, and sediment quality. This could lead to knock on effects for flora and fauna and local community users.

If hazardous materials such as fuel were to be released to the soil and surface water resources, this would be limited to the local extent, depending on the volume spilt and rate of spillage. Within the Project AoI there are limited surface water resources such as streams and rivers which could be impacted if the spill were to occur within proximity of the resource.

**Likelihood:** -Incidental spills of fuels are infrequent but do occur; most frequently due to malfunction of handling systems, poor practice of workers and force majeure. Spills are most likely to occur during refilling and transportation of substances. Large releases of hazardous materials are rare, and it is considered unlikely that a spill would occur of emergency scale.

### **Operational Phase**

The RoW will be reinstated following construction with soil spread and graded and the area revegetated. Following reinstatement, no significant soil erosion is anticipated.

**Significance of Impacts:** -For impacts to soils, the spatial scale is considered to be local. The impact could be long term and is a direct negative impact. The overall magnitude is considered



to be medium. There are areas along the transmission RoW which are used for cultivation and therefore the sensitivity is considered of medium sensitivity.

**Table 49-Pre-Mitigation Impact Assessment- Soil Erosion during Construction**

Impact		Soil Erosion during Construction			
Impact Nature	Negative	Positive		Neutral	
	Loss of soil cohesion contributing to erosion.				
Impact Type	Direct	Indirect		Induced	
	Impact is a result as a direct interaction between project activities and soil along the footprint of the project.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is expected to be short term, however in the case of serious erosion the impacts may be experienced long term.				
Impact Extent	Local		Regional		International
	The impact will be limited to the footprint of the project and immediate surrounds.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/Receptor Sensitivity	Low		Medium		High
	The sensitivity of the soil along the proposed transmission line to erosion is considered to be medium to low.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the impact magnitude is small and the sensitivity is medium to low, the overall significance is considered to be minor.				

**Source: EMC Consultants, 2019**

### **Mitigation**

The following mitigation measures will be implemented to minimize the potential for soil erosion:

- Vegetation clearing and topsoil disturbance will be minimized.
- Contour temporary and permanent access roads/laydown areas so as to minimise surface water runoff and erosion;

- Sheet erosion of soil shall be prevented where necessary through the use of sandbags, diversion berms, culverts, or other physical means.
- Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible construction work will take place during the dry season.
- Topsoil shall be evenly spread across the cleared areas when reinstated.
- Accelerated erosion from storm events during construction shall be minimised through managing storm water runoff (e.g., velocity control measures).
- Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile.
- Spread mulch generated from indigenous cleared vegetation across exposed soils after construction.

### Decommissioning Soil Erosion and Contamination Impacts

Decommissioning activities will have direct physical impacts to soil including erosion resulting from excavation to remove stainless steel pylons. This will disrupt the soil cohesion and also will result in surplus soil extracted from the foundation. The removed soil will be backfilled into the excavations in the order of removal to preserve the soil profile. Given the subtropical location of the Project and the nature of vegetation present, it is anticipated that cleared areas will revegetate naturally and relatively quickly. There is also the potential for spills (e.g., of fuels and oils from fueling, maintenance of machinery and vehicles), these have the potential to affect terrestrial environments and could lead to the deterioration of soil, water and sediment quality, the extent of this will be limited to the project site. The overall magnitude is considered to be **minor**. The mitigation measures employed during construction, will be used to mitigate this impact.

### Residual Impact

The implementation of the proposed mitigation measures reduces the significance of the residual impact from minor to negligible along the entire route of the transmission line.

**Table 50-Residual Impact Significance- Soil Erosion during Construction**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Loss of soil resources due to erosion	Construction	Minor	Negligible

Source: EMC Consultants, 2019

#### 8.3.2.4 Surface Water Quality Impacts

Construction activities associated with the transmission lines can have significant effects on the surface water resources along the proposed project route and good environmental management, including control of runoff, sediments, storage of fuels and good practice should be followed. Project activities will interact with water resources in the following ways:

- There will be direct interaction during clearing and construction near to or in surface water bodies.
- There will be indirect interaction in the case of erosion of soils into water bodies.
- There will be direct interaction from the abstraction of water from surface water bodies for construction (e.g., for dust control).
- There will be direct interaction from the discharge of treated domestic wastewater to surface water bodies (in the event camp sites are established).
- In addition, if vegetation and soil clearing are not properly managed, there is the potential for soils to run into water bodies and increased sediment load. This in turn may have a detrimental effect on water quality and affect surface water users.

During the construction of the transmission line, water will be required for several purposes including for use in the workers' accommodation camp (if determined), transmission line construction process which requires water, cleaning of the vehicles and equipment, keeping down construction dust impacts among others. The potential impacts and risk of the project relating to surface water supply are:

- Stresses on local water resources from construction water abstractions from surface and/or ground water; and
- Potential indirect effects from water demand caused by local population expansion due to in-migration.
- Overall raw water supply requirements for the construction of will be very low and necessary during concrete mixing only and keeping down the dust.

### **Baseline Conditions**

The proposed transmission line is located within the catchment basin of the Ewaso Nyiro Basin. The transmission line routing crosses a number of rivers including Perkerra, Molo, Chemeron, Ngusero and Ol Arabel. The potential risks of detrimental impacts on water quality will be higher where construction activities are close to surface water bodies or from the potential destabilization of soils and channel banks that may lead to erosion and deposition of sediment into water bodies.

### **Construction Phase**

Below are risks and impacts on surface water that are likely to be encountered as a result of the project during the construction phase:

1. The construction of the project may cause temporary disturbances and negative effects on surface water resources. These negative impacts could increase without proper scheduling or programming of the works or particular activities. In other words, there are likely to be impacts of construction of the project on water quality where required mitigation activities are not implemented correctly.
2. Stockpile and other materials may enter any other surface water resources near to the Project site where there are inadequate containment measures. Such surface runoff may carry sediments or harmful wastes, and these may collect in rivers or any other surface water resources and therefore there will be negative impacts on water quality.
3. In addition, in the project site there may be storage areas for chemicals, fuels, oils, etc., used for construction activities including refueling of vehicles. These materials must be stored according to the regulatory requirements, including the related regulation.

Otherwise, there may be risk of leakage of all chemicals to the surface water resources, and so there may be impact on water quality.

4. In addition, all chemicals, fuels, oils etc. used for construction activities must be handled, transported, and used according to related regulation and procedures. Otherwise, there may be risk of spill of these by accidents etc. Therefore, there may be impact on water quality.
5. There may also be risks of pollution from the uncontrolled runoff or accidental spillage of fuels and lubricants, or from the inadequate or unsafe disposal of wastewater from construction sites.
6. Land cleared during the construction of the transmission line and associated service infrastructure will have a direct negative effect on surface water quality by increasing the turbidity and concentration of total dissolved/ suspended solids, with potentially adverse effects on river biota.

No information is available about the turbidity and concentration of suspended solids in rivers in the project area, however given the extent of human settlement and agricultural activities it is probable that these are elevated already and therefore that these rivers have a low to medium sensitivity to change. The volume of soil like to be disturbed by proposed project activities is likely to be **minor** and therefore the extent of the impacts from sediment addition to the river is considered to be local. Owing to the subtropical location of the project and the high probability that cleared areas will revegetate naturally thereby limiting erosion, the duration of this impact is anticipated to be short term.

The nature of the construction activities for the transmission line renders the erosion of soil and subsequent siltation of rivers along the route possible. The **small** magnitude of this impact on surface water quality and the **low** sensitivity of these rivers to increased turbidity means the significance of this impact is assessed as **minor**.

**Table 51-Pre-Mitigation Impact Assessment- Siltation of surface water**

Table 51: EIA Mitigation Impact Assessment - Siltation of surface water				
Impact		Siltation of surface water		
Impact Nature	Negative	Positive		Neutral
	Eroded soil entering surface water bodies.			
Impact Type	Direct	Indirect		Induced
	Impact is a result as a direct interaction between project activities and the environment along the footprint of the project.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The impact is expected to be short term, however in the case of serious erosion the impacts of siltation of surface water may be experienced long term (into the operational phase).			
	Local		Regional	International

Impact Extent	The impact will be limited to the footprint of the project and immediate surrounds. The dilution of sediments in the river will render this impact negligible at the regional scale.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low		Medium		High
	The sensitivity of the rivers along the proposed transmission line to siltation is considered to be medium to low.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the impact magnitude is small and the sensitivity is medium to low, the overall significance is considered to be minor.				

Source: EMC Consultants, 2019

### Operation Phase

Once the RoW is reinstated, no direct disturbance of surface water bodies is anticipated.

### Mitigation

The mitigation measures listed for soil management above are also applicable to surface water quality. In addition, the following mitigation measures will be implemented to minimise the potential for siltation of surface water:

- Activities shall be conducted >100m away from water bodies, except where crossings are required.
- All wastewater which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be discharged to the environment; and
- Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan.

### Decommissioning Surface Water Quality Impacts

Decommissioning activities could have significant effects on the surface water resources along the project route. The impact will be limited to the footprint of the project and immediate surrounds. Good environmental management, including control of runoff, sediments should be followed. The volume of soil to be disturbed by proposed project activities is projected to be **minor** and extent of the impacts from sediment addition to water bodies is considered to be local. The mitigation measures employed during construction, will be used to mitigate this impact.

### Residual Impact

The implementation of the proposed mitigation measures reduces the significance of the residual impact to *negligible* along the entire route of the transmission line.

**Table 52-Residual Impact Significance- Siltation of surface water**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Availability and Quality of Water	Construction	Minor	Negligible

Source: EMC Consultants, 2019

#### 8.3.2.5 Impact on Flora and Vegetation

According to data from the survey carried out for the ESIA, some of the areas to be crossed by the transmission line are of a considerable biodiversity, particularly within areas of Lariak Forest which is a sensitive habitat and vulnerable to changes to its components. To clear a RoW for the project infrastructure, it will be necessary to remove some native vegetation particularly. This will cause impacts, such as loss of biodiversity, fragmentation of habitat, changes in light conditions and possible invasion by invasive alien species (e.g., *mathenge*), whose competitiveness and growth rate are considered high

**Table 53-Summary of Potential Impacts to Flora and Vegetation**

Construction Phase	Operation Phase
Loss and fragmentation of areas of native forest due to project infrastructure and RoW Change in the structure of the vegetation communities	<ul style="list-style-type: none"><li>• Fragmentation of habitat</li><li>• Spread of invasive alien species</li></ul>

Source: EMC Consultants, 2019

This impact of the project on flora along the transmission line will be direct and permanent in nature, since trees and vegetation will be removed to clear the RoW, install the infrastructure, and carry out regular maintenance, and along that strip no tree regeneration whose height may compromise the safety of the transmission lines is allowed.

### Baseline Conditions

The baseline conditions along the proposed transmission line reflects the vegetation dominated by grasses and shrubs, to forest, and to modified habitat due to urban expansion and agriculture and logging activities. As indicated in baseline section, in the proposed area with the exception of Lariak Forest area where the transmission line will cross, there are no other protected areas (e.g., national parks or forest reserves) within approximately 10 km distance from the transmission line routes.

The vegetation cover around most of the urban and rural areas has been largely modified to give room for anthropogenic activities. The open space, plantation areas, cultivation and vegetable



farms that have been observed within the transmission line routes are modified areas and are unlikely to have any natural vegetation with any conservation significance. Moreover, flora and vegetation in cultivated areas are unlikely to have any conservational significance, except for the section where the line crosses Lariak forest.

The transmission line is going to traverse Lariak Forest for about 1.8 kms and hence the flora within this forest section will be affected. Lariak Forest is located in Laikipia County. The floral trees species include i.e. cedar, Leleshwa (*Tarconanthus camphorates*), Euphorbia, Acacia, *Prunus africana*, *Cordial abyssinica*, *Croton macrostachyus*, *Olea africana*, *Ekebergia rueppelliana*, *Croton megalocarpus*, *Juniperus procera* and *Podocarpus falcatus*. The naturalized exotic species are; *Gravillea robusta*, and *Mangifera indica*, guava and avocado fruit species. The forest is a habitat for different fauna and also provides fuel wood to the local communities.

### Impact Assessment Construction Phase

During construction, improved access to some presently remote areas also increases human pressure on the vegetation resources for example where trees are cut for fuel wood and land is converted for agriculture use. Disturbance will also occur due to construction activities which will generate noise, vibration, and human and vehicle presence. However, these impacts are likely to be temporary and short-lived impacts as the construction work will be progressive (overall programme of 18-24 months) and most of these will take place along areas already disturbed by the existing transmission line infrastructure. The removal and vegetation associated with vehicle movement can also lead to the establishment of favourable conditions for the massive and rapid dissemination of invasive alien plants. Based on the available data it is not expected that the above-mentioned aspects will result in negative impacts on any sensitive species.

This direct impact is permanent, since the tree and shrub vegetation will be removed to clear the RoW, install the infrastructure, and carry out regular maintenance, and along that strip no tree regeneration whose height may compromise the safety of the transmission lines is allowed. The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity in most of the areas. The impact is direct and negative; resulting from the vegetation removal and disturbance during the construction phase. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be medium. Based on the analysis provided above, the impact of vegetation removal, habitat fragmentation and degradation will be a ***moderate*** negative impact pre-mitigation (*Table 60*)

**Table 54-Pre-Mitigation Impact Assessment- Flora and Vegetation during Construction**

Impact	Flora and Vegetation during Construction		
	Negative	Positive	Neutral
Impact Nature	Disturbance to vegetation and habitat loss and fragmentation as a result of the RoW or degradation to environment and habitat during		

Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the existing vegetation along the transmission line				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered permanent as the areas where vegetation will be removed for the construction of the line will have to be permanently kept with vegetation for maintenance purposes during the operational phase.				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact will occur across the whole length of the proposed transmission line RoW and access roads, large sections of the lines are in built up areas with modified habitat (i.e., urban areas, agricultural land and along the existing corridor) and thus there is a decreased risk of impacts to vegetation in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	Although the transmission line will cross some disturbed and modified habitats that occur along the transmission line RoW, it will also cross a sensitive forest patches and river. The sensitivity is considered medium.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is large and the sensitivity is medium, the overall significance is considered to be of moderate significance.				

Source: EMC Consultants, 2019

### Operation Phase

During the operational phase there is the potential for impacts on vegetation and flora as a result of the existence of the transmission line, particularly due to the maintenance including periodic clearing of the RoW which perpetuate habitat fragmentation. Due to the location of the transmission lines within the exiting corridor where three other lines are present it is not expected that there will be larger impacts on the existing flora and vegetation during the operation phase. However, there is the potential for spread of invasive alien species due to the maintenance works.

Due to the inexistence of surrounding protected areas nor sensitive habitats the impact of the operation of the transmission line is expected to have a low sensitivity. The impact is directly negative, will be permanent during the project life period, maintenance will be conducted periodically. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be small.

Based on the analysis provided above, the impact of direct loss of vegetation and flora and degradation and fragmentation of habitat will be of *moderate* significance pre-mitigation (*Table 61*).

**Table 55-Pre-Mitigation Impact Assessment- Flora and Vegetation during Operations**

Impact	Flora and Vegetation during Operations				
Impact Nature	Negative	Positive	Neutral		
	Disturbance to vegetation and potential grow of invasive species as result of the maintenance works during operation				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the transmission line infrastructure in the RoW				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered permanent as the RoW will be kept free of vegetation during operation				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered low scale as most of the impacts related to vegetation removal occurred during the construction phase. However, there will be a degree of habitat fragmentation.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered medium as the proposed transmission line will traverse Lariak forest. During operation, maintenance clearing along the ROW will lead to vegetation removal.				
	Negligible	Minor	Moderate	Major	

	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be of moderate significance.
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Source: EMC Consultants, 2019

## Mitigation

The following standard mitigation measures will be employed:

- Avoidance of impacts should be prioritised. This is especially where the transmission line crosses Lariak Forest. In order to protect these habitats, it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as necessary. Servitude (also called easement) is to be cleared in line with Kenyan standards for minimum vegetation clearance distance;
- Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;
- Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;
- There should be no deviation from the access road position without prior discussions with the authorities;
- Firewood collection by the project's employees should be strictly forbidden.
- Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;
- Materials (e.g. pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and
- Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible.

## Decommissioning Impact on Flora and Vegetation

The impacts on flora and vegetation will be **minor** and temporary impacts as the decommissioning work will take place on areas already modified by the transmission line infrastructure. It is not expected that the activities will result in negative impacts on any sensitive species. Based on the analysis provided above, the impact of vegetation removal, habitat fragmentation and degradation will be **negligible**.

## Residual Impact

The impact significance is Moderate after mitigation measures during construction and Minor post mitigation for operations (Table 62). There will be some habitat loss and fragmentation as well as potential increase of invasive species as a result of the construction, however most of the habitat is modified and not expected to have conservational value, except for sections where the lines cross the forest area (Lariak Forest). With the proposed mitigation measure the residual negative impacts on flora are assessed to be of a low magnitude.

**Table 56-Residual Impact Significance-Flora and Vegetation during Operations**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disturbance to vegetation and habitat loss and fragmentation as a result of the ROW or degradation to environment and habitat	Construction	Moderate	Minor
Disturbance to vegetation and potential grow of invasive species as result of the maintenance works	Operation	Minor	Negligible

Source: EMC Consultants, 2019

#### 8.3.2.6 Impacts on Fauna

The natural environment along the transmission line has been largely transformed along with the reception of the section of where the line crosses Lariak Forest. The open space, plantation areas, cultivation and vegetable farms that have been observed within the transmission line routes are modified areas and have no natural fauna of any importance. Moreover, fauna in cultivated areas unlikely to have any conservational significance. The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity.

#### Baseline Conditions

With the exception of Lariak Forest where the transmission line will cross, there are no protected areas within approximately 10 km distance from the transmission line route. The natural environment has been largely transformed along the route of the overhead transmission lines. The open space, plantation areas, cultivation and vegetable farms that have been observed within the transmission line routes are modified areas and are unlikely to have any natural vegetation with any importance. Moreover, fauna in cultivated areas is unlikely to have any conservational significance.

However, in the sections of the transmission line, where it crosses inside the Lariak Forest, the inherent fauna will be directly affected. The cutting down of the trees which are a habitat to various fauna as well as the disturbance associated with the construction will adversely affected the fauna. The potential impacts are restricted to disturbance of wildlife in terms of their feeding and general movements, and only at the point of intense construction activities, i.e., at the towers and the station. Disturbance could be caused by presence of labour force, noise, and vibration. The other possibility is by hunting for game meat by construction workers. Fauna species in the Lariak Forest include African hare, kirks Dik Dik, impala, Thompsons Gazelle, spring Hare, Bush squirrel, porcupine, warthog, black faced vervet monkey, Impala, and honey Badger.

## Impact Assessment

### Construction Phase

During construction, fauna within the near surrounds of the development area will be disturbed due to cutting down of natural vegetation in the affected forest area, noise, vibration and human and vehicle presence. Disturbance impacts during construction are likely to be temporary and short lived. Impacts as the construction work will be progressive (overall program of 18-24 months). Although disturbance and displacement impacts are likely to be temporary and limited in their magnitude, if combined with the impacts of direct habitat loss, it could lead to disturbance of wild fauna. Based on the survey carried out for the ESIA, it is not expected that there will be any sensitive species in the Project area of international or local importance.

The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity with the exception of Lariak Forest. The impact is direct and negative; resulting from the land take and disturbance during construction. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be medium. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be a **Minor** negative impact pre-mitigation.

**Table 57-Pre-Mitigation Impact Assessment- Avifauna during Construction**

Impact	Avifauna during Construction			
Impact Nature	Negative	Positive	Neutral	
	Disturbance to avifauna species and loss of habitat as a result of the RoW or degradation to environment during construction.			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the fauna population along the transmission lines			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The effect is considered temporary as it will only occur during the construction period			
Impact Extent	Local	Regional	International	
	Impact is limited to AoI			
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of the transmission line RoW's and access roads, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.			
Frequency	Once off			



Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High	The sensitivity is considered low due to the disturbed and modified habitats that occur along the transmission line RoW.	
Impact Significance	Negligible	Minor	Moderate	Major	Considering the impact magnitude is medium and the sensitivity is low, the overall significance is considered to be of minor significance.

Source: EMC Consultants, 2019

### Operation Phase

During the operational phase there is no significant impacts expected on fauna populations as a result of the transmission line and pylons and by electrocution. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be low. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be of Minor significance pre-mitigation (Table 64).

**Table 58-Pre-Mitigation Impact Assessment- Fauna during Operations**

Impact	Fauna during Operations			
Impact Nature	Negative	Positive	Neutral	
	Increase in fauna mortality during operation			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the erection of the transmission lines and the fauna species along the RoW			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The impact is considered permanent throughout the life cycle of the project			
Impact Extent	Local	Regional	International	
	Impact is limited to the Project Area of Influence (AoI)			
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of each of the transmission line RoW's, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.			
Frequency	The frequency is expected to be occasional			

Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is expected to be small due to wildlife mortality				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity is considered low, birds of conservational significance are not expected along the transmission line RoW.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude of the impact is small and the sensitivity is low the overall significance is considered to be of minor significance				

Source: EMC Consultants, 2019

The following mitigation measures are recommended during operations:

- All areas disturbed by construction activities shall be landscaped and rehabilitated;
- Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area
- Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill
- No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)
- All animal dens in close proximity to the work areas must be marked as no-go areas.
- Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.

### Decommissioning Impacts on Fauna

The impacts on fauna will be **minor** and temporary impacts as the decommissioning work will take place on areas already modified by the transmission line infrastructure. The modified areas have low sensitivity with no natural fauna of unique importance or conservational significance. The impact of direct loss of fauna and degradation of habitat will be **negligible**.

### Residual Impact

The impact significance is **Minor** pre-mitigation for operations and negligible post mitigation (Table 65). There will be some habitat loss as a result of the construction, however the habitat is modified and not expected to have conservational significance.

**Table 59-Residual Impact Significance**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disturbance to fauna species and degradation to environment during construction	Construction	Minor	Negligible

Disturbance to fauna species and degradation to environment during operation and maintenance.	Operation	Minor	Negligible
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Source: EMC Consultants, 2019

#### 8.3.2.7 Impacts on Avifauna

In terms of avi-fauna, project potential impacts will be focused on the avian populations within the development area and near surrounds, by habitat loss associated with the construction activities, such as displacement from breeding and foraging habitat and habitat degradation; there are also indirect impacts associated with changes to ecosystem and biophysical processes.

**Table 60-Potential Impacts to Avian Fauna**

Construction Phase	Operation Phase
<ul style="list-style-type: none"> <li>Disturbance due to noise, vibration and human and vehicle presence</li> <li>Loss of habitat as a result of RoW or other project infrastructure</li> </ul>	Bird strikes along transmission lines

Source: EMC Consultants, 2019

#### Baseline Condition

Along the project route and within the project area of influence, the transmission line does not cross into any area designated as an Important Bird Area (IBA) and therefore the bird strike impacts associated with transmission lines is not likely to occur especially to important bird species. The line however passes through 2 Endemic Bird Areas within both Counties (Mount Kenya and Serengeti Plains) where bird life are known to range and thus will be exposed to potential strikes and electrocution. Within the Lariak Forest, there are bird species which are likely to be affected by the transmission line (bird strikes), however, these species are categorized as species of Least Concern (LC) under the IUCN Red List. Below is the list of birds in Lariak forest and its environs.

**Table 61-list of birds in Lariak forest and its environs.**

No.	Common Name	Scientific Name
1.	Abyssinian White-eye	<i>Zosterops abyssinicus</i>
2.	African Pipit	<i>Anthus cinnamomeus</i>
3.	African Spoonbill	<i>Platalea alba</i>
4.	African Thrush	<i>Turdus pelios</i>
5.	African Dusky Flycatcher	<i>Muscicapa adusta</i>
6.	African Fish Eagle	<i>Haliaeetus vocifer</i>
7.	African Grey Flycatcher	<i>Melaenornis microrhynchus</i>
8.	African Grey Woodpecker	<i>Dendropicos goertae</i>
9.	African Paradise Flycatcher	<i>Terpsiphone viridis</i>
10.	African Pied Wagtail	<i>Motacilla aguimp</i>
11.	African Sacred Ibis	<i>Threskiornis aethiopicus</i>

12.	Amethyst Sunbird	<i>Chalcomitra amethystine</i>
13.	Anteater Chat	<i>Myrmecocichla aethiops</i>
14.	Arrow-marked Babbler	<i>Turdoides jardineii</i>
15.	Augur Buzzard	<i>Buteo augur</i>
16.	Baglafecht Weaver	<i>Ploceus baglafecht</i>
17.	Barn Swallow	<i>Hirundo rustica</i>
18.	Black Crake	<i>Zapornia flavirostra</i>
19.	Black Cuckooshrike	<i>Campephaga flava</i>
20.	Black Sparrowhawk	<i>Accipiter melanoleucus</i>
21.	Black Saw-wing	<i>Psalidoprocne pristoptera</i> <i>holomelas</i>
22.	Black-backed Puffback	<i>Dryoscopus cubla</i>
23.	Black-bellied Bustard	<i>Lissotis melanogaster</i>
24.	Black-chested Snake Eagle	<i>Circaetus pectoralis</i>
25.	Black-crowned Tchagra	<i>Tchagra senegalus</i>
26.	Black-headed Heron	<i>Ardea melanocephala</i>
27.	Black-headed Oriole	<i>Oriolus larvatus</i>
28.	Black-lored Babbler	<i>Turdoides sharpie</i>
29.	Blacksmith Lapwing	<i>Vanellus armatus</i>
30.	Black-winged Kite	<i>Elanus caeruleus</i>
31.	Blue-naped Mousebird	<i>Urocolius macrourus</i>
32.	Brimstone Canary	<i>Crithagra sulphurata</i>
33.	Bronzy Sunbird	<i>Nectarinia kilimensis</i>
34.	Brown Parisoma	<i>Curruca lugens</i>
35.	Brown-crowned Tchagra	<i>Tchagra australis</i>
36.	Brubru	<i>Nilaus afer</i>
37.	Cabanis's Greenbul	<i>Phyllastrephus cabanisi</i>
38.	Cape Robin-Chat	<i>Cossypha caffra</i>
39.	Cape Turtle Dove	<i>Streptopelia capicola</i>
40.	Chinspot Batis	<i>Batis molitor</i>
41.	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>
42.	Cinnamon-chested Bee-eater	<i>Merops oreobates</i>
43.	Collared Sunbird	<i>Hedydipna collaris</i>
44.	Common Bulbul	<i>Pycnonotus barbatus</i>
45.	Common Buzzard	<i>Buteo buteo</i>
46.	Common Cuckoo	<i>Cuculus canorus</i>
47.	Common Greenshank	<i>Tringa nebularia</i>
48.	Common Sandpiper	<i>Actitis hypoleucos</i>
49.	Common Swift	<i>Apus apus</i>
50.	Common Waxbill	<i>Estrilda astrild</i>
51.	Common Whitethroat	<i>Curruca communis</i>
52.	Common House Martin	<i>Delichon urbicum</i>
53.	Common Rock Thrush	<i>Monticola saxatilis</i>
54.	Crested Francolin	<i>Dendroperdix sephaena</i>
55.	Crowned Lapwing	<i>Vanellus coronatus</i>

56.	Crowned Eagle	<i>Stephanoaetus coronatus</i>
57.	Dark-capped Bulbul	<i>Pycnonotus tricolor</i>
58.	Denham's Bustard	<i>Neotis denhami</i>
59.	Dusky Turtle Dove	<i>Streptopelia lugens</i>
60.	Eastern Bronze-naped Pigeon	<i>Columba delegorguei</i>
61.	Egyptian Goose	<i>Alopochen aegyptiaca</i>
62.	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>
63.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
64.	Ethiopian Swallow	<i>Hirundo aethiopica</i>
65.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
66.	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
67.	European Bee-eater	<i>Merops apiaster</i>
68.	European Roller	<i>Coracias garrulus</i>
69.	Fan-tailed Raven	<i>Corvus rhipidurus</i>
70.	Fawn-colored Lark	<i>Calendulauda africanoides</i>
71.	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>
72.	Garden Warbler	<i>Sylvia borin</i>
73.	Golden-breasted Bunting	<i>Emberiza flaviventris</i>
74.	Greater Honeyguide	<i>Indicator indicator</i>
75.	Greater Kestrel	<i>Falco rupicoloides</i>
76.	Greater Blue-eared Starling	<i>Lamprotornis chalybaeus</i>
77.	Green Sandpiper	<i>Tringa ochropus</i>
78.	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>
79.	Grey Heron	<i>Ardea cinerea</i>
80.	Grey Cuckooshrike	<i>Cebilepyris caesius</i>
81.	Grey-backed Camaroptera	<i>Camaroptera brevicaudata</i>
82.	Grey-backed Fiscal	<i>Lanius excubitoroides</i>
83.	Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>
84.	Hadada Ibis	<i>Bostrychia hagedash</i>
85.	Hamerkop	<i>Scopus umbrette</i>
86.	Hartlaub's Turaco	<i>Tauraco hartlaubi</i>
87.	Helmeted Guineafowl	<i>Numida meleagris</i>
88.	Hildebrandt's Starling	<i>Lamprotornis hildebrandti</i>
89.	Isabelline Wheatear	<i>Oenanthe isabelline</i>
90.	Kenya Sparrow	<i>Passer rufocinctus</i>
91.	Kenya Yellow-rumped Seedeater	<i>Crithagra reichenowi</i>
92.	Lanner Falcon	<i>Falco biarmicus</i>
93.	Laughing Dove	<i>Streptopelia senegalensis</i>
94.	Lesser Kestrel	<i>Falco naumanni</i>
95.	Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>
96.	Lichtenstein's Sandgrouse	<i>Pterocles lichtensteinii</i>
97.	Lilac-breasted Roller	<i>Coracias caudatus</i>
98.	Little Bee-eater	<i>Merops pusillus</i>
99.	Little Grebe	<i>Tachybaptus ruficollis</i>
100.	Little Swift	<i>Apus affinis</i>

101.	Long-crested Eagle	<i>Lophaetus occipitalis</i>
102.	Long-tailed Widowbird	<i>Euplectes progne</i>
103.	Malachite Kingfisher	<i>Corythornis cristatus</i>
104.	Marico Sunbird	<i>Cinnyris mariquensis</i>
105.	Marsh Warbler	<i>Acrocephalus palustris</i>
106.	Meyer's Parrot	<i>Poicephalus meyeri</i>
107.	Montagu's Harrier	<i>Circus pygargus</i>
108.	Mottled Swift	<i>Tachymarptis aequatorialis</i>
109.	Namaqua Dove	<i>Oena capensis</i>
110.	Narina Trogon	<i>Apaloderma narina</i>
111.	Northern Crombec	<i>Sylvietta brachyura</i>
112.	Northern Fiscal	<i>Lanius humeralis</i>
113.	Northern Wheatear	<i>Oenanthe oenanthe</i>
114.	Northern Grey-headed Sparrow	<i>Passer griseus</i>
115.	Northern Yellow White-eye	<i>Zosterops senegalensis</i>
116.	Nubian Woodpecker	<i>Campethera nubica</i>
117.	Olive Thrush	<i>Turdus olivaceus</i>
118.	Orange-breasted Bushshrike	<i>Chlorophoneus sulfureopectus</i>
119.	Pallid Harrier	<i>Circus macrourus</i>
120.	Pied Crow	<i>Corvus albus</i>
121.	Pied Kingfisher	<i>Ceryle rudis</i>
122.	Pin-tailed Whydah	<i>Vidua macroura</i>
123.	Plain-backed Pipit	<i>Anthus leucophrys</i>
124.	Purple Grenadier	<i>Granatina ianthinogaster</i>
125.	Purple Roller	<i>Coracias naevius</i>
126.	Rattling Cisticola	<i>Cisticola chiniana</i>
127.	Red-backed Shrike	<i>Lanius collurio</i>
128.	Red-billed Teal	<i>Anas erythrorhyncha</i>
129.	Red-capped Lark	<i>Calandrella cinerea</i>
130.	Red-cheeked Cordonbleu	<i>Uraeginthus bengalus</i>
131.	Red-eyed Dove	<i>Streptopelia semitorquata</i>
132.	Red-faced Crombec	<i>Sylvietta whytii</i>
133.	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>
134.	Red-headed Weaver	<i>Anaplectes rubriceps</i>
135.	Red-throated Pipit	<i>Anthus cervinus</i>
136.	Red-winged Starling	<i>Onychognathus morio</i>
137.	Reed Cormorant	<i>Microcarbo africanus</i>
138.	Rock Martin	<i>Ptyonoprogne fuligula</i>
139.	Rueppell's Robin-Chat	<i>Cossypha semirufa</i>
140.	Rufous Chatterer	<i>Argya rubiginosa</i>
141.	Rufous-naped Lark	<i>Mirafrapa africana</i>
142.	Ruppell's Starling	<i>Lamprolornis purpuroptera</i>
143.	Scaly-throated Honeyguide	<i>Indicator variegatus</i>
144.	Scarlet-chested Sunbird	<i>Chalcomitra senegalensis</i>
145.	Secretarybird	<i>Sagittarius serpentarius</i>



146.	Slate-colored Boubou	<i>Laniarius funebris</i>
147.	Southern Black Flycatcher	<i>Melaenornis pammelaina</i>
148.	Speckled Mousebird	<i>Colius striatus</i>
149.	Speke's Weaver	<i>Ploceus spekei</i>
150.	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>
151.	Spotted Flycatcher	<i>Muscicapa striata</i>
152.	Spotted Thick-knee	<i>Burhinus capensis</i>
153.	Streaky Seedeater	<i>Crithagra striolata</i>
154.	Striated Heron	<i>Butorides striata</i>
155.	Superb Starling	<i>Lamprotornis superbus</i>
156.	Tambourine Dove	<i>Turtur tympanistra</i>
157.	Tawny-flanked Prinia	<i>Prinia subflava</i>
158.	Thrush Nightingale	<i>Luscinia Luscinia</i>
159.	Tree Pipit	<i>Anthus trivialis</i>
160.	Trumpeter Hornbill	<i>Bycanistes buccinator</i>
161.	Tullberg's Woodpecker	<i>Campethera tullbergi</i>
162.	Variable Sunbird	<i>Cinnyris venustus</i>
163.	Verreaux's Eagle-Owl	<i>Bubo lacteus</i>
164.	Wailing Cisticola	<i>Cisticola lais</i>
165.	Western Cattle Egret	<i>Bubulcus ibis</i>
166.	Western Marsh Harrier	<i>Circus aeruginosus</i>
167.	Whinchat	<i>Saxicola rubetra</i>
168.	White Stork	<i>Ciconia Ciconia</i>
169.	White-bellied Bustard	<i>Eupodotis senegalensis</i>
170.	White-bellied Go-away-bird	<i>Crinifer leucogaster</i>
171.	White-bellied Tit	<i>Melaniparus albiventris</i>
172.	White-breasted Cormorant	<i>Phalacrocorax lucidus</i>
173.	White-browed Coucal	<i>Centropus superciliosus</i>
174.	White-browed Robin-Chat	<i>Cossypha heuglini</i>
175.	White-eyed Slaty Flycatcher	<i>Melaenornis fischeri</i>
176.	Willow Warbler	<i>Phylloscopus trochilus</i>
177.	Wood Sandpiper	<i>Tringa glareola</i>
178.	Woolly-necked Stork	<i>Ciconia episcopus</i>
179.	Yellow Bishop	<i>Euplectes capensis</i>
180.	Yellow-breasted Apalis	<i>Apalis flavida</i>
181.	Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>
182.	Yellow-throated Longclaw	<i>Macronyx croceus</i>
183.	Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>

### Impact Assessment Construction Phase

During construction, avifauna within the near surrounds of the development area will be disturbed due to noise, vibration, and human and vehicle presence. Disturbance impacts during construction are likely to be temporary and short lived. Impacts as the construction work will be progressive

(overall program of 18-24 months). Although disturbance and displacement impacts are likely to be temporary and limited in their magnitude, if combined with the impacts of direct habitat loss, it could lead to disturbance of wild fauna. Based on the survey carried out for the ESIA, it is not expected that there will be any sensitive species of international or local importance in the Project area.

The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity. The impact is direct and negative; resulting from the land take and disturbance during construction. The extent of the impact presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be medium. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be a **Minor** negative impact pre-mitigation.

**Table 62-Pre-Mitigation Impact Assessment- Avifauna during Construction**

Impact Avifauna during Construction					
Impact Nature	Negative	Positive	Neutral		
	Disturbance to avifauna species and loss of habitat as a result of the RoW or degradation to environment during construction				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the fauna population along the transmission lines				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as it will only occur during the construction period				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of the transmission line RoW's and access roads, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered low due to the disturbed and modified habitats that occur along the transmission line RoW. Only small				

	sections of the Forest and areas near the forest may have moderate sensitivity			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the impact magnitude is medium and the sensitivity is low, the overall significance is considered to be of minor significance.			

**Source: EMC Consultants, 2019**

#### **Operation Phase**

During operation, there is the potential for bird strikes to occur along the transmission lines. This is most likely for large bird species, migrating species and species which have a varied flight pattern (dipping and circling). During the operational phase there is the potential for impacts on avian populations as a result of direct strike with the transmission line and pylons (bird collision) and by electrocution. A number of species of large birds suffer losses resulting from electrocution. This would mainly affect birds associated with the site; and electrocutions on power supply structures by raptors and other medium sized birds on passage. Birds sitting on power poles and /or conductors could cause short circuits between energized wires or short to ground especially numerous medium and large sized birds using the power poles as perching, roosting, and even nesting sites. Birds are able to cause electrical faults (short circuits on power lines through Bird pollution). The species of bird which are most likely to be impacted by collision with transmission lines are large species (such as raptors and waterfowl), birds that regularly migrate across the path of the transmission line (either daily or seasonal migration) and species whose flight patterns result in an increased time spent at transmission line height in the area of the development (predominantly display flight activities such as looping or circling repeatedly in the area). None of the species such as raptors and waterfowls are found within the proposed transmission route.

Collisions are a significant threat posed by overhead lines to birds. Collision with power lines is a lesser-known problem than electrocution and is harder to detect because it can occur at any point along the transmission line. Collision risk is influenced by the topography of surrounding terrain and the proximity of lines and pylons to nests and other areas used frequently by local species. Potential impact through collision could occur along river valleys that are mostly utilized by birds especially during the dry season. In most cases the impact of collision would lead to immediate death or fatal injuries.

Lake Baringo & Lake Bogoria are important bird areas though they are not within the transmission line route. There are wildlife within Baringo and Laikipia Counties though there is no wildlife migratory route traversing the transmission line route. The impact on avian populations as a result of direct strike with the transmission line and pylons (bird collision) and by electrocution is directly negative, will be permanent as the lines will be in place throughout, the project life. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be low. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be of **Minor** significance pre-mitigation (Table 68).

**Table 63-Pre-Mitigation Impact Assessment- Avifauna during Operations**

Impact					Avifauna during Operations				
Impact Nature	Negative		Positive		Neutral				
	Increase in bird mortality due to bird strikes during operation								
Impact Type	Direct		Indirect		Induced				
	Impact is as a result of a direct interaction between the erection of the transmission lines and the bird species along the RoW								
Impact Duration	Temporary		Short Term		Long Term		Permanent		
	The impact is considered permanent throughout the project life.								
Impact Extent	Local		Regional		International				
	Impact is limited to the Project AoI								
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of each of the transmission line RoW's, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to Avifauna in these areas.								
Frequency	The frequency is expected to be occasional								
Impact Magnitude	Positive		Negligible		Small		Medium		Large
	The impact magnitude is expected to be small due to bird mortality								
Resource/ Receptor Sensitivity	Low		Medium		High				
	The sensitivity is considered low, birds of conservational significance are not expected along the transmission line RoW.								
Impact Significance	Negligible		Minor		Moderate		Major		
	Considering the magnitude of the impact is small and the sensitivity is low the overall significance is considered to be of minor significance								

**Source: EMC Consultants, 2019**

### **Mitigation**

In addition to the controls mentioned above, as well as those specified for mitigating impacts to flora and vegetation the following mitigation measures are recommended during operations:

- In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;

- Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure
- Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires
- Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;
- No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)
- Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.
- All terminal structures (transformers) should be constructed with sufficient insulation on jumper wires and surge arrestors
- Contractor should consider installing line marking to increase the visibility of the line. There are three general types of line marking devices: aerial marker spheres, spirals, and suspended devices

#### Decommissioning Impacts on Avifauna

Avifauna within the surrounds of the activities may be disturbed by noise, vehicles, and human presence during decommissioning. The disturbance will be temporary and short lived, and the impact will be **negligible**.

#### Residual Impact

The impact significance is **Negligible** after mitigation measures during construction and **Minor** post mitigation for operations (*Table 69*). There will be some habitat loss as a result of the construction, however the habitat is modified and not expected to have conservational value.

**Table 64-Residual Impact Significance-Impacts on AviFauna**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disturbance to avifauna species and degradation to environment during construction	Construction	Minor	Negligible
Increase in bird mortality due to bird strikes during operation	Operation	Minor	Minor

**Source: EMC Consultants, 2019**

#### 8.3.2.8 Solid and Liquid Waste Impacts

Improper waste management procedures or lack of mitigation measures during construction, phase of the Project may result in adverse environmental and social impacts on: -

- Storm water quality and thus water quality in the water bodies in project areas;
- Soil quality;
- Surface water quality;
- Ground water quality; and
- Ecological receptors or human health.

The different types of wastes and sources that are likely to be generated from the construction of the transmission line are described below.

#### **a) Recyclable and Reusable Waste**

The types of recyclable and reusable wastes to be generated on site during the construction period include among others: -

##### **Box: Recyclable and reusable waste**

1. Waste metal
2. Waste plastic
3. Waste cables
4. Waste glass
5. Wastepaper (packaging material)
6. Clean containers, drums, bins etc.

#### **b) Excavation Waste**

The greatest volume of excavated material will arise from the construction activities of the Project during civil works associated with construction of the transmission lines. The excavated materials will be re-used immediately as back fill material.

#### **c) Wastewater**

Water will be required for the construction works, dust suppression, mixing of concrete and washing of construction equipment and in camp sites (if established by contractor) among others.

#### **d) Hazardous Waste**

The construction activities will generate hazardous wastes which may adversely impact on the local environment due to handling, storage, transport and disposal. These include, oil, grease etc. During the construction period, waste oil will result from the maintenance of machines, equipment and construction vehicles.

#### **Impact Assessment**

Direct and indirect disposal of waste oils to the receiving environment is likely to adversely impact on the environment and human health. Without mitigation measures, it is anticipated that there will be potential major to moderate adverse impacts during construction and moderate adverse impacts during the maintenance and operations periods. Wastewater if discharged indiscriminately into the environment, will lead to risks and impacts on water bodies, soil, vegetation, fisheries and human health.



**Table 65-Pre-Mitigation Impact Assessment- Waste generation and hazards during Construction**

Table 65: EIC Mitigation Impact Assessment - Waste generation and hazards during Construction						
Impact	Waste generation and hazards during Construction					
Impact Nature	Negative		Positive		Neutral	
	Disposal of waste to the receiving environment is likely to adversely impact on the environment and human health.					
Impact Type	Direct		Indirect		Induced	
	Waste generated from the used materials during construction and operation activities that could cause land and groundwater contamination if spilled or not handled, stored and disposed of correctly.					
Impact Duration	Temporary		Short Term	Long Term	Permanent	
	The impact is considered to be temporary for the duration of the construction phase.					
Impact Extent	Local		Regional		International	
	Impact limited to the Study Area					
Impact Scale	The impact is considered as small scale since it is local to the construction area.					
Frequency	The frequency is considered to be occasional considering that the construction activities are localized.					
Impact Magnitude	Positive	Negligible	Small		Medium	Large
Impact	Waste generation and hazards during Operation					
Impact Magnitude	Based on the parameters above and considering the embedded measures, the magnitude is considered to be small.					
Resource/Receptor Sensitivity	Low		Medium		High	
	The sensitivity of the of the potential receptors- land and ground water is High					
Impact Significance	Negligible		Minor	Moderate		Major
	Considering the magnitude is small and sensitivity is high, the impact of waste generated on the land and water resources during construction is considered to be of <b>moderate</b> significance.					

**Source: EMC Consultants, 2019**

### Mitigation

The following mitigation measures should be employed to reduce any impacts associated with waste generation.

- A Waste Management Plan must be prepared prior to commencement of construction by the contractor (s).
- Construction waste should be recycled or reused as much as possible to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses;
- Skips and bins should be strategically placed within the labor campsite, if any, and construction site, they should also be adequately designed and covered as well as emptied regularly to prevent access by vermin and minimize odor;

- Measures to ensure that waste materials from the project are disposed at suitable sites will be taken. These will include engaging only reputable truckers and conducting appropriate spot checks to verify that disposals are done in accordance with the requirements of NEMA, hence the ultimate fate of the wastes should be monitored so that they are not illegally disposed of.
- Contractor to liaise with licensed waste collector to routinely collect and dispose the waste

### Decommissioning Solid and Liquid Waste Impacts

Solid and liquid waste will be generated during this phase of the project and include plastic, cables, metal, transformers, capacitors, drywall, wood, glass, fasteners, wastewater etc. excavated materials will be re-used immediately as back fill material. Solid waste associated with transmission lines are largely re-used or recycled. To mitigate any residual impact, the waste management plan used during construction will be implemented.

### Residual Impact

The impact significance is Minor Significance (Pre-Mitigation) construction and **Minor** post mitigation for operations (*Table 66*).

Table 66-Residual Impact Significance- Waste generation and hazards

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Poor waste disposal	Construction	Minor	Negligible
Poor waste disposal	Operation	Minor	Minor

Source: EMC Consultants, 2019

#### 8.3.2.9 Access to Infrastructure and Services

The Project will use the existing infrastructure for activities such as transportation and waste disposal. The transportation of construction material and equipment will take place by trucks and through the existing road network during construction. Stringing activities will also require short-term road closures and will disrupt transit routes. Although road improvement and construction of access roads may lead to disruption of traffic during the construction phase, these improvements are expected to benefit the local communities in the long run during the operation phase. The potential increase in the risk of road accidents is addressed under community and occupational health and safety impacts section.

During construction, the Project is not considered to give rise to any significant impact associated the increased pressure on health care infrastructure in the study areas as the number of workers will be low/negligible. Similarly, the potential pressure on local sources of water has also been scoped out since the sources of water for construction and operating the campsite will be determined by the contractor and a water use plan will be required. No pressure on existing waste management infrastructure and services in the study area is expected either as the construction wastes associated with transmission lines are insignificant. However, wastes from the camp site could be significant and overburden the existing wastes disposal facilities in the

area. The contractor will be required to develop a Waste Management Plan and ensure that the wastes generated during construction are disposed in accordance to the NEMA waste management regulations. There are dumpsites in all the 3 Counties that are designated by NEMA and capable of handling the wastes from the construction activities which will not be significant in terms of quantity.

### Baseline Conditions

Relevant baseline conditions that may influence the significance of potential impacts on infrastructures and services are summarized as follows:

- Road infrastructure and road safety are precarious along the Project line.
- Road conditions and lack of public transportation system are the main challenges as regards access to services such as health and education, as well as to job opportunities.
- Lack of infrastructure, poor maintenance, and long dry seasons are the main difficulties related to water access. A very small % of the settlements in the Study Area have in-house running water.
- Majority of households in the settlements of the Study Area do not have access to sanitation or sewage system, and most households use pit latrines/toilets.
- In the project area, most households burn or bury their waste. Only urban households have access to appropriate waste disposal.

### Impact Assessment

Disruption to road traffic and transportation during the upgrade of existing access roads, access to tower sites, transport of equipment and material supply and stringing activities could result in impacts to quality of life, and if unmanaged, in health impacts for local populations (e.g., worsening of the sanitary situation, inability to reach healthcare infrastructure during an emergency due to road upgrading or traffic, etc.). Therefore, if unmanaged, disruption to services might also result in community distrust and resentment towards the Project. This being said, the associated increased pressure and disruption of the existing road network and related traffic issues will be temporary and limited to the construction phase. KETRACO commits to performing site reinstatement and rehabilitation including repairing any damage caused as part of the construction activities and reinstating existing access roads if needed. As described above, the impact magnitude is considered small and receptor sensitivity is high resulting in an impact of moderate significance.

**Table 67-Pre-Mitigation Impact Assessment- Damage / Access to Local Infrastructure and Services during Construction**

Impact	Damage / Access to Local Infrastructure and Services during Construction		
	Negative	Positive	Neutral
Impact Nature	Damage road infrastructure can lead to disruptions and reduced quality of life of communities in the Study Area.		
	Direct	Indirect	Induced

Impact Type	Increased pressure on road infrastructure is expected to occur as a result of direct utilization by the Project (road usage, transport of equipment, material, workers, water, waste, etc.).				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered to be of temporary duration as it is not expected that transportation and road upgrades will be continuous throughout the construction phase.				
Impact Extent	Local	Regional		International	
	Impact limited to the Study Area				
Impact Scale	The impact is considered as small scale since could result in temporary reductions in community well-being from loss of access to basic services before reinstatement.				
Frequency	The frequency is considered to be occasional considering that the traffic generated by the Project is expected to be low and localised and the building of new roads will be limited.				
	Positive	Negligible	Small	Medium	Large
Impact Magnitude	Based on the parameters above and considering the embedded measures in place to reinstate road networks, the magnitude is considered to be small.				
Resource/ Receptor Sensitivity	Low	Medium		High	
	The sensitivity of the local communities is considered to be high as they depend on the road network to access healthcare and other services.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude is small and sensitivity is high, the impact on community access to infrastructure during construction is considered to be of moderate significance.				

**Source: EMC Consultants, 2019**

## Operations

Improvements to roads have the potential to positively impact on community access to education, employment, services, and road safety. Along the project route, communities in rural and remote areas are currently lacking in quality roads and infrastructure and they have the potential to be most positively impacted by infrastructure improvement. Communities benefiting from the upgrade and construction of new roads may also experience positive impacts such as enhanced access to markets for their local agricultural produce, and access to transportation and services (education, health, transport, etc.) As the Project is expected to as much as possible use mainly existing roads, these will require upgrading during the construction phase and maintenance during operations which result in a long-term positive impact for local communities.

**Table 68-Pre-Mitigation Impact Assessment-Damage / access to local infrastructure and services during operations**

Impact	Damage / access to local infrastructure and services during operations				
Impact Nature	Negative	Positive		Neutral	
	Improvement of the local road network leading to improved access education, employment, healthcare, and improved road safety for local communities in the Study Area.				
Impact Type	Direct	Indirect		Induced	
	The improvement in access to service and in livelihoods and employment is a direct result of Project Road improvement, reinstatement and maintenance activities.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered to be of long-term duration throughout the 50- year operation phase				
Impact Extent	Local		Regional		International
	The impact will be limited to the immediate surroundings of the construction yards and access roads.				
Impact Scale	The impact is considered as medium scale considering the length of the Transmission Line route.				
Frequency	The frequency of the impact is continuous throughout the operation phase.				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and the relatively low level of civil works involved, the magnitude is considered small.				
Resource/ Receptor Sensitivity	Low		Medium		High
	The sensitivity of the receptors is considered medium given the levels of dependence on agriculture for subsistence and livelihoods as well as availability of numerous alternative raods which can be used.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the magnitude and sensititivity are small and high, the impact on livelihoods and household income during operation activities is considered to be of moderate significance				
Mitigation	Diversions will be provided in cases where temporary closure of road is required.				

**Source: EMC Consultants, 2019**

### Mitigation Measures

The following mitigation measures should be employed to reduce any impacts on local infrastructure access and/or damage:

- Methods will be implemented to maintain open, clear, and transparent communication with the local communities regarding the use of local infrastructures by the Project throughout the different phases.
- Engagement with the relevant authorities is recommended in order to avoid damage to common property and minimize access disruption to education and healthcare facilities
- A **Community Grievance Mechanism Plan** will be implemented.
- A **Traffic Management Plan** shall be issued before earth movements and construction start in order to minimize traffic disruptions
- Where temporary closure of road is required, alternative access to property will be ensured and local solutions including diversions will be implemented to ensure uninterrupted mobility.

### Decommissioning Access to Infrastructure and Services

The transportation of decommissioned material and equipment will take place by trucks and through the existing road network. The exercise is not considered to give significant rise to pressure on existing infrastructure in the study area as the number of trucks will be low/negligible. The low number of workers are not also anticipated to strain the existing health infrastructure. The existing waste management infrastructure and services in the study area is not expected to suffer additional burden as decommissioning wastes associated with transmission are largely re-used or recycled. The impact is classified as **insignificant**.

### Residual Impacts

Considering the mitigation measures in place, the significance of traffic and road network disruption may be reduced to minor, while the impact from road network improvements in the operation phase is positive.

**Table 69-Residual Impact Significance-Damage / access to local infrastructure and services**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disruption to traffic and transportation	Construction	Moderate	Minor
Improvement of the local road networks	Operation	Positive	Positive

**Source: EMC Consultants, 2019**



### 8.3.2.10 Air Navigation and Safety

For purposes of ensuring aircraft safety, the Kenya Civil Aviation Authority (KCAA) is mandated to evaluate and approve aerial masts and other structural heights. The installations, like the Power transmission towers, should not be erected in the vicinity of an aerodrome that may impact of aircraft operation being conducted safely. The impact to aircraft safety can be directly through collision, or indirectly through radar and radio interference. There are different heights and distance allowed depending on how far the building is from the runway and the approach path. Approval was obtained from the KCAA for the installations on 6/7/2021(see Annex L . There are 9 aerodromes and airstrips around the site, these are outlined in figure below. The tower heights of the stainless-steel pylons is approximately 40m above ground level and none is on the flight path of any of the airports.



**Figure 8-65: Aerodromes & Airstrips**

Source: Google Maps/EMC Consultants, 2019

**Table 70-Pre-Mitigation Impact Analysis on Air Navigation Safety**

Impact	Air Navigation and Safety			
Impact Nature	Negative	Positive	Neutral	
	Change in visual amenity			
Impact Type	Direct	Indirect	Induced	
	Impact is a result as a direct interaction between project activities and local views			
	Temporary	Short Term	Long Term	Permanent

Impact Duration	The impact duration will be temporary				
Impact Extent	Local	Regional		International	
	The impact will be limited to the immediate surroundings of the construction yards and access roads.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low	Medium		High	
	The area has mainly modified environment with no relevant scenic views' locations				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be Negligible.				
Mitigation	As a mitigation measure, the tower heights for the proposed Kabarnet-Rumuruti transmission line were submitted for clearance by KCAA. Approval of these tower heights was granted ( Annex L) and the tower heights deemed as not posing any risk to air safety.				

**Source: EMC Consultants, 2019**

### **Residual Impacts**

Considering the mitigation measures in place, the significance of air craft safety disruption may be eliminated/none.

**Table 71-Residual Impact Significance- Air Navigation Safety**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Air craft safety	Operation	Moderate	Minor

**Source: KETRACO ESIA team, 2021**

#### *8.3.2.11 Landscape and Visual Amenity Risks and Impacts*

Visual Impacts refers mainly to the changes to the visual character of landscape views resulting from: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the views of the visual receptors and intrusion of foreign elements into the view shed of landscape features. The construction

activities for the transmission lines will have an impact on the visual character of the landscape due to:

- Clearance of vegetation along the transmission line corridor, construction yards and access roads;
- Presence of construction vehicles and equipment;
- Worker presence and activity; and
- Dust emissions resulting from construction activities and traffic.

**Table 72-Potential Impacts to Landscape and Visual Amenity**

Construction Phase	Operation Phase
Presence of construction vehicles and work force	Presence of transmission lines and towers/monopoles Permanent clearance of vegetation

**Source: EMC Consultants, 2019**

### Baseline Conditions

The local settings of the landscape are mainly characterized by the presence of open space plantations and cultivation areas with the line crossing small sections of Lariak Forest.

### Impact Assessment

#### Construction Phase

As per the current settings of the project area, the proposed transmission line will cause minimal change to people's existing views. Despite the direct and negative impact of additional construction vehicles on site, it will be temporary and local. The small magnitude on visual amenity and the low sensitivity of the receptors means the significance of this impact is assessed as negligible. Based on the analysis provided above, the visual impact and change of landscape will be of minor significance.

**Table 73-Pre-Mitigation Impact Assessment-Visual Amenity during Construction**

Impact	Visual Amenity during Construction			
Impact Nature	Negative	Positive	Neutral	
	Change in visual amenity			
Impact Type	Direct	Indirect	Induced	
	Impact is a result as a direct interaction between project activities and local views			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The impact duration will be temporary			
	Local	Regional	International	

Impact Extent	The impact will be limited to the immediate surroundings of the construction yards and access roads.				
Impact Scale	The impact is considered as small (local) scale.				
Frequency	Continuous				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered small.				
Resource/ Receptor Sensitivity	Low		Medium		High
	The area has mainly modified environment with no relevant scenic views' locations				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be Negligible.				

Source: EMC Consultants, 2019

### Operation Phase

Along the proposed alignment, only the few communities in close proximity to the corridor will be able to perceive the presence of the project features, being more sensitive to the visual intrusion. Moreover, the expected pylons type (not solid but lattice) are limiting their evidence in the landscape as the viewer moves further away from them. The visual absorption capacity of the landscape is enhanced by the existing infrastructure as well as by the local vegetation patches and local gentle topography.

Based on the analysis provided above, the visual impact and change of landscape will be of *minor* significance.

**Table 74-Pre-Mitigation Impact Assessment- Visual Amenity during Operations**

Table 4.1: The Mitigation Impact Assessment – Visual Amenity during Operations				
Impact	Visual Amenity during Operations			
Impact Nature	Negative	Positive	Neutral	
	Change in visual character			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the project and surrounding residents and land users			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The impact duration will be permanent throughout the project life.			

Impact Extent	Local	Regional		International	
	The view shed experience is limited to few kilometres				
Impact Scale	The impact is considered as local scale. Visual impacts will not only impact people who live near the transmission line route, but also people who are travelling by the line daily.				
Frequency	Likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is expected to be medium				
Resource/ Receptor Sensitivity	Low	Medium		High	
	The area has mainly modified environment with no relevant scenic views' locations				
Impact Significance	Negligible	Minor	Moderate		Major
	Considering the magnitude is medium and the sensitivity is low the overall significance is considered to be minor				

**Source: EMC Consultants, 2019**

### **Mitigation**

The nature of the development (i.e., tall structures and a linear formation) does not allow many opportunities for complete screening. The objective of mitigation is to minimize visual scarring of the landscape and to enhance absorption of the development's permanent equipment and structure into the surrounding environment. Specific recommended measures during operation as best practices include:

- Any excavated or cut and fill areas will be landscaped and revegetated.
- No debris or waste materials will be left at the work sites, good housekeeping on site to avoid litter and minimise waste;
- Towers and structures should have a non-reflective finish;
- Night lighting of sites should be minimized within requirements of safety and efficiency.
- Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the corridor; and

It is suggested to evaluate locations in proximity of very close sensitive receptors to determine whether installation of screening items such as vegetated areas with indigenous species will reduce visual impacts and install if warranted.

### **Residual Impact**

Considering the nature of the construction activities, the foreseen mitigation measures are able to furtherly reduce the impacts avoiding an alteration of the view shed experience. For the operational phase, the nature of the project features is limiting the possibility to greatly reduce

the potential impacts. There are, however, a number of sensitive visual receptors in proximity to the power line and the power line will intrude on their existing views. These visual receptors are mainly limited to residents with houses within 1 km of the route. Mitigation measures are unlikely to reduce the visual impact of the power lines on these visual receptors .

**Table 75-Residual Impact Significance**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Visual impact	Construction	Minor	Negligible

**Source: EMC Consultants, 2019**

#### 8.3.2.12 Worker's Health and Safety

The construction activities will entail engagement of contractors, sub-contractors and third-party entities which will form part of the supply chain and is likely to attract workers from within the project area and outside of the project area. The total number of work force cannot be estimated at this point and will be provided by the contractor. The total work force is going to be skilled and unskilled and sourced from project locality and outside of locality including internationally depending on the skill sets desired. The workers required by the contractor may include among others: -

- a) Engineers-Skilled Experts (civil, mechanical, electrical) etc.
- b) Supervisors, Inspectors Foreman and Operators –Skilled Experts;
- c) Technicians (inspectorate, welders, masons, steel fixers, drivers etc.)–Skilled Experts; and
- d) Flagmen, diggers, cleaning, security, mixing, watering, help team- Unskilled.

Workers' rights including occupational health and safety should be considered not only for those who are directly employed by KETRACO but also its contractors (including sub-contractors) and within the supply chain. With the declaration of Covid-19 as a public health issue, the risk of spread of this highly contagious disease is exacerbated during the construction phase, and has adverse health impacts of workers hired at the construction sites. COVID-19 spreads primarily through respiratory droplets or contact with contaminated surfaces. Exposure can occur at the workplace, while travelling to work, during work-related travel to an area with local community transmission, as well as on the way to and from the workplace. COVID-19 transmits when people breathe in air contaminated by droplets and small airborne particles. The risk of breathing these in is highest when people are in close proximity as is the case in construction sites. Contaminated air can also be inhaled over longer distances, particularly indoors. The contractor therefore need to develop a prevention and management plan and ensure it is enforced.

Table 81 presents the potentially significant impacts associated with occupational health and safety and worker management during the construction and operation phases. The potential for occupational health and safety incidents throughout the life cycle of the project is higher during construction phase.



**Table 76-Potential Impacts on Occupational Health and Safety and Worker Management**

Construction Phase	Operation Phase
<p>Impacts on workers' health and safety, in particular from road accidents, slip, and trip and falls hazards during tower erection and stringing activities, exposure to chemicals and inconsistent use of personal protective equipment (PPEs).</p> <p>Impacts on workers' rights from violations of labour laws in particular with respect to enforcement of health and safety measures by the employer such as the use of appropriate PPEs during construction of the transmission lines.</p> <p>Workers are likely to be exposed to work related risks during the construction phase of the project especially when erecting the transmission towers and lines. Typical activities for the construction of the transmission lines include clearance of the RoW in vegetated areas, excavation work, erecting the towers, working at height and stringing the transmission lines. The above activities could expose workers to injuries and even fatalities when for instance those working at height fall, towers collapse, objects fall on workers, electrocution etc.</p> <p>Similarly, the storage and disposal of hazardous waste and materials generated from the use of materials during the construction of transmission lines may also pose a hazard to the health of the workforce if not handled properly. Equipment and worker transport along the access roads to the pole positions may also result in road accidents in the absence of a proper traffic management plan or if traffic safety rules are not enforced. The often-poor conditions of the existing roads may also increase the risk of accidents.</p>	<p>Impacts on workers' health and safety in particular during maintenance of the transmission lines are from occupational hazards such as electrocution and EMF during line maintenance and the exposure to chemicals.</p> <p>Impacts on worker's rights from lack of enforcement of health and safety measures by the employer such as the use of appropriate PPEs during maintenance of the transmission lines.</p>

**Source: EMC Consultants, 2019**



Non-routine events such as risk of transmission line collapse and risks during stringing activities are assessed in Section **8.3.2.16** on Unplanned Events.

### **Baseline Conditions**

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

1. There is adequate public health coverage in the 2 Counties and the majority of the population have access to County/Government of Kenya (GoK) subsidized health services.
2. Settlement level key informants reported that the distance to health centres from these settlements varies between 0 and 2 km.
3. Road infrastructure and road safety are precarious along the Project transmission line route.
4. Enforcement of health and safety laws and standards in Kenya is expected to be limited, which contributes to high incidence of accidents on construction sites.

### **Impact Assessment**

#### **Construction**

##### **Worker's Health and Safety and Labour Rights**

Typical activities for the construction of the transmission lines include clearance of the RoW in vegetated areas, excavation work, erecting the towers, working at height and stringing the transmission lines. Considering that construction was identified as one of the sectors of employment (formal and informal) in Kenya (including in the peri-urban areas along the transmission line route), the locally hired workforce may have some experience in traditional/basic construction activities such as excavation works. However, work practices and consideration for health and safety may fall short of international standards and best practice, such as the use of personal protective equipment (PPE), which will increase the severity of hazards to which the workforce are exposed.

Similarly, the storage and disposal of hazardous waste and materials generated from the use of materials during the construction of transmission lines may also pose a hazard to the health of the workforce if not handled properly.

Equipment and worker transport along the access roads to the pole positions may also result in road accidents in the absence of a proper traffic management plan or if traffic safety rules are not enforced. The often-poor conditions of the existing roads may also increase the risk of accidents.

During construction, the direct interaction between the Project and the workforce if not managed properly, will result in negative impacts on the workers' working conditions and potentially permanent impacts on their health and safety. The impact is considered short-term and continuous over the 12 months construction phase resulting in a medium impact magnitude. Since contractors are expected to operate according to international standards and considering the level of prior training of the workforce, receptor sensitivity is considered medium. Therefore, the impact is of *moderate* significance.

As stated previously, the Project during its lifetime will be subject to local labour laws and international standards with respect to the responsibility of the employer to safeguard the health and safety of its employees. The Project is therefore expected to abide by these regulations and develop and implement appropriate health and safety measures covering the operations phase including the use of PPE by the workforce. As stated for the construction phase, compliance with KETRACO's EHSS policy aimed at safeguarding the health and safety of its employees and subcontractors will additionally help prevent potential labour abuses and reduce the risk of health and safety incidents. Finally, all contractor contracts will include explicit reference to the need to abide by Kenyan law and KETRACO's standards and policies in relation to health and safety.

**Table 77-Pre-Mitigation Impact Assessment- Workers Health and Safety and Rights during Construction**

Impact	Workers Health and Safety and Rights during Construction				
Impact Nature	Negative		Positive	Neutral	
	Poor planning, non-compliance with health and safety best practice and labour rights can result in injuries or fatalities.				
Impact Type	Direct		Indirect	Induced	
	Resulting from a direct interaction between the Project (i.e., increased project traffic, working at height, stringing the transmission lines across the towers, open excavations, and demining) and the workforce.				
Impact Duration	Temporary		Short Term	Long Term	Permanent
	Injuries and fatalities could have permanent impacts on workers and their families.				
Impact Extent	Local		Regional		International
	The workforce will be primarily contracted from urban centres and potentially from peri-urban areas along the Transmission line.				
Impact Scale	As mentioned above the workers will be working on different sections of the line at different times. The impact scale is therefore medium.				
Frequency	The frequency is considered to be infrequent as the workforce and drivers are expected to be trained and the employer is expected to enforce the use of PPEs and health and safety measures.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above and considering the embedded measures in place the magnitude is considered to be medium.				
	Low		Medium		High

Resource/ Receptor Sensitivity	The sensitivity of the receptors (workforce working along the transmission lines) is considered medium as some workers may not be aware of their rights.			
Impact Significance	Negligible	Minor	Moderate	Major
	Since the magnitude is considered medium and sensitivity is medium, the impact on workers' health and safety during construction activities is considered to be of moderate significance.			

**Source: EMC Consultants, 2019**

### Operations

Similar to the construction phase, the operation phase may also lead to occupational health and safety issues in particular with respect to maintenance of the transmission lines (risk of electrocution and exposure to electric and magnetic fields).

With respect to exposure to EMF, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) considers that there are occupational circumstances where, with appropriate advice and training, it is reasonable for workers voluntarily and knowingly to experience transient effects such as retinal phosphenes and possible minor changes in some brain functions. These symptoms are not believed to result in long term or pathological health effects.

Any health and safety and labour rights related impact during the operations phase will be limited to a small number of workers and will be permanent over the operation phase. The magnitude is therefore considered small. Receptor sensitivity is considered low as most workers will be permanent skilled workers. Therefore, the impact is of *minor* significance.

**Table 78-Pre-Mitigation Impact Assessment- Workers Health and Safety and Rights during Operations**

Impact	Workers Health and Safety and Rights during Operations			
Impact Nature	Negative	Positive		Neutral
	Poor planning, non-compliance with health and safety best practice and labour rights can result in injuries or fatalities.			
Impact Type	Direct	Indirect		Induced
	Resulting from a direct interaction between the Project (i.e. increased project traffic, working at height, stringing the transmission lines across the towers, open excavations) and the workforce.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	Injuries and fatalities could have permanent impacts on workers and their families.			
	Local	Regional		International

Impact Extent	The workforce will be primarily contracted from urban and rural centres within the 3 Counties and other Counties in Kenya as well as from other countries for some higher skilled jobs.			
Impact Scale	The impact scale is considered small during operations as the workforce size will be reduced and maintenance activities will be periodic.			
Frequency	The impact is considered to be infrequent since the operation activities will be limited to maintenance works. The workforce is expected to be trained and the employer is expected to enforce the use of PPEs and health and safety measures. Lessons learned from the construction phase are expected to enhance the safety conditions and thus reducing the frequency of safety incidents during the operation and maintenance phase.			
Impact Magnitude	Positive	Negligible	Small	Medium
	Based on the parameters above, and the embedded measures in place, the magnitude is considered small.			
Resource/ Receptor Sensitivity/Value/ Importance*	Low		Medium	High
	The sensitivity of the receptors is considered low as workers will be mostly skilled permanent employees.			
Impact Significance	Negligible		Minor	Major
	Considering the magnitude is medium and sensitivity is low, the impact on workers' health and safety during operations activities is considered to be of Moderate significance.			

Source: EMC Consultants, 2019

### Decommissioning Phase: Worker's Health and Safety and Labour Rights

Typical activities for the decommissioning of the transmission lines include excavation work, dismantling of the towers, working at height and un-stringing the transmission lines. During these activities, the use of personal protective equipment (PPE), will greatly manage the severity of hazards to which the workforce is exposed. The traffic management plan will also be used to manage road accidents. The impact is considered short-term and medium over the decommissioning phase. Since contractors are expected to operate according to international standards and are in possession of prior Environmental Health & Safety (EHS) training, the impact is of **moderate** significance.

### Mitigation Measures

The following mitigation measures will be implemented during the construction phase to reduce any impacts on workers' health and safety and labour rights. KETRACO will develop and implement a Workers Health and Safety Management System covering all contractors and subcontractors including the following measures:

- KETRACO will require contractors to develop Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable International Labour Organisation (ILO) standards, compensation including consideration of overtime, holidays etc.

- KETRACO will require its contractors and subcontractors to put in place policies in line with national legislation and applicable international legislation and KETRACO Code of Conduct and Policies.
- KETRACO will establish contractual clauses to be embedded in the contracts of the EPC and all sub-contractors that require adherence to Kenyan law and international standards to be upheld related to worker rights and providing the contractor and KETRACO with the right of audit.
- KETRACO require that contractors prohibit the use of alcohol or drugs, which could adversely affect the ability the employee to perform the work safely or adversely affect the health and safety of other employees, community members or the environment.
- Pre-employment medical assessments will be put in place as a workforce risk management tool to screen individuals for risk factors that may limit their ability to perform a job safely and effectively. Expected benefits of conducting a pre-employment medical assessment include a safer working environment, reduction in workplace injuries, minimised downtime, matching the capacity of the employee with the role, and overall recruitment cost and risk reduction.
- KETRACO will ensure that training on health and safety measures is provided to all construction workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities.
- KETRACO will implement regular health and safety checks and audits of Workers, contractors and subcontractors and implementing sanctions in case of breaches of national standards and the Project's specific standards. Such audits to include workplace H&S; worker contracts, working hours, pay and conditions; housing and food standards.
- KETRACO will develop and implement a Workers Grievance Mechanism for the Project workforce including contractors and subcontractors.
- KETRACO will establish a procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational health and safety risks.
- KETRACO will ensure that facilities and work sites are designed and maintained such that robust barriers are in place to prevent accidents.
- KETRACO will ensure that its Code of Conduct is followed to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE.
- Provision of condoms (male and female) for workers
- Creating awareness on HIV/AIDS spread among workers and community
- KETRACO will ensure that adequate clean water, adequate food, and access to medical care is provided to all workers on the worksite and at accommodation.
- KETRACO will develop and implement a Traffic Management Plan covering aspect such as vehicle safety, driver, and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations.
- KETRACO will develop a Waste Management Plan for the construction phase with clear guidelines for the safe storage and disposal of hazardous waste and handling of hazardous materials.

- COVID-19 mitigation measures such as daily temperatures screening and recording for both workers and visitors, vaccination of workers, wearing of masks, and regular handwashing shall be enforced at the work site
- Recruitment will be undertaken in collaboration with local authorities and local agencies. KETRACO will put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.

During the operation phase, KETRACO will implement the following measures:

1. The Workers' Health and Safety Management System will be extended to the operation phase and adapted to address relevant aspects, including the following measures:
2. Identification and provision of appropriate PPE, training, and monitoring, as well as ongoing safety checks and safety audits.
3. Prohibiting the use of alcohol or drugs, which could adversely affect the ability the employee to perform the work safely or adversely affect the health and safety of other employees, community members or the environment.
4. Ensuring that training on health and safety measures is provided to all operation workers prior to starting to work on the Project.
5. KETRACO will undertake compliance monitoring of labour rights. KPIs will be developed around worker rights, discrimination and management, workforce grievance mechanism and monitoring of outcomes.
6. Implementing a Workers Grievance Mechanism for the Project workforce.
7. Establishing a procedure for the recording and analysis of lessons learned and implementation of additional actions to avoid or minimize occupational health and safety risks.
8. KETRACO will develop a Waste Management Plan for the operation phase with clear guidelines for the safe storage and disposal of hazardous waste and handling of hazardous materials.
9. KETRACO will put in place measures to ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, age, religion or sexual orientation.

### **Residual Impacts**

The implementation of mitigation measures will contribute to reducing occupational health and safety risks and the risk of labour rights abuses significantly. However, the risk of potential accidents still exists and may potentially lead to injuries or fatalities for the workforce during construction and operation. This risk will be short-term during the construction phase (18-24 months) and long-term during operations. With the implementation of mitigation measures the remaining impact significance is considered minor significance during construction and negligible during operation. In fact, during operations, knowledge and lessons learned in terms of health and safety and labour rights during the construction phase may extend to the operation phase and contribute to strengthening local knowledge and practices in Kenya.



**Table 79-Residual Impact Significance**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Worker health and safety and labour rights	Construction	Moderate	Minor
Worker health and safety and labour rights	Operation	Moderate	Minor

**Source: EMC Consultants, 2019**

#### 8.3.2.13 Community Health and Safety Impacts

The presence of the Project could affect the health, safety, and wellbeing of the communities along the transmission line route. Increased Project-related traffic, civil works for site preparation including site clearance and excavation work, change to the environment due to increased noise, decreased air quality, inappropriate waste handling or disposal, and accidental leaks and spills, and the presence of the Project workforce all present potential hazards for the health and safety of local communities. Similarly, communities and stakeholder concerns around the safety of the transmission lines once they are operational including exposure to electric and magnetic fields (EMF), also have the potential to affect communities. Construction activities are likely to expose the local communities to health and safety related risks. Local community members could be exposed to accidents which could lead to injuries or fatalities. Collapsing of the towers, falling objects, road accidents caused by construction vehicles, exposure to hazardous wastes from the construction sites among others are potential community health and safety impacts. Further as discussed external workers could bring with them communicable diseases including sexually transmitted diseases (STDs) that could be passed on to local communities. The potential impacts of the project to members of the community are:-

- Respiratory diseases from dust emission by project vehicles
- Accidental fall in non barricaded excavated tower foundations by children playing within the vicinity
- Noise pollution from project vehicles

- Road accidents caused by project vehicles
- Social vices i.e HIV/AIDS due to interaction of local community members and project workers

The table below presents the potentially significant community health, safety and security impacts that may occur during the construction and operation phases.

**Table 80-Potential Impacts on Community Health and Safety**

<b>Construction Phase</b>	<b>Operation Phases</b>
<p>Potential impacts on community safety, in particular road accidents, trespass on the sites, and demining activities potentially resulting in accidents leading to injuries or fatalities.</p> <p>Environmental health: changes to the environment due to increased noise and vibrations, decreased air quality and, inadequate management of waste.</p> <p>Social vices resulting from the interaction of workers from outside the project area with members of the local community.</p>	<p>Community health over exposure to EMF.</p>

**Source: EMC Consultants, 2019**

### **Baseline Conditions**

Relevant baseline conditions that may potentially influence impacts are summarized as follows:

- Road infrastructure and road safety are precarious along the Project transmission line route.
- Commercial activity such as the sale of agricultural products, wood and other small trades is often conducted on the side of the roads which increases the risk of accidents.

### **Operations**

#### **Potential Health Impact from Exposure to Electromagnetic Fields**

Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device such as power lines and electrical equipment. Electric fields are created by differences in voltage; the higher the voltage, the stronger the resulting electric field. Concerns over EMF health and safety risks are related to chronic (long term) health effects and acute (short term) effects. The potential impacts on community health and safety resulting from potential chronic and acute health effects caused by the transmission lines' EMF are assessed below.

Chronic effects relate to long term exposure to low magnetic fields and the potential impacts on health. Specifically, epidemiological studies indicated that long term exposure to 50-60 Hz magnetic fields might be associated with an increased risk of childhood leukemia. There are also some concerns about possible increased risk of cancer from exposure to electromagnetic

radiation from overhead transmission line. However, according the IFC EHS guidelines for electric power distribution, there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. Nevertheless, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

Similarly, with respect to acute health effects from EMF, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines notes that there are a number of well-established acute effects of exposure to low frequency EMFs on the nervous systems; these being a result of direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes. These health effects are not believed to result in long term or pathological health effects.

The development of the Project has been designed to comply with the *IFC EHS Guidelines for Electric Power Transmission and Distribution (April 30, 2007)* and the *ICNIRP Guidelines (2010)*. As such, rerouting of the transmission line has aimed to minimize exposure to the public in accordance with ICNIRP guidelines on public and occupational exposure. Based on the analysis provided above, the potential impact from EMF from chronic and acute exposure is of **minor** significance.

**Table 81-Pre-Mitigation Impact Assessment- EMF Chronic and Acute Health Effects**

Impact	EMF Chronic and Acute Health Effects			
Impact Nature	Negative	Positive		Neutral
	Negative chronic and acute health effects as a result of EMF exposure.			
Impact Type	Direct	Indirect		Induced
	The impact is a direct interaction between the transmission lines and surrounding residents and land users.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The duration is permanent as the project life cycle is expected to last throughout the project life.			
Impact Extent	Local	Regional		International
	The impact is of local extent as it will be limited to the vicinity of the transmission line.			
Impact Scale	The impact scale is small considering the embedded measures in place to minimize exposure to the public in accordance with <i>ICNIRP guidelines on public and occupational exposure</i> and <i>IFC EHS Guidelines on Electric Power Transmission and Distribution</i> .			
Frequency	The occurrence of EMF is constant during the operation of the transmission lines; however, the risk of the chronic and acute health effects occurring is low.			

Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is considered small considering the embedded measures in place.				
Resource/ Receptor Sensitivity	Low		Medium	High	
	Receptor sensitivity is considered medium due to range of individuals in nearby settlements.				
Impact Significance	Negligible	Minor	Moderate	Major	
	The overall potential chronic and acute effects are considered minor.				

Source: EMC Consultants, 2019

### Impact on Community Safety related to Road Traffic, Site Trespass Activities

During construction there will be an increase in traffic movements of heavy machinery and light vehicles in the road along the Transmission Line route and in access roads leading to the temporary tower site working areas during a period of 18-24 months. This will include water trucks, cement trucks, transport of construction material, excavation machinery, etc. which is expected to increase the risk of road traffic accidents and potential injuries or fatalities to other road users or pedestrians. The increase in movement of vehicles during the construction phase may result in greater disturbance and decreased wellbeing for those communities closest to the tower site working areas and along transportation routes and access roads.

It is assumed that the tower site working areas (40x50m each on average) will not be fenced during construction activities. The risk of trespass is highest when the tower sites are closest to settlements and agricultural areas with no electricity coverage, which increases the risk of accidental trespass at night. Trespassing on the temporary tower site working areas could result in accidents leading to injuries or even fatalities, especially due to the presence of large machinery, tower construction parts such as metal structures, and open excavations, which could at times be partly filled with water (e.g., open excavations for the erection of towers). Young people, elders and children are most at risk of being injured. The impact is a direct result of interaction with the increased traffic associated with construction activities. The impact is temporary in nature and limited to the settlements in the Study Area and the surrounding road network. Contractors will also be required to operate according to best international practice. However, considering the potential risk posed to communities, the magnitude is considered medium. Receptor sensitivity is also rated as medium, resulting in moderate impact significance.

**Table 82-Pre-Mitigation Impact Assessment- Community Health and Safety**

Impact	Community Health and Safety		
	Negative	Positive	Neutral

Impact Nature	Increased traffic during the construction period may result in increased risk to road traffic accidents and the presence of unfenced tower site working areas near settlements may result in trespassing and potential injuries.				
Impact Type	Direct	Indirect	Induced		
	Impact that results from a direct interaction between the Project (i.e., increased traffic, unfenced tower work sites, risk posed by demining activities) and the local population along the transmission lines and road users.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The increased traffic effect and risks to injuries is temporary, as construction activities will take place in a sequential manner during the length of the construction period. However, although construction activities at the tower sites working areas will be sequential, access to these sites will be prohibited throughout the 18-24 months of construction, as machinery and equipment will be left at the sites in between team shifts from site to site until completion of the works.				
Impact Extent	Local	Regional	International		
	Impact limited to the settlements in the Study Area				
Impact Scale	The impact is considered as medium scale since temporary tower sites will be under construction along the transmission line.				
Frequency	The frequency is considered to be occasional or one time at each temporary tower site over the duration of the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be medium considering the potential consequence of accidents.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity of the receptors (local population along the transmission lines and road users including vehicle users, pedestrians and cyclists) is considered medium, as contractors will ensure that construction activities are undertaken in compliance with international standards. In addition, the transmission lines will be built in mostly rural areas and peri-urban areas where previous transmission lines have been built in recent years, and dense traffic in these areas may not be unusual for the populations, which may also contribute to improving the overall sensitivity.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude and sensitivity are medium, the impact on the community safety during construction activities is considered to be of moderate significance.				

Source: EMC Consultants, 2019

### Impact on Environmental Health for Communities

During the construction phase (approximately 18-24 months), activities will result in changes to the physical environment, with the potential to affect the health and welfare of communities. There will be temporary increases in dust during the duration of the construction phase, which will be mostly localised to the temporary tower site working areas and access roads. These are likely to result in increased disturbance and decreased wellbeing especially for residents closest to construction site and along unpaved access roads. There are no impacts on local air quality over the long term and therefore unlikely to result in a recordable increase in respiratory diseases in the population.

Similarly, the construction of the transmission lines is likely to result in temporary increased noise levels for residents close to the temporary tower site working areas. The increase in noise is likely to result in disturbance and decreased wellbeing for those closest to the construction activities. However, this will be limited to construction hours and sleep disturbance is unlikely assuming construction work will be undertaken during daytime hours.

Project construction will also entail some temporary, localized, ground works that will generate vibrations. Depending on the soil characteristics and on the distance to the nearest building, these activities could produce vibrations for houses in the vicinity. Impacts could range from the level of temporary nuisance and disturbance, up to actual damage to buildings. It should be noted that the minimum allowed distance from a physical structure to the tower position is 10m.

Waste production as a result of the construction activities is unlikely to impact on the health of communities along the route since most of the waste will be placed in the appropriate covered waste containers, and transported periodically to licensed dumpsites, and therefore opportunities for communities to come into contact with waste will be minimal.

KETRACO will reinstate and rehabilitate construction areas including repairing any damage caused as part of the construction activities.

The impacts on environmental health during construction are temporary in nature for the duration of the construction phase. Construction activities and associated vehicular traffic will take place in temporary tower working areas and dirt access roads along the transmission line and close to local settlements. Considering the temporary nature of the works and the sequential approach, the magnitude is considered medium.

Receptor sensitivity is also considered medium as receptors will include children, old people and others that may be susceptible to changes to environmental quality. However, it is noted that the transmission line crosses areas where previous transmission lines have been built in recent years, and related environmental changes might not be unusual for the populations, which may reduce the overall sensitivity of the populations. The impact significance is therefore considered moderate.

**Table 83-Pre-Mitigation Impact Assessment- Environmental Health**

Impact	Environmental Health		
	Negative	Positive	Neutral



Impact Nature	Construction activities have the potential to impact on environmental health which may translate into decreased localized air quality and increase in noise emission and associated disturbance.				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project (i.e., air and noise emissions, vibrations, changes into visual environment and generation of waste) and the population along the transmission lines.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary since it is expected to be limited to the duration of construction activities at each of the temporary tower sites. Note however that the time between each stop may vary, and that machinery and equipment will be left at the sites in between team shifts. Access to these sites will therefore be prohibited during the 18-24 months of construction.				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area and surrounding access roads connecting to settlements located further away (500m area from the line)				
Impact Scale	The impact is considered medium. Although construction will take place in a phased manner at the different sites, there is the potential for air and noise emissions to extend beyond the immediate tower sites working areas and associated access roads.				
Frequency	The frequency is considered to be occasional or one time at each tower site and associated access roads throughout the 18-24 months construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered to be medium.				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered medium as receptors may experience disturbance and decreased well-being. Also, although structures inside the 30m footprint corridor will be displaced to maintain security distances to the line, houses located further away may still experience some impacts related to noise and air quality. However, since the transmission line crosses areas where previous transmission lines have been built in recent years, related environmental changes might not be unusual for the populations, which may contribute to reducing the sensitivity of the local people.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering both the magnitude and receptor sensitivity are medium, the impact on the community health due to environmental changes during construction activities is considered of moderate significance.				

**Source: EMC Consultants, 2019**

### Potential Interactions with Project Workforce

Indirectly, results of the development activities might affect population growth. It is predicted that the following demographic processes will take place:

1. **In-migration:** People from other areas will move to the area in search of new opportunities. The opportunities may not be directly in the project; they could be incoming to conduct business as a result of the project.
2. **Presence of temporary workers:** It is not expected that the area will experience substantial labor influx.

Without mitigation, the primary impact of in-migration will be an increase in population, physical expansion of project affected areas and informal development.

1. The potential for unplanned and uncontrolled growth could lead to issues surrounding safety, sanitation, and service delivery.
2. Where in-migrants compete directly against local people, especially for unskilled jobs, it may result in tension, and possible aggression, between job seekers within the affected areas, and the country more widely.
3. In-migration can also lead to negative social change and an erosion of cultural values, as migrants bring in different cultural norms and values and attitudes to traditional leadership systems.
4. An influx of in-migrants is likely to lead to an increase in communicable diseases such as TB, HIV/AIDS and other sexually transmitted diseases, exacerbated by increased pressure on health care facilities and the possible introduction of new diseases.
5. Influx of in-migrants is likely to lead to the risk of GBV (SEA and SH).

The Project workforce may be housed in open or closed accommodation camps. Interaction with nearby communities is therefore very likely and could potentially lead to an increased transmission of communicable diseases and sexually transmitted diseases within these communities. This is a particular risk in relation to communities located close to worker camps where the potential for interaction is highest. The exact locations of the workers camps are not confirmed at this stage but are expected to be located near the town centers.

The profile of these diseases will be influenced by the existing diseases profile of communities along the route and the diseases profile of the country's workers are sourced from (in case of international workers). In addition, if opportunistic workers arrive in the area hoping to benefit from employment spin offs this could also impact on the transmission of communicable diseases. Considering that 85% of the workers will be sourced from urban and peri-urban centers and areas near the transmission line route, communicable diseases of concern are likely to include diarrhea, respiratory infections, and typhoid fever. Children will be at particular risk of diarrheal diseases due to their sanitary behaviors, while the elderly will be at risk of more severe health outcomes as a result of their frailty.

In addition, considering that HIV/AIDS prevalence in Kenya as of 2018 was approximately 4.7% among adults aged 15–49 years old, transmission of HIV may also occur. Since workers may live in open camps, prostitution may also be an issue considering the low levels of employment opportunities, and it is possible that some women in settlements close to the construction camps may resort to prostitution for short term economic gain. There is also a risk of increased

pregnancies of young girls that could result in increased school dropouts in the settlements of the Study Area.

Based on the above, interaction between Project workforce and local communities in the Study Area is considered very likely during the construction phase. Receptor sensitivity is considered high as the low levels of employment opportunities might encourage prostitution and transmission of STDs and communicable diseases. This results in a moderate impact significance.

**Table 84-Pre-Mitigation Impact Assessment- Interaction with Project Workforce**

Impact	Interaction with Project Workforce				
Impact Nature	Negative	Positive	Neutral		
	The presence of Project Workforce will lead to interaction with the local communities which will potentially result in increased transmission of communicable diseases and sexually transmitted diseases.				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project workforce and the population along the transmission lines.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered short term as it is expected to last throughout the 18-24 months construction period in sequential manner along the transmission line and in the areas surrounding worker camps (if established).				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area and nearby urban centers.				
Impact Scale	Camps are open, workers will be free to access surrounding villages and settlements, and interaction is therefore very likely.				
Frequency	The frequency is considered to be continuous throughout the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the parameters above, the magnitude is considered small since work forces is				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered high. The low levels of employment opportunities might encourage prostitution and transmission of STDs, and children and the elderly are considered particularly vulnerable to the transmission of communicable diseases.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Since impact magnitude is considered small and receptor sensitivity is high, the impact on community health due to interactions with the Project Workforce during construction activities is considered of moderate significance.				

**Source: EMC Consultants, 2019**

### **Mitigation Measures**

The following mitigation measures will be implemented during the construction phase to reduce any impacts on community health and safety.

- KETRACO will develop and monitor the implementation of a Community Health and Safety Management Plan which will include the following measures:
  - Ensure that workers are housed in accommodation camps rather than in the local settlements in order to minimize interaction with local communities and related health and safety impacts.
  - Ensure all workers including contractors and subcontractors undergo pre-employment health screening by a medical doctor to determine medical status and fitness for work and issue a certificate of fitness.
  - Ensure any trucking companies employed to work on the Project will have policies around health screening of their workers in line with Project requirements.
  - Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern and STDs.
  - Undertake awareness creation among the communities on HIV/AIDS and other STDs.
  - Provide access to health care for those injured by its activities.
  - Ensure that work sites are fenced and that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. When work fronts are less than 100 meters from a community or house, employ security guards from the local community to prevent trespass.
  - Undertake a program of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, and the dangers of playing on or near equipment or entering fenced areas. Special attention to be paid in primary and secondary schools along the transmission routes and in areas where towers will be built close to residential or school areas.

KETRACO will develop Emergency Prevention Preparedness and Response Plans (EPRPs) in cooperation with local emergency authorities and hospitals.

- KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process.
- KETRACO will provide primary health care and first aid at construction camp sites to avoid pressure on local healthcare infrastructures.
- KETRACO will implement a Community Grievance Mechanism.
- KETRACO will develop and implement a Traffic Management Plan covering aspect such as vehicle safety, driver, and passenger behavior, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations.

### **Decommissioning Phase: Community Health and Safety Impacts**

Increased Project-related traffic for site decommissioning will cause change to the environment due to increased noise, decreased air quality, waste handling or disposal, accidental leaks and spills, and the presence of the Project workforce all present potential hazards for the health and safety of local communities. The community engagement plans, mechanisms and associated measures used during construction and operation will also be used in this phase.

### Residual Impacts

The significance of the residual impacts on community health and safety after the implementation of mitigation measures is presented in **Table 85** below.

**Table 85-Residual Impact Significance**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Community Safety (Road Accidents, Site Trespass)	Construction	Moderate	Minor
Environmental Health (Noise and Air)	Operation	Moderate	Minor
Interaction with Project Workforce	Operation	Moderate	Minor
EMF Health effects	Operation	Moderate	Minor

**Source: EMC Consultants Field Data Survey, 2019**

#### 8.3.2.14 Gender-Based Violence

Due to the large influx of workers from other regions during the construction phase, it is expected that there will be an increased occurrence of gender-based violence (GBV) such as sexual harassment (SH) and sexual exploitation and abuse (SEA). The large influx of workers may lead to an increase in sexual exploitation and abuse and the demand for prostitution (sex work) — even increase the risk for trafficking of women for the purposes of sex work—or the risk of forced early marriage in the community where marriage to employed men may be seen as the best livelihood strategy for adolescent girls. Feedback received from the public consultation process highlighted that labor influx might result to perceived foreigners interacting and engaging in extra-marital affairs with their women. Such could result to domestic violence and sexual exploitation and abuse between project staff and those living in and along the RoW of the project, but also within the homes of those affected by the project i.e. GBV at family and community level. Other forms of GBV mentioned by men and women included inflicting bodily harm, physical assault, verbal abuse, and rape.

Furthermore, during public barazas, it was noted that perceived project benefits such as higher income for spouses in the community could lead to an increase in prostitution and extra-marital affairs. The risk of incidents of sexual exploitation and abuse for minors, even when it is not

transactional / prostitution, could also increase. For instance, the women noted that child neglect, irresponsible spouses, marriage breaks, and gender-based violence might arise due to perceived 'greener pastures' of spouses from the project. The situation, if not mitigated, would mostly hurt the children and women. Such scenarios are likely to escalate to gender-based violence with women and girls being most at risk. The locals and mainly women expressed concerns over possible risks of sexual exploitation and abuse through request of sexual favors while seeking for employment from the project. There was also highlight of possible risk of sexual exploitation and abuse through unwanted sexual advances to women and also men mainly by project workers, contractors, and service providers.

Interviews with key stakeholders also noted the possibility of sexual harassment (SH) between workers / staff working on the project. The key informant stated that unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature might arise at the project workplaces. The potential perpetrators of SH can be any individuals associated with the proposed project including construction workers and other personnel of the contractor, consultants supervising the project or undertaking technical assistance activities relating to the project or even the security personnel hired for the project

Based on the above, interaction between Project workforce and local communities in the Study Area is considered very likely during the construction phase. Receptor sensitivity is considered high as the low levels of employment opportunities might encourage prostitution, an upsurge in GBV/ SH/SEA related cases, and transmission of STDs and communicable diseases. This results in a high impact significance pre-mitigation.

**Table 86-Pre-Mitigation Impact Assessment- Interaction with Project Workforce**

<b>Impact</b>	<b>Interaction with Project Workforce</b>				
Impact Nature	Negative	Positive	Neutral		
	The presence of Project Workers will lead to interaction with the local communities which will potentially result in increased transmission of communicable diseases and sexually transmitted diseases.				
Impact Type	Direct	Indirect	Induced		
	Impacts that result from a direct interaction between the Project workers and the population along the transmission lines.				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered short term as it is expected to last throughout the construction period in sequential manner along the transmission line and in the areas surrounding worker camps (if established).				
Impact Extent	Local	Regional	International		
	Impact limited to the Study Area and nearby urban centers.				
Impact Scale	Camps are open, workers will be free to access surrounding villages and settlements, and interaction is therefore very likely.				
Frequency	The frequency is considered to be continuous throughout the construction phase.				
	Positive	Negligible	Small	Medium	Large

Impact Magnitude	Based on the parameters above, the magnitude is considered high since work forces freely moves within the community, and the likely loss of social fabric, morals and values within the community which is irreparable..		
Impact Significance	Low	Medium	High
Resource/ Receptor Sensitivity	Receptor sensitivity is considered high. The low levels of employment opportunities might encourage prostitution and transmission of STDs, and children and women are considered particularly vulnerable to the transmission of communicable diseases.		
Impact Significance	Negligible	Minor	Major
	Since impact magnitude is considered high and receptor sensitivity is high, the impact on community health due to interactions with the Project Workforce during construction activities is considered of major significance.		

**Source: EMC Consultants, 2019**

**Table 87-Potential Impacts of Gender- Based violence/- SH and SEA**

Construction Phase	Operation Phases
<p>Potential impacts of GBV- SH and SEA, in particular road increase in sexual exploitation and abuse and the demand for prostitution (sex work) —even increase the risk for trafficking of women for the purposes of sex work—or the risk of forced early marriage in the community where marriage to employed men may be seen as the best livelihood strategy for adolescent girls.</p> <p>Social vices resulting from the interaction of workers from outside the project area with members of the local community. This includes an increase in cases of child neglect, irresponsible spouses, prostitution, marriage breaks, and gender-based violence might arise.</p>	<p>The operational phase of the Kabarnet-Rumuruti project may result to influx of maintenance labour force (of both skilled, semi-skilled and unskilled workers) from other regions hence increase occurrences of gender-based violence (GBV) such as sexual harassment (SH) and sexual exploitation and abuse (SEA). SH may manifest between workers / staff working on the project. This could include unwelcome sexual advances, requests for sexual favours, and other unwanted verbal or physical conduct of a sexual nature at the project workplaces.</p> <p>There is likely to be an upsurge of sexually transmitted diseases including HIV and AIDS especially during maintenance works for RoW as migrant</p>



	workers get attracted to prostitution
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### Mitigation Measures

The following mitigation measures shall be undertaken during the construction, operation, and decommissioning phases to mitigate the risk of GBV-SEA/SH.

- Ensure sensitization of the contractor, their sub-contractors and consultants on GBV -SEA/SH issues including refraining from unacceptable conduct towards local community members.
- Introduce a worker Code of Conduct as part of the employment contract, to be signed by all with physical presence on site as well as within the project area, and to include sanctions for non-compliance (e.g., termination).
- Ensure mandatory trainings regarding GBV -SEA/SH to be provided to all project workers including temporary and casual workers. All relevant staff of the contractor should receive training on receiving GBV complaints and referral systems during the project implementation. This will include training on key protocols including referral, reporting and informed consent to enable proper receiving and referral of GBV/SEA-H cases.
- Undertake awareness meetings for the project affected communities on GBV-SEA/SH issues. Participants should be informed about the Code of Conduct, related national legislations and available GRM including other available services/referral mechanism mechanisms for seeking help within the community. In addition, the GRM operators at the community level will be sensitized to ensure appropriate response by; providing a safe caring environment and respect the confidentiality and wishes of the survivor;
- Adopt and implement a grievance redress mechanism (GRM) and referral mechanism to address all emerging complaints including risks such as Sexual Exploitation and Abuse (SEA) / Sexual Harassment (SH). Given to the sensitive nature of GBV complaints, the GRM will provide different ways to submit grievances in a confidential manner
- Ensure establishment and Implementation of a GBV-SEA/SH Action Plan by the contractor which should reflect the unique dimensions of the project and community.
- Ensure separate sanitation and hygiene facilities (toilets, utility rooms and changing rooms) for men and women in the workers' camps / workplaces are provided.
- Prioritize GBV -SEA/SH prevention, response, and risk mitigation approaches
- Adopt a policy to cooperate with law enforcement agencies in investigating complaints about GBV-SEA/SH should a survivor choose the legal redress. Survivors should be facilitated to understand that this may require them to commit to cooperate with the agencies.

- Inform workers and local community about national laws such as the Sexual Offences Act. No 3 of 2006 that make GBV-SEA/SH a punishable offence which is prosecuted.
- Apply all Kenyan Constitutional / legal requirements on gender and sexual based violence throughout the project.

**Table 88-Residual Impact Significance- Gender Based Violence - SH and SEA**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Gender- Based violence/- SH and SEA	Construction	Major	Minor
Gender- Based violence/- SH and SEA	Operation	Major	Minor
Gender- Based violence/- SH and SEA	Decommission	Major	Minor

**Source: EMC Consultants Field Data Survey, 2019**

#### 8.3.2.15 Violence Against Children and Child labour

The recruitment of children under the age of 18 during the construction, operation, and maintenance and decommissioning of the transmission line is a potential risk and considered child labour. Based on current conditions in the sector it is assessed that the risk of child or forced labor is negligible. This ESIA study appreciates the probable risk to minors who may seek job opportunities due to the availability of work, or accompanying parents to the work site in far-flung construction sites. However, this risk is adequately managed and mitigated against through national legislation and KETRACO's corporate requirement. Sex with minors is another form of child labour that may occur during construction, operation and decommissioning mainly by the work force.

**Table 89-Pre-Mitigation Impact Assessment-Violence Against Children and Child Labour**

Impact	Violence Against Children and Child Labour			
Impact Nature	Negative	Positive	Neutral	
	The presence of employment opportunities will lead to an increased risk to minors who may seek job opportunities or accompany parents to the work site in far-flung construction sites.			
Impact Type	Direct	Indirect	Induced	
	Impacts that result from a direct interaction between the Project workers and the population along the transmission lines.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The effect is considered short term as it is expected to last throughout the construction period in sequential manner along the transmission line and in the areas surrounding worker camps (if established).			

	Local	Regional	International		
Impact Extent	Impact limited to the Study Area and nearby urban centers.				
Impact Scale	Camps are open, workers will be free to access surrounding villages and settlements, and interaction is therefore very likely.				
Frequency	The frequency is considered to be continuous throughout the construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Pre-mitigation, based on the parameters above, the magnitude is considered medium to children and minors within the project area due to the disruption of affected minor’s education, mental and physical health and well bieng				
Resource/ Receptor Sensitivity	Low	Medium	High		
	Receptor sensitivity is considered high given the serious and lasting impact on children Voilence against children and child labor can play a role in increasing				
Impact Significance	Negligible	Minor	Moderate	Major	
	Since impact magnitude is considered high and receptor sensitivity is high, the impact on children during construction activities is considered of major significance.				

**Source: EMC Consultants, 2019**

### **Mitigation Measures**

The following mitigation measures will be implemented during the project phases to reduce any impacts on children.

- KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process.
- Preparing and implementing a child protection plan
- Employing persons aged 18+ years (in accordance with the labour laws of Kenya).
- See 8.3.2.14 on SEA mitigation measures

### **Decommissioning Phase: Impacts**

Increased Project-related activities for site decommissioning activities will attract an influx of workers from the neighboring community , a trend similar to the construction phase. There is a likelihood of minors seeking employment or accompanying their parents. It is prudent that the proposed mitigation measures protecting minors from violence or child labor be implemented throughout the project cycle phases.

### Residual Impacts

The significance of the residual impacts after the implementation of mitigation measures is presented in Table 90 below.

**Table 90-Residual Impacts Violence Against Children and Child Labor**

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Violence against Children and Child labour	Construction and decommissioning phase	Major	Negligible

**Source: EMC Consultants Field Data Survey, 2019**

#### 8.3.2.16 Archaeology and Cultural Heritage Impacts

Baseline assessments have not identified cultural heritage sites along the proposed transmission line corridor and thus no valuable tangible cultural heritage structures and resources are likely to be impacted by the project. There were no cultural heritage and archaeological sites identified in the area. Further, there are no graves or cemeteries identified during the ESIA study along the transmission line and this is further confirmed by the asset inventory study undertaken during the RAP preparation. During the construction activities there will be the need to improve access to some of the areas for vehicle. The removal of vegetation and opening of road accesses might uncover cultural sites which can only be removed by the appropriate governmental structures and consultation with the traditional authorities. The potential impacts are likely to be temporary and short term and most of these can be avoided during the vegetation removal process. Based on the baseline data it is not expected that the planned activities will result in negative impacts over the existent cultural and archaeological sites.

#### Baseline Conditions

There are no cultural heritage and archaeological sites identified in the two Counties crossed by the project. The identified archeological and cultural heritage sites are located further away from the proposed transmission line route and thus are unlikely to be affected by the proposed project. There are also no graves along the proposed transmission line.

#### Impact Assessment

##### Pre-Construction Phase

This phase includes design related activities, compensation, and relocation of Project Affected Households due to loss of land, structure, and other assets. The design activities and loss of land and other assets will not lead to any archeological or cultural heritage impacts.

### Construction Phase

During the construction activities there will be the need to improve access to some of the presently remote areas for vehicles and establishment of camps as well as in some inhabited areas. The removal of vegetation and opening of road accesses might uncover illegal grave sites which can only be removed by the appropriate governmental structures and consultation with the traditional authorities. The potential impacts are likely to be temporary and short term and most of these can be avoided during the vegetation removal process. Based on the baseline data it is not expected that the planned activities will result in negative impacts over the existent cultural and archaeological sites. In terms of embedded controls, during the construction phase of the proposed transmission line project the contractor will apply the chance finding procedures as recommended by OP 4.09).

This direct impact is temporary since the impacts will be evident during the vegetation removal and installation of the infrastructure. As there are no grave sites identified within the transmission line RoW the likelihood of these impacts is low. The potential impact in case illegal grave sites are identified during the vegetation removal process, is direct and negative. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be negligible.

Based on the analysis provided above, the impact of the project on cultural sites, will be a low negative impact pre-mitigation (Table 92).

**Table 91-Pre-Mitigation Impact Assessment-Cultural Heritage during Construction**

Impact	Cultural Heritage during Construction				
Impact Nature	Negative	Positive	Neutral		
	Disturbance to grave sites during vegetation removal and construction activities				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and potential cultural sites (e.g., grave sites) along the transmission line				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as grave sites would be identified during the vegetation removal activities				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered to be of negligible scale.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large

Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High	
	The receptors can be identified in the early stages of the process (e.g., vegetation removal and opening accesses). The sensitivity is considered low.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the impact magnitude is negligible and the sensitivity is low, the overall significance is considered to be of negligible significance.			

**Source: EMC Consultants, 2019**

### Operations

During the operational phase there are not expected potential impacts on the cultural heritage as a result of the existence of the transmission line. Table 93 reflects the non-applicability of the significance of impacts on cultural heritage during the operation of the transmission line.

**Table 92-Pre-Mitigation Impact Assessment- Cultural Heritage during Operations**

<b>Impact</b>	<b>Cultural Heritage during Operations</b>				
Impact Nature	Negative	Positive	Neutral		
	There are no expected impacts during operation				
Impact Type	Direct	Indirect	Induced		
	N/A				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	N/A				
Impact Extent	Local	Regional	International		
	N/A				
Impact Scale	The impact is considered to be of negligible scale.				
Frequency	N/A				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	N/A				
Impact Significance	Negligible	Minor	Moderate	Major	
	N/A				

**Source: EMC Consultants, 2019**

### Mitigation

The following standard mitigation measures will be employed:

- Consult community leaders when any community issue arises in order to engage traditional forms of community leadership.
- Work with local community representatives to develop cultural awareness materials (that will cover key issues including the location and importance of all local cultural sites and other cultural sensitivities.
- Should construction activity be required in proximity to existing graves, develop and implement working protocols in consultation with local traditional leaders.
- Do not remove any cultural heritage including graves without prior consultation to the communities and fulfilling the legal requirements. Any removal of cultural heritage should be conducted by the best available techniques.
- Establish a grievance procedure to ensure community concerns are addressed.
- Develop a chance find procedure which will detail the appropriate course of action that must be followed for any relevant cultural heritage discoveries.

### **Residual Impact**

The impact significance is negligible after mitigation measures during construction and no impacts are expected during operations (Table 94). With the proposed mitigation measures, particularly the development of chance finding procedures the residual negative impacts on cultural resources are assessed to be of a low magnitude.

**Table 93-Residual Impact Significance- Cultural Heritage during Construction**

<b>Impact</b>	<b>Project Phase</b>	<b>Significance (Pre-mitigation)</b>	<b>Residual Impact Significance (Post-mitigation)</b>
Damage of grave sites considered important by the local communities	Construction	Negligible	Negligible

**Source: EMC Consultants, 2019**

#### *8.3.2.17 Unplanned Events*

The following section presents the assessment of impacts resulting from unplanned or non-routine events and those which are a result of accidents. These are different to impacts that would reasonably be predicted to occur in the normal course of activities (including the application of in-built control measures) during construction and operations. Unplanned and accidental events have the potential to occur during Project activities and therefore the evaluation of impacts for unplanned and accidental event takes into account the likelihood of the event occurring into the impact magnitude. Likelihood is determined as unlikely, possible, or likely based in professional judgement and quantitative information (statistical frequency) where available. Given the nature of Project activities, unplanned and accidental events relate to potential accidental spills of equipment fuel and oils and vehicle traffic accidents. If unplanned and accidental events did occur, there would be effects on the biophysical and social environment. The risks of unplanned and accidental events are described in this section.

### **Potential Impacts to Soil and Surface Water from Spill Events**



During construction there is the potential for spills of fuels and oils during construction activities, fuelling, maintenance of machinery and vehicles. Spills could occur in a number of locations along the transmission line RoW. Spills have the potential to affect terrestrial environments and could lead to the deterioration of soil, water and sediment quality. This could lead to knock on effects for flora and fauna and local community users.

### Impact Assessment

If hazardous materials such as fuel were to be released to the soil and surface water resources, this would be limited to the local extent, depending on the volume spilt and rate of spillage. Within the Project AoI there are surface water resources such as streams which could be impacted if the spill were to occur within proximity of the resource.

### Likelihood

Incidental spills of fuels are infrequent but do occur; most frequently due to malfunction of handling systems, poor practice of workers and force majeure. Spills are most likely to occur during refilling and transportation of substances. Large releases of hazardous materials are rare and it is considered unlikely that a spill would occur of emergency scale.

### Significance of Impacts

For impacts to soils, the spatial scale is considered to be local. The impact could be long term and is a direct negative impact. The overall magnitude is considered to be medium. There are areas along the transmission RoW which are used for cultivation and therefore the sensitivity is considered of medium sensitivity. This results in a potential negative impact of Moderate significance (Table 95 below).

**Table 94-Potential Impacts from Spillages**

Construction Phase	Operation Phase
Soil and surface water degradation due to fuel spills during construction activities (refueling, maintenance machinery)	Soil and surface water degradation as a result of fuel spills due to maintenance activities of the transmission lines.

**Source: EMC Consultants, 2019**

For surface water, the impact of the spill would be short to medium term as the release of fuel or oil is likely to be a discrete (i.e.: non-continuous) event and the effects on water quality naturally mitigated through dilution and natural attenuation. The magnitude of the impact is considered medium and the potential impact is therefore of Moderate significance (Table 96).

**Table 95-Pre-Mitigation Impact Assessment- Accidental Fuel Spills on Soils**

Impact	Accidental Fuel Spills on Soils		
Impact Nature	Negative	Positive	Neutral
	Reduction in local soil quality as a result of spillage during maintenance of machinery, improper storage of hazardous materials, spillage during transfers of fuel and general construction activities.		
	Direct	Indirect	Induced

Impact Type	Impact is a result as a direct interaction between project activities soil resources along the RoW areas				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is long term due to time for remediation or natural attenuation expected for contaminated soils				
Impact Extent	Local		Regional	International	
	The impact will be limited to the AoI				
Impact Scale	The impact is considered as medium scale. If a spill occurs, it will be locally– usually at a construction site – and not along the whole of the transmission line.				
Frequency	Not Applicable				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above the impact magnitude is considered medium				
Resource/ Receptor Sensitivity	Low		Medium	High	
	While some areas along the RoW are in urban areas other sections include cultivated areas and therefore the significance is medium.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the impact magnitude is medium and the sensitivity is medium the overall significance is considered to be moderate.				

**Source: EMC Consultants, 2019**

### **Mitigations**

The following management measures will be implemented in the Project's ESMP:

- The Project will develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications of any significant spills that have the potential to affect communities. The Project will maintain spill clean-up and response capability adequate for addressing spills during all phases of the Project. All spills will be immediately contained and cleaned up. Contaminated areas will be remediated, and post remediation verification will be carried out (involving sampling of water and/or soil).
- Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills, fuels will be collected and either reused, treated by incineration, or removed by an authorised local contractor. Drip trays must be used when refuelling and servicing vehicles or equipment, where it is not on a hardstanding surface.
- Hazardous material storage will be on hard standing and impermeable surface and the bulk storage facility will be bunded. The Project will restrict storage and handling of hazardous materials and fuels to bunded areas of sufficient capacity to contain a release.
- Hydrocarbon spill clean-up kits shall be available at all locations where refuelling or maintenance of vehicles and equipment is done, and responsible people shall be trained in the use thereof.

### **Residual Impact**

The impacts on soils are considered Minor post mitigation, largely because parts of the transmission line occur in cultivated areas and spills of hazardous substances here are likely to have a greater impact than spills in unutilized areas. Based on the surface water context, impacts on surface water will be of Minor significance post mitigation.

**Table 96-Residual Impact Significance- Accidental Fuel Spills on Soils**

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Reduction in local soil quality	Construction and Operation	Moderate	Minor
Reduction in surface water quality	Construction and Operation	Moderate	Minor

**Source: EMC Consultants, 2019**

### **Potential Impacts to Community Health and Safety**

During the transmission line construction and operation phases, unplanned events with the potential to negatively affect human population could occur. Table 98 presents the potentially significant unplanned events that may occur during the construction and operation phases.

### **Impact Assessment**

Stringing activity around the wires and other electrical units can be a potential hazard if proper planning is not followed. The assumption that local workers at times are not accustomed to using personal protective equipment (PPE) should be taken in consideration, i.e., their attitude to avoid PPE may result in accident/hazard. During operation, there is a possibility of lines or towers/parts of the tower failing and causing injuries and/or fatalities. Additionally, during the operation phase, contact with the transmission line can result in electrocution.

### **Embedded Controls**

The following embedded controls are considered as part of the assessment:

- Contractor team will follow the method statement for overhead stringing; the activities will be managed by experienced Supervisors.
- Implementation of design standards (built in safety), the line hardware used on the overhead transmission lines is rated or designed higher than the conductor ultimate tensile strength and the conductor is only pulled to 20% of its ultimate tensile strength.

The potential impacts are all considered unlikely in that they are not likely to occur during the lifetime of the Project. The significance of the impact associated with stringing activities is

summarized in Table 8-55. This is considered a negative event that could lead to permanent impacts if there are injuries and fatalities. The overall impact is considered of Moderate significance.

**Table 97-Potential Impacts on Community Health and Safety**

Construction Phase	Operation Phase
Risks during stringing activities.	Dielectric oil release that has the potential to ignite, create fire or explosion and could lead to fatalities. Potential disaster resulting in a transmission line snapping, transmission tower/pylon collapse.

**Source: EMC Consultants, 2019**

In terms of the impact related to UXO exposure to the communities, it is considered a negative event that could lead to permanent impacts if there are injuries and fatalities. The overall impact is considered of major significance if unmitigated.

**Table 98: Pre-Mitigation Impact Assessment**

Impact	Risks during Stringing Activities				
Impact Nature	Negative		Positive		Neutral
	Inadequate planning of stringing activities has the potential to impact occupational and community health.				
Impact Type	Direct		Indirect		Induced
	The community health and welfare of workers and population around the stringing activities could be directly impacted.				
Impact Duration	Temporary		Short Term	Long Term	Permanent
	Potential impacts are considered to be permanent as they could lead in injuries and fatalities.				
Impact Extent	Local		Regional		International
	The impact will have a localized extent limited to the transmission lines footprint.				
Impact Scale	The impact is considered as medium scale covering the length of the transmission lines.				
Likelihood	Unlikely because it is not likely to occur during the lifetime of the project.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the above, the event is considered to have a medium magnitude.				

Resource/ Receptor Sensitivity	Low	Medium	High	
	Sensitivity of receptor considered as Medium.			
Impact Significance	Negligible	Minor	Moderate	Major
	Considering the magnitude is medium as well as the sensitivity, the impact on the community health and welfare is considered to be of moderate significance.			

**Source: EMC Consultants, 2019**

Table 100 summarizes the potential impact associated with transmission line snapping or pylon collapse. The negative impact is a direct impact, which while regional in its extent, could lead to permanent impacts and therefore has a large magnitude. The risk is influenced by , tower member theft, material corrosion due to poor coating and poor quality or damaged fittings exposing the system to failure

The receptor sensitivity is considered low as KETRACO in collaboration with Ministry of Interior and coordination has put in place measures to ensure that no houses or business structures are erected within the transmission ROW during the construction and operation phase of the project. The event of the transmission line snapping as an unplanned event is considered as a major significant impact in the event it occurs and if unmitigated. The probability of occurrence is however unlikely to during the lifetime of the project and the impact further diminished as relocation of structures out of the ROW will be done prior to construction and the operation phases. During stringing activities, as a mitigation measure, the contractor will ensure that the area is barricaded during to prevent accidents to passersby. In addition, proper communication through the local chief shall be done, to the community members on the risks associated with the activity and raise awareness of the activities taking place within the community.

**Table 99-Pre-Mitigation Impact Assessment- Risks during Stringing Activities**

Impact	Risks during Stringing Activities			
Impact Nature	Negative	Positive		Neutral
	Injuries or fatalities to community members or workforce.			
Impact Type	Direct	Indirect		Induced
	The community health and welfare of workers and population around the construction areas could be directly impacted.			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	Potential impacts are considered to be permanent as they could lead in injuries and fatalities.			
Impact Extent	Local	Regional		International
	The impact will have a localized extent limited to the transmission lines footprint.			
Impact Scale	The impact is considered as medium scale covering the length of the transmission lines.			
Likelihood	Possible given the high incident of UXOs in the region.			

Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Based on the potential for fatalities, the event is considered to have a large magnitude.				
Resource/ Receptor Sensitivity	Low	Medium		High	
	Sensitivity of receptor considered as Medium.				
Impact Significance	Negligible		Minor	Moderate	Major
	Considering the risk of fatalities. the impact on the community health and welfare (and workforce) is considered to be of Major significance if unmitigated.				

**Source: EMC Consultants, 2019**

### **Mitigations**

The following mitigation measures will be employed to reduce any impacts resulting from a potential unplanned event:

- Stringing activities near wires and other electrical utilities will be done after proper shutdown of the line/utilities with prior information and permission.
- Making sure that temporary soil stockpiles are safely stored, with controlled access.
- An Emergency Prevention and Response Plan (EPRP) will be developed according to international industry standards and best practices.
- The EPRP will be developed in consultation with the competent authorities, emergency service and administrations along the transmission routes.
- Based on consultations with relevant stakeholders, KETRACO will investigate the capacity of statutory local emergency response providers to participate in emergency response activities.
- Personnel will be trained on how to respond to unplanned events.
- Periodic audits will be performed in order to ensure the safeguards are in place.
- Risks to general public during operation will be reduced by public awareness and education and physical measures by attaching an appropriate warning sign on all faces of the tower.
- Once the stringing work is complete, notices and permanent anti-climbing devices will be installed on the tower (in particular in lattice towers). The operational start date for electricity transmission and safety implications will be publicized locally in advance.
- In addition, the risk of the transmission line spanning, or pylon collapse can be mitigated through complying with design specifications, installing anti- theft devices, conducting material quality inspection and compliance, and following KETRACO's installation procedures.

**Table 100-Pre-Mitigation Impact Assessment- Potential Disaster Resulting in Transmission Line Snapping and/or Transmission Tower/Pylon Collapse**

Impact	Potential Disaster Resulting in Transmission Line Snapping and/or Transmission Tower/Pylon Collapse
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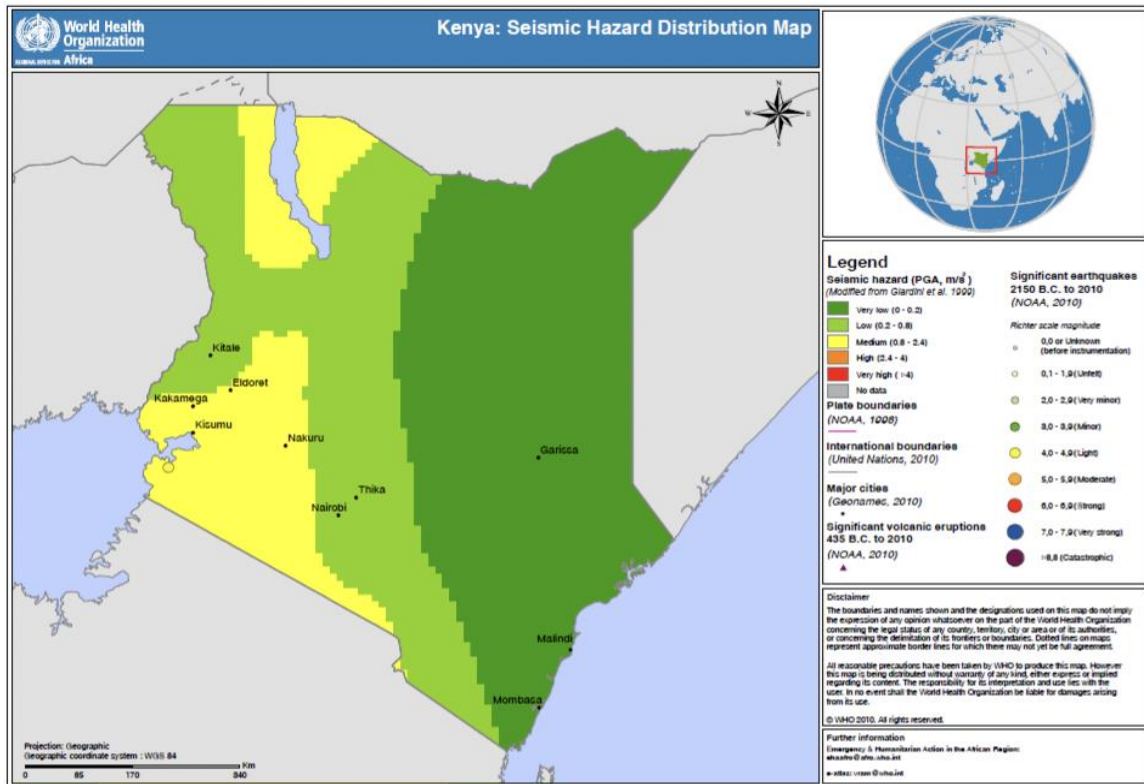
	Negative	Positive	Neutral
Impact Nature	An unplanned event leading to the snapping of the transmission lines or collapse of transmission towers or parts of it has the potential to impact on community health and welfare.		
	Construction and operation	Moderate	Minor
Impact Type	Direct	Indirect	Induced
	The community health and welfare of population around the transmission lines could be directly impacted.		
Impact Duration	Temporary	Short Term	Long Term
	Impacts on community health and wellbeing are considered to be permanent as they could lead in injuries and fatalities.		
Impact Extent	Local	Regional	International
	The impact will have a localized extent limited to the areas surrounding the transmission lines – more acute close to urban and peri/urban areas		
Impact Scale	The impact is considered as medium scale.		
Likelihood	Unlikely because the event is not likely to occur during the lifetime of the project.		
Impact Magnitude	Positive	Negligible	Small
	Based on the above, the event is considered to have a large magnitude.		
Resource/ Receptor Sensitivity	Low	Medium	High
	Sensitivity of receptor considered as High, considering that significant portions of the transmission lines routes cross dense residential areas.		
Impact Significance	Negligible	Minor	Moderate
	Considering the magnitude is large and the sensitivity high, the impact on the community health and welfare in case of transmission line snapping or transmission tower/pylon collapse is considered to be of major significance in the urban areas with crowded settlements and moderate significance in the rural areas. It should be noted that although this event is unlikely to occur it has a great consequence since the majority of the transmission line crosses urban areas.		

**Source: EMC Consultants, 2019**

### Seismic Hazards

The location of the proposed transmission line project generally exhibits low seismic hazards as shown in the Figure 8-6. The measure of seismic risk is defined by Probabilistic Ground Acceleration (PGA) which is the maximum acceleration of the ground shaking during an earthquake. The PGA for an earthquake along the transmission line route is in the range of 0.2 – 0.8m/s.





**Figure 8-66: Seismic Hazard Distribution Map**

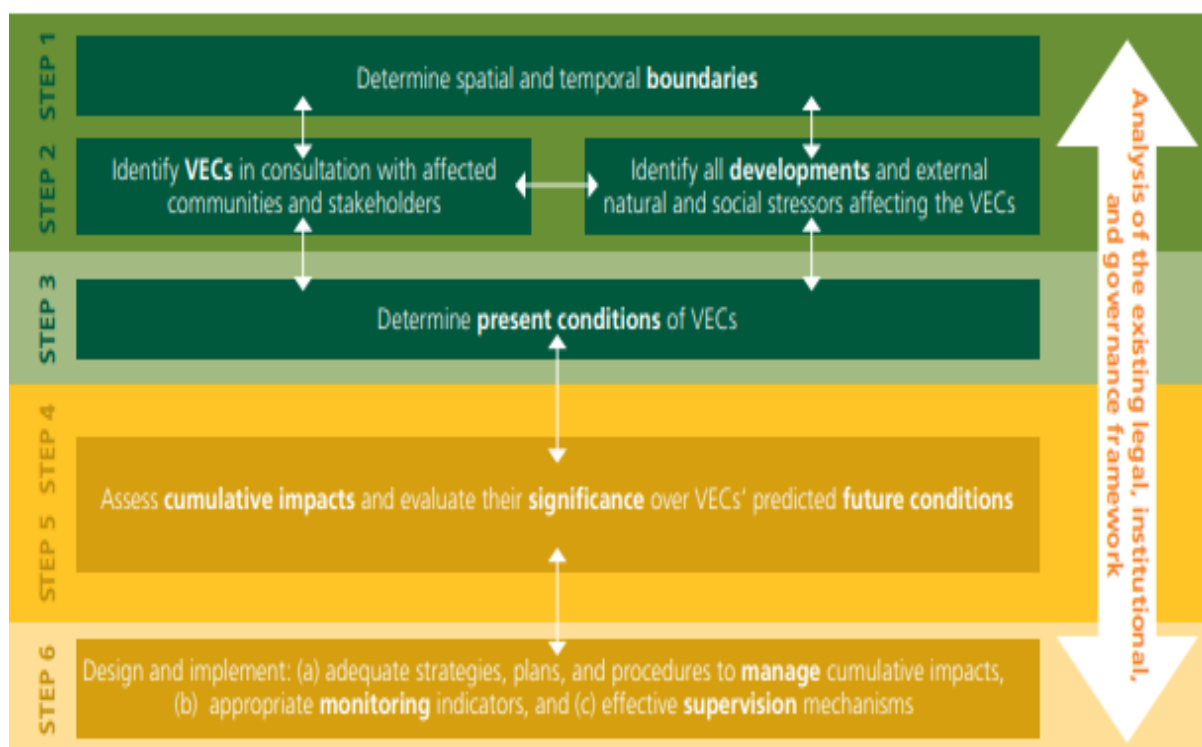
**Source: World Health Organization**

### 8.3.3 Cumulative Impacts

Effects of an action, project, or activity (collectively referred to in this document as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones (IFC, 2013). The potential for cumulative impacts within the Project AoI is considered low as no significant urban developments are expected to occur as a direct cause of the project - the future transmission line will boost energy provision to the counties of Baringo and Laikipia. Consequently, is not likely to result in increased traffic activity in the AoI, increased pressure on waste management facilities and accidental events such as spillages or uncontrolled releases. Cumulative impacts are considered to be Project impacts that act with impacts from other projects such that:

- Sum of the impacts is greater than the parts; or
- Sum of the impacts reaches a threshold level such that the impact becomes significant.

The overall approach is summarized in Figure 8-7 below, as outlined in the IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (Source: [www.ifc.org](http://www.ifc.org) 18/06/2020).



**Figure 8-67: Cumulative Impact Approach**

Source: IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (Source: [www.ifc.org](http://www.ifc.org) 18/06/2020).

Due to the inherent uncertainties in the nature of cumulative impacts, the CIA has by necessity been performed in a qualitative manner, but still provides useful context for determining the significance of the Project's contribution to the overall impacts. Because all of Project predicted residual adverse impacts are of **Minor** or **Negligible** significance, only a high-level CIA has been carried out, on the basis that the potential significant cumulative effects are low. Upon assessment of the project impacts, the cumulative impact assessment will focus impacts on Atmospheric Air quality, Noise Levels, Water quality and use.

### 8.3.3.1 Air Quality

It is expected that air quality will be impacted due to cumulative impacts of additional machines and vehicles along the project RoW. The only source for air pollution from the Transmission Line construction shall be the excavation which shall be carried out during benching and foundation work. However, with only about 9mx9m area to be excavated, the amount of dust generated will be minimal. The other sources of air contaminants will be from the additional worker camps where wood and kerosene may be the main fuel for cooking and heating, especially since these camps will be located away from access roads and Liquefied Petroleum Gas (LPG) or electricity will not be readily available. The net impact of the Project on Air Quality is **small** and **transient**, because air pollution will be generated at the sporadically spread

worker camps and along the highway and will be limited to the pre-construction and construction period.

#### *8.3.3.2 Noise Impacts*

It is expected that the noise levels will be impacted due to cumulative impacts of additional construction machines, vehicles and general construction activities along the RoW given the noise levels of the machines used. The net impact of the Project on Noise Levels is **small** and **transient**, because noise will be generated at the construction sites of the stainless-steel pylons and along the highway and will be limited to the pre-construction and construction period.

#### *8.3.3.3 Water Resources Demand*

Depending on the number of workers deployed at the construction locations of the Transmission Line and in line with the World Health Organization (WHO) requirement that 50 to 100 liters of water per person per day is needed to ensure that most basic needs are met and few health concerns arise. About 300 litres/day of water shall also be used in concrete works, concreting shall be done only for laying foundation for the stainless-steel pylon tower. About 50 liters of water will be also required for sprinkling on to the area of excavation to suppress dust. This shall only be required during the excavation at pylon foundation. The net impacts of the Project activities on water resources are **small** and **transient** because the only use of water for construction of the TL is to serve for domestic purposes. Water use has been calculated for the peak construction period and could be considerably lower than the estimated quantity depending on number of workers at each site.

#### *8.3.3.4 Socioeconomic Parameters*

With regard to socioeconomic parameters, if a project activity causes a negative impact in one parameter that can be compensated by an overall positive development impact, then the impact can usually be considered to be acceptable. The major socio-economic impact is the land acquisition along the RoW, this is mitigated by compensation and livelihood restoration for all persons affected by the project.

## 9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environment Management Plan is an important tool of ensuring project sustainability and environmental and social protection. Whereas efforts are usually made to develop mitigation measures for a proposed project, it is during the operation lifespan of the project that actual impacts are noted or experienced. It is therefore important to integrate in the environmental and social impact assessment process, an environment and social management plan that includes the monitoring of the progress of mitigation measures being implemented while also monitoring the project for any new negative impacts that were not earlier considered or anticipated.

Implementation of the ESMP will largely be handled by KETRACO and the Contractor each with varying roles as indicated in table 102-105 below.

### 9.1 Mitigation Measures

#### Mitigation Hierarchy for the Planned Project Activities

##### **Avoid at source: Reduce at source**

Avoiding or reducing at source is essentially “designing” the project so that a feature causing an impact is designed out (e.g., a Transmission line re-routed) or altered (e.g., reduced working width). Often this is called minimization.

##### **Abate on site**

This involves adding something to the basic design to abate the impact for example, pollution controls fall in this category. This is often called end-of-pipe.

##### **Abate at receptor**

If an impact cannot be abated on-site, then measures can be implemented off-site an example of this would be to install double-glazed windows to minimize the impact of noise at a nearby residence.

##### **Repair or Remedy**

Some impacts involve unacceptable damage to a resource, e.g., agricultural land during transmission line construction. Repair essentially involves restoration and re-instatement type measures.

### 9.2 Pre-Construction

The majority of mitigation measures and in particular mitigations to protect and enhance the physical environment are most effectively incorporated during the design phase. There are five key elements:

- Development of sustainable designs with the lowest possible environmental impact within the constraints of the project funding and the socio-economic setting.
- Incorporate the recommendations and requirements of the ESMP to be an integral part of the Bidding and Contract Documents thereby building in enforceable measures to protect the environmental and social matters throughout the construction phase.
- Development of stakeholder engagement plan or procedures

- Provide adequate grievance redress procedures to address the concerns of local people and stakeholders to ensure satisfactory resolution of any grievance arising from the project.
- Ensure adequate and fair compensation for involuntary resettlement for any party suffering inconvenience, financial or loss of livelihood due to being moved to accommodate the works, principally the construction of the transmission line.

For each of the identified impacts, mitigation measures have been suggested in accordance with a general rule defining mitigation criteria as:

1. Avoidance of major impacts: major impacts are generally considered unacceptable, ones that would endure in the long-term or extend over a large area;
2. Reduction of major and moderate impacts to as low as reasonably practicable (ALARP) by planning, designing, and controlling mitigation measures. This implies that mitigation measures will be applied until the limitations of cost effectiveness and practical application have been reached. The limitations are established by international practice;
3. Implementation of good practices for impacts rated as minor, in order to ensure that impacts are managed within good reason.

There will only be localized short-term impacts during construction due to the implementation of the civil works. Impacts have been addressed at the design stage by choosing engineering solutions that, as far as is possible, minimize the impacts during the construction and operational phase. The impacts which could not be eliminated by the design, mostly impacts during construction, will be reduced or eliminated by mitigation and monitoring measures specified in the ESMP. These construction related impacts can be mitigated by

- i) the contractors' work practices, especially those related to maintenance of access, methods of trench excavation, the storage of construction materials and cleanliness of the work sites;
- ii) cooperation by the local authorities with the contractor in terms of traffic management and use of public space and utilities;
- iii) project management's strict enforcement of the correct construction practices and standards;
- iv) the incorporation of the mitigation measures identified in the ESIA into the bid documents and specifications;
- v) public awareness including liaison at ward level shortly in advance of work in each work location; and
- vi) close monitoring of the contractor's implementation of the required mitigation measures. Environmental impacts and proposed mitigation measures during project pre-construction, construction, operation, and decommissioning phases are described in the following sections.

### 9.3 Environmental and Social Management Plan

The ESIA includes an ESMP which details the mitigation measures, environmental monitoring activities, institutional responsibilities, and environmental management capacity building. The relevant ESMP provisions are included in bid documents for contractors. During construction, the project management team will closely monitor the works contractors' environmental performance and overall ESMP implementation.

**Table 101-Environmental and Social Management Plan- Pre construction phase**

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>PRE-CONSTRUCTION PHASE</b>				
<b>Land Acquisition and Involuntary Displacement</b>	-Permanent and temporary loss of assets (land, structures, and crops), livelihoods and household income as a result of temporary land take.  -Displacement of physical structures and physical resettlement.	Preparation and implementation of the RAP, including any livelihoods restoration measures, as applicable. <ul style="list-style-type: none"> <li>▪ Avoiding or minimizing the number of towers sites working areas in agricultural areas or areas of community resources.</li> <li>▪ Minimizing clearance of maintenance road as in some cases clearance may not be necessary since other access roads are available.</li> <li>▪ Minimizing as far as possible tree cut-off and tree trimming in the temporary tower sites working areas.</li> </ul>	<b>568,944,570.11</b>	KETRACO Social Safeguards Team

Table 102-Environmental and Social Management Plan- Construction Phase

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>Construction Phase</b>				
<b>A1. Construction Air Impacts</b>	Impact on sensitive receptors	<b>A1-1:</b> Develop a Dust Management Plan; <b>A1-2:</b> Record all dust and air quality complaints, identify cause(s), take appropriate measures	8,000,000	Contractor Civil Engineer & Environmental Team Implementation role)
	Impact on workers' health and safety	<b>A1-3:</b> Liaise with local communities to forewarn of potentially dusty activities; <b>A1-4:</b> Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring		
	Impact on community health and safety	<b>A1-5:</b> Undertake inspections to ensure compliance with the Dust Management Plan; <b>A1-6:</b> Plan potentially dusty activities so that these are located as far from receptors as feasible		KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)
	Impact on flora and fauna	<b>A1-7:</b> Erect solid screens if feasible around stockpiles and concrete batching; <b>A1-8:</b> Avoid run off of mud and water and maintain drains in a clean state; <b>A1-9:</b> Remove dusty materials from site as soon as possible if not being re-used. If being re-used, cover or vegetate if possible; <b>A1-10:</b> Impose speed limits on haul routes and in construction compounds to reduce dust generation; <b>A1-11:</b> Minimise drop heights when loading stockpiles or transferring materials; and <b>A1-12:</b> Avoid waste or vegetation burning.		
		For traffic on unpaved roads: <b>A1-13:</b> Undertake watering to attenuate dust near sensitive receptors. The duration and frequency of this should be set out in		



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p>the Dust Management Plan and will consider water availability and any stakeholder grievances; and</p> <p><b>A1-14:</b> On unpaved roads in use for more than 1 month, consider use of surface and sealants to reduce the use of water and water trucks. Use of lignin-based sealants recommended due to low environmental toxicity.</p> <p><b>For earthworks:</b></p> <p><b>A1-15:</b> Revegetate exposed areas as soon as feasible</p> <p><b>A1-16:</b> Revegetate or cover stockpiles if feasible;</p> <p><b>A1-17:</b> Expose the minimum area required for the works and undertake; and exposure on a staged basis to minimise dust blow</p> <p><b>For track out:</b></p> <p><b>A1-18:</b> Where track out is onto paved roads, use wet road cleaning methods to remove dirt and mud build up;</p> <p><b>A1-19:</b> Avoid dry sweeping of large areas; and</p> <p><b>A1-20:</b> Where feasible, undertake wheel washing and vehicle clean down prior to accessing public roads.</p> <p>Exhaust emissions</p> <ul style="list-style-type: none"> <li>• Idling of vehicles is prohibited</li> <li>• Regular maintenance of plant and equipment</li> <li>• Use serviceable vehicles and machinery to avoid excessive smoke emission</li> </ul>		
<b>A2. Noise and Vibration Impacts</b>	Impact on sensitive receptors	<b>A2-1:</b> Siting noisy plant and equipment as far away as possible from NSRs, and use of barriers (e.g., site huts, acoustic sheds or	5,500,000	Contractor Civil Engineer &

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	<p>Impact on workers' health and safety</p> <p>Impact on community health and safety</p> <p>Impact on fauna</p>	<p>partitions) to reduce the level of construction noise at receptors wherever practicable;</p> <p><b>A2-2:</b> Where practicable noisy equipment will be orientated to face away from the nearest NSRs;</p> <p><b>A2-3:</b> Working hours for significant noise generating construction work (including works required to upgrade existing access roads or create new ones), will be daytime only;</p> <p><b>A2-4:</b> Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable;</p> <p><b>A2-5:</b> Where practicable, stationary equipment will be located in an acoustically treated enclosure</p> <p><b>A2-6:</b> For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also, that the doors close properly against the seals;</p> <p><b>A2-7:</b> Throttle settings will be reduced, and equipment and plant turned off, when not being used;</p> <p><b>A2-8:</b> Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked; and</p> <p><b>A2-9:</b> Fitting of mufflers or silencers of the type recommended by manufacturers</p>		<p>Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>A3. Soil erosion and contamination impacts</b>	Impacts on water quality (sediment run-off/contamination)	<p><b>A3-1:</b> Vegetation clearing, and topsoil disturbance will be minimized.</p> <p><b>A3-2:</b> Contour temporary and permanent access roads/laydown areas so as to minimise surface water runoff and erosion;</p>	1,500,000	Contractor Civil Engineer & Environmental Team

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	<p>leading to deterioration of quality.</p> <p>Deteriorated water quality will impact on fauna if consumed.</p> <p>Deteriorated water quality will impact on community health if consumed.</p>	<p><b>A3-3:</b> Sheet erosion of soil shall be prevented where necessary through the use of sandbags, diversion berms, culverts, or other physical means.</p> <p><b>A3-4:</b> Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible construction work will take place during the dry season.</p> <p><b>A3-5:</b> Topsoil shall be evenly spread across the cleared areas when reinstated.</p> <p><b>A3-6:</b> Accelerated erosion from storm events during construction shall be minimised through managing storm water runoff (e.g., velocity control measures).</p> <p><b>A3-7:</b> Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile. Material (e.g. fuel or chemicals).</p> <p><b>A3-8:</b> Spread mulch generated from indigenous cleared vegetation across exposed soils after construction.</p>		<p>Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>A4. Surface Water Quality Impacts</b>	<p>Impacts on water quality (sediment run-off/contamination) leading to deterioration of quality.</p> <p>Deteriorated water quality will impact</p>	<p><b>A4-1:</b> Activities shall be conducted &gt;100m away from water bodies, except where crossings are required.</p> <p><b>A4-2:</b> All wastewater which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be discharged to the environment;</p> <p><b>A4-3:</b> Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan. Park vehicles preferably on paved platforms</p>	1,000,000	

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	<p>on fauna if consumed.</p> <p>Deteriorated water quality will impact on community health if consumed.</p>			
<b>A5. Impact on Flora and Vegetation</b>	<p>Loss of biodiversity.</p> <p>Fragmentation of habitat.</p>	<b>A5-1:</b> Avoidance of impacts should be prioritized. , it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.	1,500,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
		<b>A5-2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;		
		<b>A5-3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;		
		<b>A5-4:</b> There should be no deviation from the access road position without prior discussions with the authorities;		
		<b>A5-5:</b> Firewood collection by the project's employees should be strictly forbidden.		
		<b>A5-6:</b> Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;		

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>A5-7:</b> Materials (e.g., pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and</p> <p><b>A5-8:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		
<b>A6. Impact on Fauna</b>	-Disturbance due to noise, vibrations, and vehicle presence.	<p><b>A6-1:</b> All areas disturbed by construction activities shall be landscaped and rehabilitated;</p> <p><b>A6-2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>A6-3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>A6-4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>A6-5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p> <p><b>A6-6:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>A6-7:</b> Restrict construction to day time</p> <p><b>A6-8:</b> Apply applicable protected areas regulations</p> <p><b>A6-9:</b> No blockage of wildlife migratory routes</p>	1,100,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>A7. Impact on Avifauna</b>	-Disturbance due to noise, vibrations, and vehicle presence.	<b>A7-1:</b> In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;	8,000,000	
		<b>A7-2:</b> Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energized parts of transmission infrastructure		
		<b>A7-3:</b> Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energized wires		
		<b>A7-4:</b> Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;	2,700,000	Contractor Civil Engineer & Environmental Team Implementation role)
		<b>A7-5:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)		
		<b>A7-6:</b> All animal dens in close proximity to the work areas must be marked as no-go areas.		
		<b>A7-7:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.		
				KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>A8: Solid and Liquid Waste Impacts</b>	<ul style="list-style-type: none"> <li>-Impact on storm water quality and thus water quality in the water bodies in project areas</li> <li>-Impact on soil quality</li> <li>-Impact on surface water quality;</li> <li>-Impact on ground water quality; and</li> <li>-Impact on ecological receptors or human health</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide means for handling sewage generated at the construction site;</li> <li>▪ Provision of mobile toilets at every active site for transmission line and associated facilities construction;</li> </ul> <p>Monitor effluent quality on quaternary basis to ensure that the stipulated discharge standard as per Environmental Management and Co-ordination (Water quality) Regulations 2006 are not violated.</p>	80,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>A9. Access to Infrastructure and Services</b>	<ul style="list-style-type: none"> <li>-Disruption of transit routes</li> <li>-Disruption of normal traffic operations</li> <li>-Wastes from the camp site could be significant and overburden the existing wastes disposal facilities in the area</li> </ul>	<p><b>A9-1:</b> Methods will be implemented to maintain open, clear and transparent communication with the local communities regarding the use of local infrastructures by the Project throughout the different phases.</p> <p><b>A9-2:</b> Engagement with the relevant authorities is recommended in order to avoid damage to common property and minimize access disruption to education and healthcare facilities</p> <p><b>A9-3:</b> Community Grievance Mechanism will be implemented.</p> <p><b>A9-4:</b> A Traffic Management Plan shall be issued before earth movements and construction start in order to minimize traffic disruptions</p>	300,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental</p>



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<b>A9-5:</b> Where temporary closure of road is required, alternative access to property will be ensured and local solutions including diversions will be implemented to ensure uninterrupted mobility.		Safeguards Team (Supervisory and monitoring role)
<b>A10: Landscape &amp; Visual amenities risks</b>	-Impacts on aesthetics of the surroundings with the possibility to affect the neighbouring residents.	<p><b>A10-1:</b> Any excavated or cut and fill areas will be landscaped and revegetated;</p> <p><b>A10-2:</b> No debris or waste materials will be left at the work sites, good housekeeping on site to avoid litter and minimise waste</p> <p><b>A10-3:</b> Towers and structures should have a non-reflective finish;</p> <p><b>A10-4:</b> Night lighting of sites should be minimized within requirements of safety and efficiency.</p> <p><b>A10-5:</b> Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the corridor;</p> <p><b>A10-6:</b> Reforestation activities Minimize clearing of indigenous plant species and ensure replanting of indigenous plant species in disturbed areas by liaising with experts from Kenya Forest Services (KFS); Employ vegetation rehabilitation techniques to recover lost land cover such as planting indigenous grass species in areas where the RoW will traverse; Ensure proper demarcation and delineation of the project area to be affected by construction works; Implement a landscaping programme for the substation site; Consider to support community initiatives in tree planting initiatives such as in surrounding primary schools, and public amenity areas as part of CSR and for reforestation purposes.</p>	5,600,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>A11: Worker's Health and Safety and Workers Management</b>	-Workers are likely to be exposed to work related risks during the construction phase of the project.	<b>A11-1:</b> KETRACO will develop a Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc.	800,000	KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)  Contractor Civil Engineer & Environmental Team Implementation role)
		<b>A11-2:</b> KETRACO will require its contractors and subcontractors to put in place policies in line with national legislation and applicable international legislation and KETRACO Code of Conduct and Policies.		
		<b>A11-3:</b> KETRACO will establish contractual clauses to be embedded in the contracts of the EPC and all sub-contractors that require adherence to Kenyan law and international standards to be upheld related to worker rights and providing the contractor and KETRACO with the right of audit.		
		<b>A11-4:</b> Pre-employment medical assessments will be put in place as a workforce risk management tool to screen individuals for risk factors that may limit their ability to perform a job safely and effectively. Expected benefits of conducting a pre-employment medical assessment include a safer working environment, reduction in workplace injuries, minimised downtime, matching the capacity of the employee with the role, and overall recruitment cost and risk reduction.		
		<b>A11-5:</b> KETRACO will ensure that training on health and safety measures is provided to all construction workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities.		

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>A11-6:</b> KETRACO will implement regular health and safety checks and audits of workers, contractors and subcontractors and implementing sanctions in case of breaches of nationals</p> <p><b>A11-7:</b> KETRACO will develop and implement a Workers Grievance Mechanism for the Project workforce including contractors and subcontractor's standards and the Project's specific standards. Such audits to include workplace H&amp;S; worker contracts, working hours, pay and conditions; housing and food standards.</p> <p><b>A11-8:</b> KETRACO will establish a procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational health and safety risks.</p> <p><b>A11-9:</b> KETRACO will ensure that facilities and work sites are designed and maintained such that robust barriers are in place to prevent accidents.</p> <p><b>A11-10:</b> KETRACO will ensure that its Code of Conduct is followed to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE.</p> <p><b>A11-11:</b> KETRACO will ensure that adequate clean water, adequate food, and access to medical care is provided to all workers on the worksite and at accommodation.</p> <p><b>A11-12:</b> KETRACO will ensure that condoms are provided to male and female workers</p>		

<p><b>A12: Community Health and Safety Impacts</b></p>	<p>-Increased noise decreased air quality, inappropriate waste handling or disposal, and accidental leaks and spills, debris and movement of heavy equipment may pose a safety risk to the general public.</p> <p>-Potential impacts on community safety, in particular road accidents, trespass on the sites, and demining activities potentially resulting in accidents leading to injuries or fatalities.</p> <p>~ Environmental health: changes to the environment due to increased noise and vibrations, decreased air quality and, inadequate</p>	<p><b>A12-1:</b> KETRACO will develop and monitor the implementation of a Community Health and Safety Management Plan which will include the following measures:</p> <ul style="list-style-type: none"> <li>• Ensure that all workers are housed in accommodation camps rather than in the local settlements in order to minimize interaction with local communities and related health and safety impacts.</li> <li>• Ensure all workers including contractors and subcontractors undergo pre-employment screening and regular health screening including voluntary screening for STDs.</li> <li>• Ensure any trucking companies employed to work on the Project will have policies around health screening of their workers in line with Project requirements.</li> <li>• Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern and STDs.</li> <li>• Undertake community awareness on HIV/AIDS and other STDs</li> <li>• Ensure that COVID-19 protocols and guidelines by GoK's Ministry of Health are adhered to during the decommissioning activities including social distancing, provision of face masks to all workers, provision of sanitizers, the establishment of handwashing areas and provision of water and soap, conducting temperature checks for all workers, creating awareness on signs and symptoms of COVID-19, encouraging staff to take COVID-19 tests if symptoms associated with the same are</li> </ul>	<p>3,700,000</p>	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
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	<p>management of waste.</p> <p>~ Impact from workers presence and potential interaction with local populations</p>	<p>exhibited, liaising with GoK to offer vaccination for workers</p> <ul style="list-style-type: none"> <li>• Provide access to health care for those injured by its activities.</li> <li>• Ensure that work sites are fenced and that signs are put up around work fronts and construction sites advising people of the risks associated with trespass. When work fronts are less than 100 metres from a community or house, employ security guards from the local community to prevent trespass.</li> <li>• Undertake a programme of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, and the dangers of playing on or near equipment or entering fenced areas. Special attention to be paid in primary and secondary schools along the transmission routes and in areas where towers will be built close to residential or school areas.</li> </ul>		
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IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>A12-2:</b> KETRACO will develop Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals.</p> <ul style="list-style-type: none"> <li>• KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process.</li> <li>• KETRACO will provide primary health care and first aid at construction camp sites to avoid pressure on local healthcare infrastructures.</li> <li>• KETRACO will implement a Community Grievance Mechanism.</li> <li>• KETRACO will develop and implement a Traffic Management Plan covering aspect such as vehicle safety, driver, and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations</li> </ul>	90,000	
<b>A13: Gender-based violence at the community level</b>	-Gender-based violence at the community level -Forced Early Marriages -Sexual Exploitation and Abuse -Transactional sex. -Shift in power dynamics in the	<p><b>A13-1:</b> KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct periodically to all employees including contractors and subcontractors as part of the induction process.</p> <p>Ensure that the Worker Code of Conduct is publicly disclosed in local languages and are widely accessible to all workers and all group of people in the project areas.</p> <p>Establish a link between KETRACO activities or operations with,</p>	400,000	Contractor Civil Engineer & Social Team Implementation role)  KETRACO Social Safeguards Team

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	community or family. -Abusive behaviour among project-related staff	GBV cases at the community level such as domestic violence. This is to ensure that all GBV cases reported at the community level and resulting from or exacerbated by project operations are managed effectively.  Conduct safety audits to identify settings affected by the project that might increase the risk of GBVH. Ensuring that all the workers have contracts and background checks including reference from the most recent employers.		(Supervisory and monitoring role)
<b>A14: Violation of children rights by contractor and labour force on site</b>	-Violation of children rights by contractor and labour force on site. e.g., child labour, sexual relations with minors etc.	<b>A14-1:</b> • KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process. <b>A 14-2:</b> Prepare and implement a Child Protection Strategy <b>A 14-3:</b> Prepare and implement a child protection plan and monitoring the employment register, <b>A 14-4:</b> Employing persons aged 18+ years	150,000	Contractor Civil Engineer & Environmental Team Implementation role)  KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)
<b>A15: Archaeology and Cultural Heritage Impacts</b>	-Restriction to access cultural sites.	<b>Avoid damage to, relocation of or restricting access to physical, cultural resources.</b>	600,000	Contractor Civil Engineer & Environmental



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	-Destruction of cultural sites during construction or operations	<p><b>A15-1:</b> Consult community when any community issue arises in order to engage traditional forms of community leadership. Develop stakeholder engagement procedures to guide consultations.</p> <p><b>A15-2:</b> Work with local community representatives to develop cultural awareness materials (that will cover key issues including the location and importance of all local cultural sites and other cultural sensitivities (graves). Develop stakeholder engagement procedures to guide consultations.</p> <p><b>A15-3:</b> Should construction activity be required in proximity to existing graves, develop and implement working protocols in consultation with local traditional leaders. Develop stakeholder engagement procedures to guide consultations.</p> <p><b>A15-4:</b> Do not remove any cultural heritage including graves without prior consultation to the communities and fulfilling the legal requirements. Any removal of cultural heritage should be conducted by the best available techniques.</p> <p><b>A15-5:</b> Establish a grievance procedure to ensure community concerns are addressed.</p> <p><b>A15-6:</b> Develop a chance find procedure which will detail the appropriate course of action that must be followed for any relevant cultural heritage discoveries.</p>		<p>Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>A16: Unplanned Events</b>	-Impacts to soil and surface water from spill events	<b>A16-1:</b> Develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications of any significant spills that have the potential to affect communities.	3, 120,000	Contractor Civil Engineer & Environmental Team Implementation role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>A16-2:</b> Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground.</p> <p><b>A16-3:</b> Hazardous material storage will be on hard standing and impermeable surface and the bulk storage facility will be bunded.</p> <p><b>A16-4:</b> Hydrocarbon spill clean-up kits shall be available at all locations where refuelling or maintenance of vehicles and equipment is done, and responsible people shall be trained in the use thereof.</p>		KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)
		<b>Sub Total ( Excluding RAP Cost)</b>	xKsh 44,140,000	

**Table 103-Environmental and Social Management Plan- Operation and Maintenance phase**

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>OPERATIONS AND MAINTENANCE PHASE</b>				
<b>B1. Air pollution Impacts</b>		<p><b>B1-1:</b> Develop a Dust Management Plan;</p> <p><b>B1-2:</b> Record all dust and air quality complaints, identify cause(s), take appropriate measures</p> <p><b>B1-3:</b> Liaise with local communities to forewarn of potentially dusty activities;</p> <p><b>B1-4:</b> Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring</p>	6,900,000	KETRACO Civil Engineer & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>B1-5:</b> Undertake inspections to ensure compliance with the Dust Management Plan;</p> <p><b>B1-6:</b> Plan potentially dusty activities so that these are located as far from receptors as feasible</p> <p><b>B1-7:</b> Erect solid screens if feasible around stockpiles and concrete batching;</p> <p><b>B1-8:</b> Avoid run off of mud and water and maintain drains in a clean state;</p> <p><b>B1-9:</b> Remove dusty materials from site as soon as possible if not being re-used. If being re-used, cover or vegetate if possible;</p> <p><b>B1-10:</b> Impose speed limits on haul routes and in construction compounds to reduce dust generation;</p> <p><b>B1-11:</b> Minimise drop heights when loading stockpiles or transferring materials; and</p> <p><b>B1-12:</b> Avoid waste or vegetation burning.</p>		
		<p>For traffic on unpaved roads:</p> <p><b>B1-13:</b> Undertake watering to attenuate dust near sensitive receptors. The duration and frequency of this should be set out in the Dust Management Plan and will consider water availability and any stakeholder grievances; and</p> <p><b>B1-14:</b> On unpaved roads in use for more than 1 month, consider use of surface and sealants to reduce the use of water and water trucks. Use of lignin-based sealants recommended due to low environmental toxicity.</p>		
		<p>For earthworks:</p> <p><b>B1-15:</b> Revegetate exposed areas as soon as feasible</p> <p><b>B1-16:</b> Revegetate or cover stockpiles if feasible;</p>		

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>B1-17:</b> Expose the minimum area required for the works and undertake; and exposure on a staged basis to minimise dust blow/</p> <p>For track out:</p> <p><b>B1-18:</b> Where track out is onto paved roads, use wet road cleaning methods to remove dirt and mud build up;</p> <p><b>B1-19:</b> Avoid dry sweeping of large areas; and</p> <p><b>B1-20:</b> Where feasible, undertake wheel washing and vehicle clean down prior to accessing public roads.</p>		
<b>B2. Noise Emissions and Vibration Impacts</b>	Intermittent noise from high voltage overhead power transmission lines can generate noise by a phenomenon known as 'corona discharge'	<p><b>B2-1:</b> Siting noisy plant and equipment as far away as possible from NSRs, and use of barriers (e.g., site huts, acoustic sheds or partitions) to reduce the level of construction noise at receptors wherever practicable;</p> <p><b>B2-2:</b> Where practicable noisy equipment will be orientated to face away from the nearest NSRs;</p> <p><b>B2-3:</b> Working hours for significant noise generating construction work (including works required to upgrade existing access roads or create new ones), will be daytime only;</p> <p><b>B2-4:</b> Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable;</p> <p><b>B2-5:</b> Where practicable, stationary equipment will be located in an acoustically treated enclosure</p> <p><b>B2-6:</b> For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also, that the doors close properly against the seals;</p>	2,200,000	KETRACO Civil Engineer & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>B2-7:</b> Throttle settings will be reduced, and equipment and plant turned off, when not being used;</p> <p><b>B2-8:</b> Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked; and</p> <p><b>B2-9:</b> Fitting of mufflers or silencers of the type recommended by manufacturers</p>		
<b>B3. Soil erosion and contamination impacts</b>	~ Minimal or no soil erosion	<p><b>B3-1:</b> Vegetation clearing, and topsoil disturbance will be minimized.</p> <p><b>B3-2:</b> Contour temporary and permanent access roads/laydown areas so as to minimise surface water runoff and erosion;</p> <p><b>B3-3:</b> Sheet erosion of soil shall be prevented where necessary through the use of sandbags, diversion berms, culverts, or other physical means.</p> <p><b>B3-4:</b> Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible construction work will take place during the dry season.</p> <p><b>B3-5:</b> Topsoil shall be evenly spread across the cleared areas when reinstated.</p> <p><b>B3-6:</b> Accelerated erosion from storm events during construction shall be minimised through managing storm water runoff (e.g. velocity control measures).</p> <p><b>B3-7:</b> Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile. Material (e.g. fuel or chemicals).</p>	4,500,000	KETRACO Civil Engineer & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<b>B3-8:</b> Spread mulch generated from indigenous cleared vegetation across exposed soils after construction.		
<b>B4. Surface Water Quality Impacts</b>	-Minimal or no water pollution	<b>B4-1:</b> Activities shall be conducted >100m away from water bodies, except where crossings are required.		
		<b>B4-2:</b> All wastewater which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be discharged to the environment; and		
		<b>B4-3:</b> Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan. Park vehicles preferably on paved platforms		
<b>B5. Impact on Flora and Vegetation</b>	-No Large impact on existing flora and vegetation.	<b>B5-1:</b> Avoidance of impacts should be prioritized; it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.	2,400,000	KETRACO Civil Engineer & Environmental Safeguards Team
		<b>B5-2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;		
		<b>B5-3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;		
		<b>B5-4:</b> There should be no deviation from the access road position without prior discussions with the authorities;		

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>B5-5:</b> Firewood collection by the project's employees should be strictly forbidden.</p> <p><b>B5-6:</b> Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;</p> <p><b>B5-7:</b> Materials (e.g., pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and</p> <p><b>B5-8:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		



PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>B6. Impact on Fauna</b>	<p>~ Disturbance due to noise, vibrations and vehicle presence.</p> <p>~ Direct strike with the transmission line and pylons (bird collision) and by electrocution</p> <p>~ Change of avian flight patterns for some species.</p>	<p><b>B6-1:</b> All areas disturbed by maintenance activities shall be landscaped and rehabilitated;</p> <p><b>B6-2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>B6-3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>B6-4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>B6-5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p>	1,200,000	KETRACO Civil Engineer & Environmental Safeguards Team
<b>B7. Impact on Avifauna</b>	<p>~ Direct strike with the transmission line and pylons (bird collision) and by electrocution</p> <p>~ Change of avian flight</p>	<p><b>B7-1:</b> In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;</p> <p><b>B7-2:</b> Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure</p> <p><b>B7-3:</b> Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires</p>	4,250,000	KETRACO Civil Engineer & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	patterns for some species	<p><b>B7-4:</b> Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;</p> <p><b>B7-5:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p>	2,700,000	KETRACO Environmental Safeguards Team
<b>B8: Solid and Liquid Waste Impacts</b>	Minimal or no solid or liquid waste	<b>B8-1:</b> Implement Solid Waste Management Plan, as described in this report.	80,000	KETRACO Civil Engineer & Environmental Safeguards Team
<b>B9: Landscape &amp; visual amenities risks</b>	Impacts on aesthetics of the surroundings with the possibility to affect the neighbouring residents.	<b>B9-1:</b> Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the corridor;	500,000	KETRACO Civil Engineer & Environmental Safeguards Team
<b>B11: Worker's Health and Safety and Workers Management</b>	Potential impacts to workers health and safety -respect for labour rights	<p>Develop and implement a Worker's Health and Safety Management System including the following measures:</p> <ul style="list-style-type: none"> <li>• HR Policy in line with Local labour laws and ILO standards <ul style="list-style-type: none"> <li>○ Training on H&amp;S Risks</li> <li>○ H&amp;S Audits for workers</li> <li>○ Workers Grievance Mechanism</li> <li>○ Incident and Accident Reporting</li> </ul> </li> </ul>	3,050,000	KETRACO Civil Engineer , Safety and Health & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	during construction	<ul style="list-style-type: none"> <li>• Code of conduct to regulate behaviour</li> <li>• Ensure that COVID-19 protocols and guidelines by GoK's Ministry of Health are adhered to during the decommissioning activities including social distancing, provision of face masks to all workers, provision of sanitizers, establishment of handwashing areas and provision of water and soap, conducting temperature checks for all workers, creating awareness on signs and symptoms of COVID-19, encouraging staff to take COVID-19 tests if symptoms associated with the same are exhibited, liaising with GoK to offer vaccination for workers</li> </ul>		
		<ul style="list-style-type: none"> <li>• Access to clean water</li> </ul>		
		<ul style="list-style-type: none"> <li>• Traffic Management Plan               <ul style="list-style-type: none"> <li>○ Vehicle Safety</li> <li>○ Drug and alcohol use</li> <li>○ Rest periods</li> <li>○ Traffic safety</li> <li>○ Accident Reporting</li> </ul> </li> </ul>		
		<ul style="list-style-type: none"> <li>• Non-Discrimination on basis of gender, marital status Age, Religion or sexual orientation</li> </ul>		

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>B12: Community Health and Safety Impacts</b>	-Exposure to Electromagnetic Fields	<b>B12-1:</b> KETRACO will develop and monitor the implementation of a Community Health and Safety Management Plan which will include the following measures: <ul style="list-style-type: none"> <li>Undertake a programme of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, and the dangers of playing on or near equipment or entering fenced areas. Special attention to be paid in primary and secondary schools along the transmission routes and in areas where towers will be built close to residential or school areas.</li> </ul>	500,000	KETRACO Civil Engineer , health and Safety team and Environmental Safeguards Team
		<b>B12-2:</b> KETRACO will develop Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals.		

<b>B13: Gender-based violence at the community level</b>	-Gender-based violence at the community level -Sexual Exploitation and Abuse -Transactional sex.	<b>A13-1:</b> KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct periodically to all employees including contractors and subcontractors. Ensure that the Worker Code of Conduct is publicly disclosed in local languages and are widely accessible to all workers and all group of people in the project areas. Establish a link between KETRACO activities or operations with, GBV cases at the community level such as domestic violence. This is to ensure that all GBV cases reported at the community level and resulting from or exacerbated by project operations are managed	850,000	KETRACO Civil Engineer & Environmental and Social Safeguards Team
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	-Shift in power dynamics in the community or family. -Abusive behaviour among project-related staff	effectively.  Conduct safety audits to identify settings affected by the project that might increase the risk of GBVH. Ensuring that all the workers have contracts and background checks including reference from the most recent employers.		
		<b>Sub Total</b>	xKsh 29,130,000	

**Table 104-Environmental and Social Management Plan-Decommissioning phase**

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>DECOMMISSIONING PHASE</b>				
<b>C1. Demolition Air Impacts</b>	Impact on sensitive receptors  Impact on workers' health and safety	<b>C1-1:</b> Develop a Dust Management Plan; <b>C1-2:</b> Record all dust and air quality complaints, identify cause(s), take appropriate measures <b>C1-3:</b> Liaise with local communities to forewarn of potentially dusty activities; <b>C1-4:</b> Undertake monitoring close to dusty activities, noting that this may be daily visual inspections, or passive/active monitoring	2,500,000	Contractor Engineer & Environmental Team (Implementation role)  KETRACO Engineer & Civil

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	<p>Impact on community health and safety</p> <p>Impact on flora and fauna</p>	<p><b>C1-5:</b> Undertake inspections to ensure compliance with the Dust Management Plan;</p> <p><b>C1-6:</b> Plan potentially dusty activities so that these are located as far from receptors as feasible</p> <p><b>C1-7:</b> Erect solid screens if feasible around stockpiles;</p> <p><b>C1-8:</b> Avoid run off of mud and water and maintain drains in a clean state;</p> <p><b>C1-9:</b> Remove dusty materials from site as soon as possible if not being re-used. If being re-used, cover or vegetate if possible;</p> <p><b>C1-10:</b> Impose speed limits on haul routes and in compounds to reduce dust generation;</p> <p><b>C1-11:</b> Minimise drop heights when loading stockpiles or transferring materials; and</p> <p><b>C1-12:</b> Avoid waste or vegetation burning.</p> <p>For traffic on unpaved roads:</p> <p><b>C1-13:</b> Undertake watering to attenuate dust near sensitive receptors. The duration and frequency of this should be set out in the Dust Management Plan and will consider water availability and any stakeholder grievances; and</p> <p><b>C1-14:</b> On unpaved roads in use for more than 1 month, consider use of surface and sealants to reduce the use of water and water trucks. Use of lignin-based sealants recommended due to low environmental toxicity.</p> <p><b>For earthworks:</b></p> <p><b>C1-15:</b> Revegetate exposed areas as soon as feasible</p> <p><b>C1-16:</b> Revegetate or cover stockpiles if feasible;</p>		Environmental Safeguards Team (Supervisory and monitoring role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>C1-17:</b> Expose the minimum area required for the works and undertake; and exposure on a staged basis to minimise dust blow</p> <p><b>For track out:</b>  <b>C1-18:</b> Where track out is onto paved roads, use wet road cleaning methods to remove dirt and mud build up;  <b>C1-19:</b> Avoid dry sweeping of large areas; and  <b>C1-20:</b> Where feasible, undertake wheel washing and vehicle clean down prior to accessing public roads.</p>		
<b>C2. Demolition Noise and Vibration Impacts</b>	Impact on sensitive receptors	<b>C2-1:</b> Siting noisy plant and equipment as far away as possible from NSRs, and use of barriers (e.g., site huts, acoustic sheds or partitions) to reduce the level of decommissioning noise at receptors wherever practicable;	2,200,000	Contractor Civil Engineer & Environmental Team Implementation role)
	Impact on workers' health and safety	<b>C2-2:</b> Where practicable noisy equipment will be orientated to face away from the nearest NSRs;		
	Impact on community health and safety	<b>C2-3:</b> Working hours for significant noise generating decommissioning work (including works required to upgrade existing access roads or create new ones), will be daytime only;		
	Impact on fauna	<b>C2-4:</b> Alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, will be used, where practicable;		
		<b>C2-5:</b> Where practicable, stationary equipment will be located in an acoustically treated enclosure		
		<b>C2-6:</b> For machines with fitted enclosures, doors and door seals will be checked to ensure they are in good working order; also, that the doors close properly against the seals;		KETRACO Civil Engineer &



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>C2-7:</b> Throttle settings will be reduced, and equipment and plant turned off, when not being used;</p> <p><b>C2-8:</b> Equipment will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be checked; and</p> <p><b>C2-9:</b> Fitting of mufflers or silencers of the type recommended by manufacturers</p>		Environmental Safeguards Team (Supervisory and monitoring role)
<b>C3. Soil erosion and contamination impacts</b>	<p>Impacts on water quality (sediment run-off/contamination) leading to deterioration of quality.</p> <p>Deteriorated water quality will impact on fauna if consumed.</p> <p>Deteriorated water quality will impact on community health if consumed.</p>	<p><b>C3-1:</b> Vegetation clearing, and topsoil disturbance will be minimized.</p> <p><b>C3-2:</b> Contour temporary and permanent access roads/laydown areas so as to minimise surface water runoff and erosion;</p> <p><b>C3-3:</b> Sheet erosion of soil shall be prevented where necessary through the use of sandbags, diversion berms, culverts, or other physical means.</p> <p><b>C3-4:</b> Topsoil shall be stockpiled separate from subsoil. Stockpiles shall not exceed 2 m height, shall be located away from drainage lines, shall be protected from rain and wind erosion, and shall not be contaminated. Wherever possible decommissioning work will take place during the dry season.</p> <p><b>C3-5:</b> Topsoil shall be evenly spread across the cleared areas when reinstated.</p> <p><b>C3-6:</b> Accelerated erosion from storm events during decommissioning shall be minimised through managing storm water runoff (e.g., velocity control measures).</p> <p><b>C3-7:</b> Soil backfilled into excavations shall be replaced in the order of removal in order to preserve the soil profile. Material (e.g., fuel or chemicals).</p>	500,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<b>C3-8:</b> Spread mulch generated from indigenous cleared vegetation across exposed soils after decommissioning.		
<b>C4. Surface Water Quality Impacts</b>	<p>Impacts on water quality (sediment run-off/contamination) leading to deterioration of quality.</p> <p>Deteriorated water quality will impact on fauna if consumed.</p> <p>Deteriorated water quality will impact on community health if consumed.</p>	<p><b>C4-1:</b> Activities shall be conducted &gt;100m away from water bodies, except where crossings are required.</p> <p><b>C4-2:</b> All wastewater which may be contaminated with oily substances must be managed in accordance with an appropriate waste management plan and no hydrocarbon-contaminated water may be discharged to the environment.</p> <p><b>C4-3:</b> Domestic wastewater shall be treated and disposed of in accordance with an approved waste management plan. Park vehicles preferably on paved platforms</p>	350,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>C5. Impact on Flora and Vegetation</b>	<p>Loss of biodiversity.</p> <p>Fragmentation of habitat.</p>	<p><b>C5-1:</b> Avoidance of impacts should be prioritized; it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.</p> <p><b>C5-2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;</p>	1,100,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>C5-3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;</p> <p><b>C5-4:</b> There should be no deviation from the access road position without prior discussions with the authorities;</p> <p><b>C5-5:</b> Firewood collection by the project's employees should be strictly forbidden.</p> <p><b>C5-6:</b> Rehabilitation of temporary decommissioning. sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;</p> <p><b>C5-8:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		(Supervisory and monitoring role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>C6. Impact on Fauna</b>	-Disturbance due to noise, vibrations and vehicle presence.	<p><b>C6-1:</b> All areas disturbed by decommissioning activities shall be landscaped and rehabilitated;</p> <p><b>C6-2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazards, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>C6-3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>C6-4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>C6-5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p> <p><b>C6-6:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct).</p>	650,000	<p>Contractor Civil Engineer &amp; Environmental Team (Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>C7. Impact on Avifauna</b>	-Disturbance due to noise, vibrations and vehicle presence.	<p><b>C7-1:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>C7-2:</b> All animal dens in close proximity to the work areas must be marked as no-go areas.</p> <p><b>C7-3:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during decommissioning.</p>	320,000	<p>Contractor Civil Engineer &amp; Environmental Team (Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>C8: Solid and Liquid Waste Impacts</b>	<p>-Impact on storm water quality and thus water quality in the water bodies in project areas</p> <p>-Impact on soil quality</p> <p>-Impact on surface water quality;</p> <p>-Impact on ground water quality; and</p> <p>-Impact on ecological receptors or human health</p>	<b>C8-1:</b> The Contractor should prepare a Solid Waste Management Plan.	120,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>
<b>C9. Access to Infrastructure and Services</b>	<p>-Disruption of transit routes</p> <p>-Disruption of normal traffic operations</p>	<p><b>C9-1:</b> Methods will be implemented to maintain open, clear and transparent communication with the local communities regarding the use of local infrastructures by the Project throughout the different phases.</p> <p><b>C9-2:</b> Engagement with the relevant authorities is recommended in order to avoid damage to common property</p>	500,000	Contractor Civil Engineer & Environmental Team Implementation role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	-Wastes from the camp site could be significant and overburden the existing wastes disposal facilities in the area	and minimize access disruption to education and healthcare facilities <b>C9-3:</b> Community Grievance Mechanism will be implemented. <b>C9-4:</b> A Traffic Management Plan shall be issued before decommissioning start in order to minimize traffic disruptions <b>C9-5:</b> Where temporary closure of road is required, alternative access to property will be ensured and local solutions including diversions will be implemented to ensure uninterrupted mobility.		KETRACO Civil Engineer & Social Safeguards Team (Supervisory and monitoring role)
<b>C10: Landscape &amp; visual amenities risks</b>	-Impacts on aesthetics of the surroundings with the possibility to affect the neighbouring residents.	<b>C10-1:</b> Any excavated or cut and fill areas will be landscaped and revegetated; <b>C10-2:</b> No debris or waste materials will be left at the work sites, good housekeeping on site to avoid litter and minimise waste <b>C10-3:</b> Night lighting of sites should be minimized within requirements of safety and efficiency; <b>C10-5:</b> Ongoing rehabilitation of cleared areas to minimise visual scarring and maintenance clearing will be kept to the absolute minimum and should not extend beyond the corridor;	300,000	Contractor Civil Engineer & Environmental Team Implementation role)  KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)
<b>C11: Worker's Health and Safety and Workers Management</b>	-Workers are likely to be exposed to work related risks during the decommissioning phase of the project.	<b>C11-1:</b> KETRACO will develop a Human Resources Policy, which will outline worker rights to be included in all contracts including restrictions on working hours in line with applicable ILO standards, compensation including consideration of overtime, holidays etc. <b>C11-2:</b> KETRACO will require its contractors and subcontractors to put in place policies in line with national	1,100,000	Contractor Civil Engineer & Environmental Team Implementation role)  KETRACO Health and Safety and

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p>legislation and applicable international legislation and KETRACO Code of Conduct and Policies.</p> <p><b>C11-3:</b> KETRACO will establish contractual clauses to be embedded in the contracts of the EPC and all sub-contractors that require adherence to Kenyan law and international standards to be upheld related to worker rights and providing the contractor and KETRACO with the right of audit.</p> <p><b>C11-4:</b> Pre-employment medical assessments will be put in place as a workforce risk management tool to screen individuals for risk factors that may limit their ability to perform a job safely and effectively. Expected benefits of conducting a pre-employment medical assessment include a safer working environment, reduction in workplace injuries, minimised downtime, matching the capacity of the employee with the role, and overall recruitment cost and risk reduction.</p> <p><b>C11-5:</b> KETRACO will ensure that training on health and safety measures is provided to all workers prior to starting to work on the Project and that supervisors have adequate experience to deliver on their responsibilities.</p> <p><b>C11-6:</b> KETRACO will implement regular health and safety checks and audits of workers, contractors and subcontractors and implementing sanctions in case of breaches of national standards.</p> <p><b>C11-7:</b> KETRACO will develop and implement a Workers Grievance Mechanism for the Project workforce including contractors and subcontractor's standards and the Project's specific standards. Such audits to include workplace H&amp;S; worker contracts, working hours, pay and conditions; housing and food standards.</p>		Environmental Safeguards Team (Supervisory and monitoring role)



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>C11-8:</b> KETRACO will establish a procedure for the recording and analysis of incidents and lessons learned such that additional actions can be implemented to avoid or minimize occupational health and safety risks.</p> <p><b>C11-9</b> KETRACO will ensure that facilities and work sites are designed and maintained such that robust barriers are in place to prevent accidents.</p> <p><b>C11-10:</b> KETRACO will ensure that its Code of Conduct is followed to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE.</p> <p><b>C11-11:</b> KETRACO will ensure that adequate clean water, adequate food and access to medical care is provided to all workers on the worksite and at accommodation.</p> <p><b>C-11-12:</b> Ensure that COVID-19 protocols and guidelines by GoK's Ministry of Health are adhered to during the decommissioning activities including social distancing, provision of face masks to all workers, provision of sanitizers, establishment of hand washing areas and provision of water and soap, conducting temperature checks for all workers, creating awareness on signs and symptoms of COVID-19, encouraging staff to take COVID-19 tests if symptoms associated with the same are exhibited, liaising with GoK to offer vaccination for workers</p>		

<p><b>C12: Community Health and Safety Impacts</b></p>	<p>-Increased noise decreased air quality, inappropriate waste handling or disposal, and accidental leaks and spills, debris and movement of heavy equipment may pose a safety risk to the general public.</p> <p>-Potential impacts on community safety, in particular road accidents, trespass on the sites, and demining activities potentially resulting in accidents leading to injuries or fatalities.</p> <p>~ Environmental health: changes to the environment due to increased noise and</p>	<p><b>C12-1:</b> KETRACO will develop and monitor the implementation of a Community Health and Safety Management Plan which will include the following measures:</p> <ul style="list-style-type: none"> <li>• Ensure that all workers are housed in accommodation camps rather than in the local settlements in order to minimize interaction with local communities and related health and safety impacts.</li> <li>• Ensure all workers including contractors and subcontractors undergo pre-employment screening and regular health screening including voluntary screening for STDs.</li> <li>• Ensure any trucking companies employed to work on the Project will have policies around health screening of their workers in line with Project requirements.</li> <li>• Ensure all workers including contractors and subcontractors receive education around transmission routes and symptoms of communicable diseases of concern and STDs.</li> <li>• Undertake awareness creation on STDs and specifically HIV/AIDS targeting the local communities</li> <li>• Provide access to health care for those injured by its activities.</li> <li>• Ensure that work sites are fenced and that signs are put up around work fronts and decommissioning sites advising people of the risks associated with trespass. When work fronts are less than 100 metres from a community or house, employ security guards from the local community to prevent trespass.</li> </ul>	<p>1,150,000</p>	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Health and Safety and Environmental Safeguards Team (Supervisory and monitoring role)</p>
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	<p>vibrations, decreased air quality and, inadequate management of waste.</p> <p>~ Impact from workers presence and potential interaction with local populations</p>	<ul style="list-style-type: none"> <li>Undertake a programme of stakeholder engagement and consultation to educate local communities of the risks of trespassing onto sites, the meaning of signs, and the dangers of playing on or near equipment or entering fenced areas. Special attention to be paid in primary and secondary schools along the transmission routes and in areas where towers will be built close to residential or school areas.</li> </ul>		
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IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>C12-2:</b> KETRACO will develop Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals.</p> <ul style="list-style-type: none"> <li>• KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process.</li> <li>• KETRACO will provide primary health care and first aid at decommissioning. camp sites to avoid pressure on local healthcare infrastructures.</li> <li>• KETRACO will implement a Community Grievance Mechanism.</li> <li>• KETRACO will develop and implement a Traffic Management Plan covering aspect such as vehicle safety, driver, and passenger behaviour, use of drugs and alcohol, operating hours, rest periods, community education on traffic safety and accident reporting and investigations</li> </ul>		
<b>C13: Gender-based violence at the community level</b>	-Gender-based violence at the community level -Forced Early Marriages -Sexual Exploitation and Abuse -Transactional sex.	<p><b>C13-1:</b> KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct periodically to all employees including contractors and subcontractors.</p> <p>Ensure that the Worker Code of Conduct is publicly disclosed in local languages and are widely accessible to all workers and all group of people in the project areas. Establish a link between KETRACO activities or operations with, GBV cases</p>	300,000	

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
	<ul style="list-style-type: none"> <li>-Shift in power dynamics in the community or family.</li> <li>-Abusive behaviour among project-related staff</li> </ul>	<p>at the community level such as domestic violence. This is to ensure that all GBV cases reported at the community level and resulting from or exacerbated by project operations are managed effectively.</p> <p>Conduct safety audits to identify settings affected by the project that might increase the risk of GBVH.</p> <p>Ensuring that all the workers have contracts and background checks including reference from the most recent employers.</p>		
<b>C14: Violation of children rights by contractor and labour force on site</b>	<ul style="list-style-type: none"> <li>-Violation of children rights by contractor and labour force on site (e.g., child labour, sexual relations with minors etc.)</li> </ul>	<p><b>C14-1:</b> KETRACO will extend the Worker Code of Conduct to include guidelines on worker –community interactions and will provide training on the worker code of conduct to all employees including contractors and subcontractors as part of the induction process.</p> <p><b>C 14-2:</b> Prepare and implement child protection strategy</p> <p><b>C14-3:</b> Prepare and implement a child protection plan and monitoring the employment register,</p> <p><b>C14-4:</b> Employing persons aged 18+ years</p>	250,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Social Safeguards Team (Supervisory and monitoring role)</p>
<b>C15: Archaeology and Cultural Heritage Impacts</b>	<ul style="list-style-type: none"> <li>-Restriction to access cultural sites.</li> <li>-Destruction of cultural sites during decommissioning.</li> </ul>	<p><b>C15-1:</b> Consult community when any community issue arises in order to engage traditional forms of community leadership. Develop stakeholder engagement procedures to guide consultations.</p> <p><b>C15-2:</b> Work with local community representatives to develop cultural awareness materials (that will cover key issues including the location and importance of all local cultural sites and other cultural sensitivities (graves). Develop stakeholder engagement procedures to guide consultations.</p> <p><b>C15-3:</b> Should decommissioning activity be required in proximity to existing graves, develop and implement working</p>	200,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Health and Safety and Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p>protocols in consultation with local traditional leaders. Develop stakeholder engagement procedures to guide consultations.</p> <p><b>C15-4:</b> Do not remove any cultural heritage including graves without prior consultation to the communities and fulfilling the legal requirements. Any removal of cultural heritage should be conducted by the best available techniques.</p> <p><b>C15-5:</b> Establish a grievance procedure to ensure community concerns are addressed.</p> <p><b>C15-6:</b> Develop a chance find procedure which will detail the appropriate course of action that must be followed for any relevant cultural heritage discoveries.</p>		
<b>C16: Unplanned Events</b>	-Impacts to soil and surface water from spill events	<p><b>C16-1:</b> Develop a detailed Oil Spill Response Plan (OSRP) which includes community notifications of any significant spills that have the potential to affect communities.</p> <p><b>C16-2:</b> Refuelling of equipment and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground.</p> <p><b>C16-3:</b> Hazardous material storage will be on hard standing and impermeable surface and the bulk storage facility will be bunded.</p> <p><b>C16-4:</b> Hydrocarbon spill clean-up kits shall be available at all locations where refuelling or maintenance of vehicles and equipment is done, and responsible people shall be trained in the use thereof.</p>	150,000	<p>Contractor Civil Engineer &amp; Environmental Team (Implementation role)</p> <p>KETRACO Health and Safety and Environmental Safeguards Team (Supervisory and monitoring role)</p>
		<b>Sub total</b>	xKsh 11,690,000	

Source: EMC Consultants, 2019

**Table 105-Environment and Social Monitoring Indicators**

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
<b>PHASE A-PRE-CONSTRUCTION PHASE</b>						
<b>A. Land Acquisition and Resettlement</b>	<b>A-1</b> Loss of Land and land use rights	<ul style="list-style-type: none"> <li>Community sensitization and awareness creation regarding the project including communication on compensation and valuation procedures</li> <li>Conduct a Resettlement Action Plan (RAP) along the transmission line</li> <li>Development/Implementation of GRM</li> </ul>	<ul style="list-style-type: none"> <li>No. of community sensitization meetings</li> <li>No. of participants in sensitization meetings</li> <li>No. of RAPs prepared and disclosed</li> <li>No. of PAPs compensated for loss of land, structures</li> <li>Number of Grievances received/resolved</li> </ul>	<ul style="list-style-type: none"> <li>Developed Stakeholder Engagement Plan</li> <li>Meeting minutes and list of attendance.</li> <li>PAPs compensation records.</li> <li>Development/Disclosure of RAP</li> <li>Land records (for replaced land)</li> <li>Photographs of PAPs new/replaced structures/livelihood activities</li> </ul>	KETRACO /NLC	Prior to project commencement



Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
			<ul style="list-style-type: none"> <li>• Number of complaints on land registered</li> <li>• Number of complaints on land (registration, succession) etc, resolved</li> <li>• Landowners informed about compensation package</li> </ul>			
<b>B. Socio-Economic aspects</b>	<b>B-1</b> Relocation activities leading to disruption/loss of livelihoods	<ul style="list-style-type: none"> <li>• Community sensitization and awareness creation regarding the project including communication on compensation and valuation procedures</li> </ul>	<ul style="list-style-type: none"> <li>• No. of community sensitization meetings</li> <li>• No. of participants in sensitization meetings</li> <li>• No. of RAPs prepared and disclosed</li> </ul>	<ul style="list-style-type: none"> <li>• PAPs compensation records.</li> <li>• Development and Disclosure of RAP</li> <li>• Signed minutes of discussion on community sensitization on project impacts and controls</li> </ul>	KETRACO	Preconstruction, construction, and operation phases

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>Conduct a Resettlement Action Plan (RAP) along the transmission line</li> <li>Development/Implementation of LRP</li> </ul>	<ul style="list-style-type: none"> <li>No of PAPs compensated for loss of land, structures</li> <li>Number of restored livelihoods.</li> <li>Number of PAPs completing Livelihood restoration training courses</li> </ul>	<ul style="list-style-type: none"> <li>Livelihoods restoration training records</li> </ul>		
<b>PHASE B- CONSTRUCTION AND OPERATION PHASE</b>						
<b>C. Crop/ Tree loss/ damage</b>	<b>C-2</b> Crop/Plant/ property on community and Private land destroyed during	<ul style="list-style-type: none"> <li>Compensation for damage verified as done by the contractor during the construction phase.</li> </ul>	<ul style="list-style-type: none"> <li>Number of crops/plants damaged</li> </ul>	<ul style="list-style-type: none"> <li>Property damage report (PDR)</li> <li>Crop compensation records</li> </ul>	KETRACO	<ul style="list-style-type: none"> <li>Continuous process during construction</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
	clearance activities					
<b>D. Labour Influx and related impacts</b>	<p><b>D-1</b> Higher rates of violence, injury,</p> <p><b>D-2</b> Alcohol and drug consumption and</p> <p><b>D-3</b> sexually transmitted diseases in the local population.</p> <p><b>D-4</b> social conflicts within and between communities</p> <p><b>D-5-</b> Gender-Based Violence (GBV)- Sexual Exploitation and Abuse (SEA)</p>	<p>Development/Implementation and clear communication of:</p> <ul style="list-style-type: none"> <li>• KETRACO HR Policy</li> <li>• Labour influx Management Plan</li> </ul> <p>On GBV (SEA and SH):</p> <ul style="list-style-type: none"> <li>• Ensure sensitization of the contractor, their sub-contractors, and consultants on GBV - SEA/SH issues including refraining from unacceptable conduct towards local community members.</li> <li>• Introduce a worker Code of Conduct as part of the employment contract, to be signed by all with physical presence on site as well as within the project area, and to include sanctions for non-compliance (e.g., termination).</li> </ul>	<ul style="list-style-type: none"> <li>• Number of GBV (SEA and SH) cases reported/recorded/resolved.</li> <li>• Number of sensitization meetings held on alcohol and drug abuse, GBV and HIV/AIDS.</li> <li>• Number of signed employee code of conduct signed by all employees</li> <li>• Number of trainings done on GBV</li> </ul>	<ul style="list-style-type: none"> <li>• HR records on the percentage of local versus non-local employment.</li> <li>• Meeting minutes and attendance records (communities and workers) of sensitization meetings held on Alcohol and drug abuse, GBV (SEA and SH),</li> <li>• Review of training attendance records on GBV.</li> <li>• Code of conduct clauses included in contracts</li> <li>• Established link between activities/operations with GBV at the community level</li> </ul>	HSE Manager Human Resource Manager Contractor/ KETRACO (supervisory and monitoring role)	<ul style="list-style-type: none"> <li>• Prior to construction commencing for Local Content and Procurement Plan.</li> <li>• Continuous during construction, operations and decommissioning phases for employment and procurement-related measures.</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
	/Workplace Sexual Harassment (SH ) related impacts	<ul style="list-style-type: none"> <li>• Ensure mandatory trainings regarding GBV - SEA/SH to be provided to all project workers including temporary and casual workers.</li> <li>• Undertake awareness meetings for the project affected communities on GBV-SEA/SH issues. Participants should be informed about the Code of Conduct, related national legislations and available GRM including available services/referral mechanism mechanisms for seeking help within the context of the COVID-19 pandemic</li> <li>• Adopt and implement a grievance redress mechanism (GRM) and referral mechanism to address all emerging complaints including risks such as COVID 19 related to Sexual Exploitation and</li> </ul>		such as domestic violence. This is to ensure that all GBV cases reported at the community level and resulting from or exacerbated by project operations are managed effectively.		<ul style="list-style-type: none"> <li>• Quarterly for training-related measures.</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		Abuse (SEA) / Sexual Harassment (SH). <ul style="list-style-type: none"> <li>• Implement the GBV-SEA/SH Management Plan and Labour Influx Management Plan</li> <li>• Ensure establishment and Implementation of a GBV-SEA/SH Action Plan by the contractor which should reflect the unique dimensions of COVID-19.</li> </ul>				
<b>E. Air Quality/ Atmospheric Conditions</b>	<b>E-1 Dust Emissions</b> associated with construction activities	<ul style="list-style-type: none"> <li>• The Contractor to protect stockpiles of friable material subject to wind-throw by wetting, or with a barrier, vegetation, or windscreen.</li> <li>• Covering loads of friable material during transportation.</li> <li>• Restrict speed on loose surface roads during dry or dusty conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Clause in the contractor/ subcontractors ' contract</li> <li>• Baseline air quality readings taken prior to construction activities</li> </ul>	<ul style="list-style-type: none"> <li>• Photographic evidence of revegetated areas, dust barriers</li> <li>• Speed limit signage</li> <li>• PPE issuance records</li> <li>• Vehicle maintenance and service records</li> <li>• Evidence of Dust suppression activities</li> <li>• Air quality measurement</li> </ul>	Contractor/HSE KETRACO (supervisory and monitoring role)	<ul style="list-style-type: none"> <li>• At least once during excavation and casting activities</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility	Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>• Suppress dust during dry periods by use of water sprays.</li> <li>• Maintain equipment in good running condition – no vehicles to be used that generate excessive black smoke.</li> <li>• Idling of vehicles should be prohibited</li> <li>• Ensure regular maintenance of plant and equipment</li> <li>• Use serviceable vehicles and machinery to avoid excessive smoke emission</li> <li>• Burning of woody debris &amp; construction waste to be prohibited within the wayleave</li> <li>• The Contractor to ensure that all equipment used, and all facilities erected on site are designed and operated to control the emission of smoke, dust, fumes and any other air</li> </ul>		<p>reports from a NEMA accredited lab</p> <ul style="list-style-type: none"> <li>• Quarterly ESMP Reports</li> </ul>			

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		impurity into the atmosphere • Use of personnel protective equipment (PPE) at areas with dust emissions e.g. batching plant				
<b>F. Noise</b>	<b>F-1</b> Noise and Vibration from construction activities	To be managed by equipment choice, legal requirements, and arrangement of construction activities: • The Contractor shall comply with the legal requirements for the management of noise impact as specified Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. • Provide silencers or enclosures for noise generating machines such concrete mixtures, compressors, etc.	• Baseline ambient noise level readings • Number of noise level complaints received	• Noise measurement reports • Noise Hazard and PPE requirement signages in specified locations • Workers medical records citing noise related complications • PPE issuance records	HSE and Contractor site manager KETRACO (Supervisory and monitoring role)	Construction and operation phase



Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Monitoring Responsibility	Responsibility Duration/Frequency
		<ul style="list-style-type: none"> <li>Landowners along the routes to be notified about the construction schedule &amp; activities, including blasting, should it be required.</li> <li>Noise generating activities that take place near residential or sensitive institutional receptors will be restricted to between 0600 and 2000hrs, which is defined as 'daytime' in the Kenyan noise regulations</li> <li>Contractor is prohibited causing excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.</li> </ul>				

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>Provision of protective devices like earmuffs/earplugs to workers, who are continuously exposed to high levels of noise during construction activities.</li> </ul>				
<b>G. Soils pollution/compaction and waste management</b>	<p><b>G-1</b> Dumping of construction material outside the project construction footprint</p> <p><b>G-2</b> Erosion and compaction</p> <p><b>G-3</b> Contamination due to spill of civil construction material</p> <p><b>G-4</b> Accumulation of waste on site causing</p>	<ul style="list-style-type: none"> <li>Develop a Construction Waste Management Plan</li> <li>The wrappings and packaging materials should be reused or recycled where applicable</li> <li>Any service/ repair of vehicles to be done offsite in approved garages or service stations</li> <li>Construction wastes to be managed in accordance with standards.</li> <li>Scrap metals/ conductors and other salvaged materials to be disposed/recycled off-site by licensed vendors.</li> </ul>	<ul style="list-style-type: none"> <li>Kilograms of waste collected by licensed NEMA waste handler</li> <li>Number of weekly checks of waste management arrangements</li> <li>Number of eroded sites within the project area.</li> </ul>	<ul style="list-style-type: none"> <li>Colour coded waste bins</li> <li>NEMA Waste licence for approved waste handlers</li> <li>Waste tracking documents</li> <li>Photographs of erosion control measures implemented at affected sites.</li> <li>Observation of vehicular movement during ESMP visits</li> <li>MSDS Records</li> <li>Destruction certificate for any disposed hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>Contractor/HSE</li> <li>KETRACO (Supervisory and monitoring role)</li> </ul>	<ul style="list-style-type: none"> <li>Continuous during the construction, operation and decommissioning phase</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility	
					Monitoring Responsibility	Duration/Frequency
	nuisances such as odor, pest control problems and general litter. <b>G-5</b> Soil contamination arising from Hazardous Materials (Fuel, Oil & chemical storage on site)	<ul style="list-style-type: none"><li>• Application of 3R Principle in waste management</li><li>• Drivers should be sensitized to use designated roads to minimize soil compaction</li><li>• The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.</li><li>• The Contractor shall manage all hazardous materials and waste in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals because of the use of these materials.</li><li>• The contractor shall place on-site tools and</li></ul>		<ul style="list-style-type: none"><li>• Spill containment kits</li><li>• Photographs of visible fuel, oil and chemical spills</li></ul>		

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<p>equipment, such as generators, compressors on compact impermeable sheeting to prevent oil spills/leaks from causing subsurface contamination.</p> <ul style="list-style-type: none"> <li>• The contractor shall ensure oil spills/leaks are prevented or minimized. This can be achieved through instructing employees to avoid spills and regular auditing to verify that no leaking or defective equipment is brought/used onsite;</li> <li>• The Contractor shall ensure that fueling and repairs are carried out by trained personnel familiar with spill containment and clean-up procedures and in Garages and licensed petrol stations</li> <li>• The Contractor shall ensure that all the employees working onsite</li> </ul>				

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		are trained on good housekeeping practices				
<b>H. Ecology</b>	<b>H-1</b> Disruption to existing flora and fauna <b>H-2</b> Loss of Vegetation / terrestrial habitat <b>H-3</b> Disturbance to fauna due to movement by workers and construction vehicles	<ul style="list-style-type: none"> <li>• Sensitization trainings to worker on local ecology and extent of care.</li> <li>• Mark out areas for clearance and use manual method of clearance</li> <li>• Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the way leave</li> <li>• Prevent colonization by invasive species</li> </ul>	<ul style="list-style-type: none"> <li>• Signs and warnings against hunting</li> </ul>	<ul style="list-style-type: none"> <li>• Number of revegetated areas.</li> <li>• % area of site cleared vs. remaining un-cleared land.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor/HSE</li> <li>• KETRACO (Supervisory and monitoring role)</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous during the construction, operation and decommissioning phase</li> </ul>
<b>I. Landscape and Visual Amenity impacts</b>	<b>I-1</b> Visual scarring of the landscape ; <ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Extensive public consultation during the planning of power line and power line right-of-way locations.</li> <li>• Maximize straight-line runs to reduce the need for angle towers</li> </ul>	<ul style="list-style-type: none"> <li>• Transmission line designs and route selection criteria</li> <li>• Substation land Scoping and selection criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Survey data, route selection and firming reports</li> <li>• Substation scoping reports</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor/HSE</li> <li>• KETRACO</li> </ul>	Continuous throughout the construction and operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>• Locate new towers adjacent to already existing high-impact visual features, such as forests where possible</li> <li>• Where possible, locate the new line adjacent to existing power lines.</li> <li>• Siting power lines, and designing substations, with due consideration to landscape views and important environmental and community features.</li> <li>• Location of high-voltage transmission lines in less populated areas, where possible.</li> </ul>				
<b>J. Workers Health, Safety and Labour Rights</b>	<b>J-1</b> Workers' health and safety <b>J-2</b> Respect for labor rights	<ul style="list-style-type: none"> <li>• Develop and implement a Worker Health and Safety Management System and Human Resources Policy.</li> <li>• Verify contractual clauses of Contractor and all sub-contractors requiring adherence to Kenya law</li> </ul>	<ul style="list-style-type: none"> <li>• Number of workers trained on the Human resource and Health and Safety policy</li> <li>• Number of special</li> </ul>	<ul style="list-style-type: none"> <li>• DOSH Workplace register on site</li> <li>• Induction records for workers</li> <li>• Inspection &amp; Maintenance records</li> <li>• Appointed SHE Expert on site</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor site manager/HSE</li> <li>• KETRACO (Supervisory and monitoring role)</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous throughout the construction and operation phase</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility	
					Monitoring Responsibility	Duration/Frequency
		<p>and international standards.</p> <ul style="list-style-type: none"> <li>• Staff Training and regular equipment service and testing</li> <li>• Only trained &amp; certified workers to install, maintain or repair electrical equipment.</li> <li>• Workers not directly associated with power transmission activities who are operating around power lines should adhere to local legislation, standards, and guidelines relating to minimum approach distances for excavations, tools, vehicles, pruning, and other activities</li> <li>• Testing structures and fall protective equipment for integrity prior to undertaking work.</li> <li>• Use of signs, barriers and education/ public outreach to prevent public contact</li> </ul>	<ul style="list-style-type: none"> <li>• operators trained</li> <li>• Occupational hazards signage</li> <li>• Number of trained first aiders</li> <li>• Number of workers using PPE provided</li> </ul>	<ul style="list-style-type: none"> <li>• Records of incidents and accidents.</li> <li>• PPE issuance records</li> <li>• Record on training sessions and attendance on health and safety measures</li> <li>• Record of lessons learned to minimize occupational health and safety.</li> <li>• Signed Code of Conduct documents</li> <li>• Daily toolbox talks records</li> <li>• Occupational hazards signage</li> <li>• Work at height permits</li> <li>• First aid training certificate</li> </ul>		



Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		with potentially dangerous equipment. <ul style="list-style-type: none"> <li>• Ensure provision and proper use of Personal Protective Equipment (e.g. Safety harness, helmet, dust masks, etc.)</li> <li>• Follow safe work procedures</li> <li>• Maintain a fully stocked and accessible first aid kit under trained first aider</li> <li>• Observe OSHA 2007 regulations</li> <li>• Ensure there is no encroachment on the transmission line wayleave</li> </ul>				
<b>K. Fire</b>	<b>Fire risk related impacts</b>	<ul style="list-style-type: none"> <li>• The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process.</li> <li>• The Contractor shall prepare a fire prevention and fire emergency plan as a part of the Environmental</li> </ul>	<ul style="list-style-type: none"> <li>• Number of fire drills carried out</li> <li>• Number of serviced and operational fire extinguishers</li> <li>• Number of fire audits</li> </ul>	<ul style="list-style-type: none"> <li>• Fire safety policy in place</li> <li>• Trained fire fighters</li> <li>• Quarterly ESMP Reports highlighting status</li> <li>• Firefighting equipment inspection records</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor site manager/HS E</li> <li>• KETRACO (Supervisory and monitoring role)</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous throughout the construction and operation and decommissioning</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		Plan to be submitted to KETRACO <ul style="list-style-type: none"> <li>The Contractor shall provide adequate firefighting appliances at specified localities on the worksite to meet any emergency resulting from ignition of a fire.</li> <li>No burning of any litter/cleared vegetation on site</li> <li>Avoid Careless handling of cigarette butts</li> <li>Monitoring right-of-way vegetation according to fire risk</li> <li>Removing blowdown and other high-hazard fuel accumulations;</li> <li>Time thinning, slashing, and other maintenance activities to avoid forest fire seasons</li> </ul>	<ul style="list-style-type: none"> <li>Number of trained fire fighters.</li> <li>Number of electrocutions and fire by line snapping</li> </ul>	<ul style="list-style-type: none"> <li>Fire clearance by certificate contractor</li> </ul>		ssioning phase
<b>L. Ergonomics, Repetitive Motion,</b>	<b>K-1</b> Impacts on Workers' health and safety	<ul style="list-style-type: none"> <li>Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and</li> </ul>	<ul style="list-style-type: none"> <li>Mechanical equipment registers and checklist</li> </ul>	<ul style="list-style-type: none"> <li>Workers' training records, meeting minutes and attendance sheets</li> </ul>	<ul style="list-style-type: none"> <li>Contractor site manager/HS E</li> </ul>	<ul style="list-style-type: none"> <li>Continuous throughout the</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
<b>Manual Handling</b>		<p>work objects, and requiring multi-person lifts if weights exceed thresholds .</p> <ul style="list-style-type: none"> <li>• Selecting and designing tools that reduce force requirements and holding times, and improve postures</li> <li>• Providing user adjustable workstations</li> <li>• Incorporating rest and stretch breaks into work processes, and conducting job rotation</li> <li>• Implementing quality control and maintenance programs that reduce unnecessary forces and exertions</li> <li>• Taking into consideration additional special conditions such as left-handed persons</li> </ul>	<ul style="list-style-type: none"> <li>• Manual handling and ergonomics training</li> </ul>	<ul style="list-style-type: none"> <li>• Daily toolbox talks records</li> <li>• Work related injuries records</li> </ul>	<ul style="list-style-type: none"> <li>• KETRACO (Supervisory and monitoring role)</li> </ul>	construction and operation phase
<b>M. COVID 19 Transmission</b>	Public health impacts due to the spread	<ul style="list-style-type: none"> <li>▪ Develop and communicate to all employees (skilled, semi-skilled and</li> </ul>	<ul style="list-style-type: none"> <li>• Number of workers vaccinated,</li> </ul>	<ul style="list-style-type: none"> <li>• Training register on COVID 19</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor HSE and Site manager</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous throughout</li> </ul>

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/ Frequency
	of Covid-19 within the construction site and camp site	<p>unskilled), a COVID-19 Preparedness management plan that addresses all aspects of COVID-19 readiness including but not limited to Policy, Planning and Organizing project activities vis-à-vis COVID-19.</p> <ul style="list-style-type: none"> <li>▪ Sensitize all workers (skilled, semi-skilled and unskilled) on COVID-19 risk mitigation measures with sufficient information to keep them and local community safe.</li> <li>• Establish prevention and mitigation measures against COVID-19 and arrangements for dealing with suspected and confirmed COVID-19 cases</li> <li>▪ The measures should include but not limited to; <ul style="list-style-type: none"> <li>✓ Infection control plans,</li> <li>✓ Ensuring social distancing of not less 1.5</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Number of workers detected with COVID-19,</li> <li>• Observable social distancing.</li> <li>• Number of COVID prevention and control signages on site</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Weekly temperature logs</li> <li>• PPEs issuance records</li> <li>• Presence of COVID-19 prevention measures (hand washing points, sanitizers, masks provided to workers</li> <li>• observable awareness creation materials/signs,</li> </ul>	<ul style="list-style-type: none"> <li>• KETRACO (Supervisory and monitoring role</li> </ul>	at the construction and operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<p>meters between employees in all directions,</p> <ul style="list-style-type: none"> <li>✓ Hygiene promotion through suitable hand sanitizing facility or handwashing soap and water</li> <li>✓ Strict and proper use of face masks throughout all working hours and public places.</li> </ul>				
<b>N. Community Health and Safety</b>	<b>M-1</b> Community Health impacts including risks of STDs, HIV/AIDS)	<ul style="list-style-type: none"> <li>• Adherence to OSHA 2007 Act and its subsidiary legislations to ensure that health and safety of immediate neighbors and the public is not threatened.</li> <li>• The Contractor to ensure that construction work is undertaken in a manner not likely pose risks to community health and safety.</li> <li>• The contractor should use barricading tape to prevent members of public from</li> </ul>	<ul style="list-style-type: none"> <li>• Number of barricaded active construction site</li> <li>• Number of public HIV/AIDS awareness campaigns</li> </ul>	<ul style="list-style-type: none"> <li>• Community sensitization meeting minutes and attendance records</li> <li>• Hazard signages on all tower and active construction sites</li> <li>• Placement of condoms dispensers at accessible points within the work sites</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor HSE and Site manager</li> <li>• KETRACO (Supervisory and monitoring role</li> </ul>	Continuous throughout the pre-construction, construction, operations, and decommissioning phases

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<p>accessing excavated tower foundations and work sites during construction</p> <ul style="list-style-type: none"> <li>• The contractor should put in place adequate hazard communication to the public by use of appropriate signages as prescribed by national law and international best practice</li> <li>• The contractor should conduct public awareness on safety requirements within construction sites</li> <li>• HIV &amp; AIDS education and awareness</li> <li>• Provide adequate security where necessary for the public and staff</li> <li>• Public awareness of the public health issues identified.</li> <li>• Provision of condoms for staff</li> </ul>				

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>Distribution of HIV &amp; AIDS awareness materials in collaboration NACC</li> <li>Condone working sights and ensure controlled access.</li> </ul>				
	<b>M-2</b> Violence Against Children	<ul style="list-style-type: none"> <li>Policies against VAC in place</li> <li>community members sensitized on the employment procedures and conditions</li> <li>Development and implementation of a robust HR Policy with clause preventing employment of persons less than 18yrs.</li> <li></li> </ul>	<ul style="list-style-type: none"> <li>Number of awareness meetings</li> <li>Workers contracts terms and conditions' clauses</li> </ul>	<ul style="list-style-type: none"> <li>Employee records with National ID card/ ID copies indicated/ maintained</li> <li>Visual verification of workers present during ESMP site visits</li> <li>Meeting minutes and attendance records</li> </ul>	<ul style="list-style-type: none"> <li>Contractor HSE and Site manager</li> <li>KETRACO (Supervisory and monitoring role)</li> </ul>	Continuous throughout the pre-construction, operations, and decommissioning phases
<b>O. Cultural Heritage</b>	<b>N-1</b> Cultural and religious sensitivities maybe impacted by project	<ul style="list-style-type: none"> <li>Development of a Chance Find Procedures</li> <li>Diversion of the Right of Way for the proposed transmission line, to minimize the impacts of these sites if they are present.</li> </ul>	<ul style="list-style-type: none"> <li>Workers' training on handling chance finds during construction.</li> <li>Number of verified chance finds</li> </ul>	<ul style="list-style-type: none"> <li>Records of training on chance find procedures</li> <li>Records of chance finds and archaeological artefacts handed over to the National Museums of Kenya</li> </ul>	<ul style="list-style-type: none"> <li>Contractor HSE and Site manager</li> <li>KETRACO (Supervisory and monitoring role)</li> </ul>	Continuous throughout the construction phase



Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<ul style="list-style-type: none"> <li>Selective tower placement to span archaeological site if any</li> <li>Contractor to follow procedures for chance find and protection of Archaeological sites and contact the National Museums of Kenya (NMK).</li> <li>Avoid siting transmission line towers on cultural property (Graves, shrines etc.) consult with local community.</li> <li>If avoidance is not possible prepare a management plan to ensure least damage to cultural, archaeological sites.</li> </ul>	<ul style="list-style-type: none"> <li>Number of Graves, shrines damaged/destroyed during construction</li> </ul>	<ul style="list-style-type: none"> <li>Developed Sop's and Chance find management plan</li> </ul>		
<b>P. Local amenities and infrastructure and construction materials sourcing</b>	<b>P-1</b> Pressure on local infrastructure from use of local resources	<ul style="list-style-type: none"> <li>Ensure accurate budgeting to ensure only Necessary material is ordered</li> <li>Proper storage to ensure minimal loss</li> <li>Strip &amp; store topsoil separate from subsoil for</li> </ul>	<ul style="list-style-type: none"> <li>Number of quarry sites</li> <li>Number of rehabilitated excavation pits</li> </ul>	<ul style="list-style-type: none"> <li>License for water abstraction from WRMA</li> <li>NEMA License for sand or quarry stone harvesting</li> </ul>	KETRACO Community Liaison Officer Contractor Local representative administration	Continuous throughout the construction and operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		major tower site excavations. <ul style="list-style-type: none"> <li>• Rehabilitation of exposed sites as soon as practicable</li> <li>• Source Raw Materials from NEMA approved sites</li> <li>• Use recycled and recyclable materials where possible</li> </ul>	<ul style="list-style-type: none"> <li>• Contactor bill of quantities vs Construction material inventory list</li> </ul>			
<b>Q. Theft and Vandalism</b>	<b>Q-1 Damage to transmission infrastructure</b>	<ul style="list-style-type: none"> <li>• Adopt and implement a Grievances Redress Mechanism to receive and address complaints from PAPs and host community.</li> <li>• Community policing to be encouraged to reduce vandalism of towers</li> <li>• Minimize overcrowding at the construction site so as to prevent double handling of materials and equipment.</li> <li>• Provision of proper management of materials by allocation to specific persons involved.</li> </ul>	<ul style="list-style-type: none"> <li>• Visibly vandalised tower and substation infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Security status reports</li> <li>• Quarterly ESMP Reports</li> <li>• Photograph of vandalized tower and substation infrastructure</li> <li>• Material inventory records</li> <li>• Vandalism incidence records</li> </ul>	KETRACO Community Liaison Officer Contractor Local representative administration	Continuous throughout the construction and operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Monitoring Responsibility	Responsibility Duration/Frequency
		<ul style="list-style-type: none"> <li>Advanced tracking of on-site construction machinery which facilitate an improvement in the safety performance job site layout and prevent theft</li> <li>Optimize the utilization of construction equipment.</li> <li>Proponent to engage local persons as Wayleave Officers to work with the contractor, in order to ensure the project is implemented smoothly</li> <li>Engage Community Liaison Officers (CLOs) to support local engagements. They act as the focal point for communications between local population and the project management team.</li> <li>Liaise with law enforcement in the project area to ensure theft and vandalism perpetrators are held to account.</li> </ul>				

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/ Frequency
<b>R. Live lines</b>	R-1 Electrocuting from powerlines	<ul style="list-style-type: none"> <li>• A maintenance system to ensure physical integrity of structures is maintained</li> <li>• Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines.</li> <li>• Ensuring that live-wire work is conducted by trained workers should not approach an exposed energized or conductive part even if properly</li> <li>• Ensure vegetation along wayleave id below 12ft in height</li> <li>• Ensure shut down of live lines when construction work is undergoing underneath live lines</li> </ul>	<ul style="list-style-type: none"> <li>• Number of inspection visits as per the maintenance schedule</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Operation and Maintenance team inspection records</li> <li>• ESMP reports</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor HSE and Site manager</li> <li>• KETRACO (Supervisory and monitoring role)</li> </ul>	During construction and operational phase
	R-2 Avian mortalities	<ul style="list-style-type: none"> <li>• Undertake wire marking/reflective balls to</li> </ul>	<ul style="list-style-type: none"> <li>• Number of bird carcasses</li> </ul>	<ul style="list-style-type: none"> <li>• KWS Bird mortality reports</li> </ul>	<ul style="list-style-type: none"> <li>• KETRACO</li> </ul>	Operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility	
					Monitoring Responsibility	Duration/Frequency
		alert birds to the presence of power line. <ul style="list-style-type: none"><li>• Build raptors platforms on top of pylons for roosting and nesting</li></ul>	collected and verified to be a result of live line impact	<ul style="list-style-type: none"><li>• Quarterly Reports</li></ul> ESMP		
S. EMF	S-1 Perceived EMF effect on humans	<ul style="list-style-type: none"><li>• Routing or siting Transmission line is so as to avoid or minimize exposure to the public and where it is unavoidable all resettlements within the wayleave will be relocated.</li><li>• Installation of transmission lines above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided</li><li>• If EMF levels are expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced</li></ul>	<ul style="list-style-type: none"><li>• Complaints received from affected community members</li></ul>	<ul style="list-style-type: none"><li>• EMF test results</li><li>• Quarterly ESMP monitoring reports</li></ul>	<ul style="list-style-type: none"><li>• KETRACO</li></ul>	Operation phase

Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility Monitoring Responsibility	Duration/Frequency
		<p>by power lines. Examples of these techniques include:</p> <ul style="list-style-type: none"> <li>○ Shielding with specific metal alloys</li> <li>○ Burying transmission lines</li> <li>○ Increasing height of transmission towers</li> </ul> <p>Modifications to size, spacing, and configuration of conductors</p>				

#### PHASE C- DECOMMISSIONING PHASE

<b>T. Demolition waste</b>	Pollution of soil, water and natural resources adjacent to the transmission line and associated substations	<ul style="list-style-type: none"> <li>• 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</li> <li>• Use of an integrated solid waste management system i.e. through a hierarchy of</li> </ul>	<ul style="list-style-type: none"> <li>• Kilograms of waste collected by licensed NEMA waste handler</li> <li>• Number of weekly checks of waste management</li> </ul>	<ul style="list-style-type: none"> <li>• Colour coded waste bins</li> <li>• NEMA Waste licence for approved waste handlers</li> <li>• Waste tracking documents</li> <li>• Destruction certificate for any disposed hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor HSE and Site manager</li> <li>• KETRACO</li> <li>• (Supervisory and monitoring role)</li> </ul>	Decommissioning phase
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Project Activity/Aspect	Possible Impact/Effect	Mitigation measure	Indicators	Verifier	Institutional Responsibility	Monitoring Responsibility	Duration/Frequency
		options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary land-filling <ul style="list-style-type: none"> <li>Contractor to ensure vehicles and machinery used are in a good state of repair to avoid oil leakage and water pollution. Servicing and repair of vehicles should be done only on designated garages and not in the field</li> <li>No waste to be disposed in water body. KETRACO to supervise all activities</li> </ul>		<ul style="list-style-type: none"> <li>Spill containment kits</li> <li>Photographs of visible fuel, oil and chemical spills</li> </ul>			
<b>U. Buried/ underground infrastructure including cables from third parties, water pipes, sewer systems</b>	<b>U-1</b> Damage to underground infrastructure	<ul style="list-style-type: none"> <li>Contractor should conduct extensive ground investigations where pylons will be sited to ensure that no damage is caused on buried/ underground infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>Number of damaged underground infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Damage register</li> </ul>	<ul style="list-style-type: none"> <li>KETRACO</li> </ul>		Decommissioning phase





### **9.3.1 Construction Environment and Social Management Plan**

For an effective integration of environmental and social safeguards into the project implementation the Contractor will need to adopt this ESMP and prepare a comprehensive Construction Environment and Social Management Plan (C-ESMP) that will provide the key reference point for compliance. The environmental supervision will also adopt the C-ESMP. Construction Environment and Social Management Plan (C-ESMP) is an upgraded ESMP illustrating realities of the project works to be prepared by the Contractor. The Contractor is expected to finalize the Work Plan and upon approval, list the works items and for each item present practical actions that will be undertaken to realize achievement of the ESMP. The actions on works items should address environmental and social aspects associated with the works and in line with guidelines from the ESMP. Based on these ESMP outline, the Contractor will be instructed to develop a Construction Environment and Social Management Plan (C-ESMP) for each component of the project and submit these plans to the KETRACO.

### **9.3.2 KETRACO Project Management Team**

The Project will be implemented by KETRACO which has a long experience of implementing AfDB financed projects under the safeguards policies. KETRACO has experienced environmental and social safeguards specialist. The project implementation arrangements have been established and the proponent has appointed the KETRACO project implementation team including: -

- Project manager
- Environmentalist
- Socio-Economist /Social Specialist/ Community Liaison Officer
- Land Surveyor
- Land Economist
- Civil Engineer
- Electrical Engineer
- Project Accountant

The core functions of the team will be to coordinate and facilitate oversight for technical, environmental, and social safeguards, health and safety and social risks supervision.

### **9.3.3 Project Supervision Engineer**

The Project Supervision Engineer will be required to recruit a qualified Environmental and Social Expert who will be charged with the responsibilities of supervision, review of site reports, preparation of monthly progress reports, prepare and issue appropriate instructions to the Contractor and monitor ESMP implementation.

#### **9.3.4 Contractor**

The Contractor will ensure that the established mitigation measures are integrated and implemented throughout the project works as per the C-ESMP. The Contractor will internalize the ESMP/C-ESMP, prepare monthly progress reports and implement instructions issued by the Supervision Consultant. The Contractor, therefore, will engage qualified Environmentalist (ensure compliance to ESMP and C-ESMPs) and Social Specialist (ensure compliance to social aspects of the ESMP and C-ESMPs) and Community Liaison Officer (link between community and contractor) on full time basis to interpret the C-ESMP and advice on the implementation of the same, as well to the counterpart personnel for the supervision expert.

#### **9.3.5 National Environment Management Authority**

The National Environment Management Authority (NEMA) is responsible for ensuring environmental compliance in the country and has offices in Baringo and Laikipia Counties with staffing who will further ensure that the ESMP is implemented as part of their mandate, functions, and responsibilities. NEMA will undertake surveillance on the project implementation and review compliance performance based on the supervision monitoring reports.

#### **9.3.6 Grievance Redress**

AfDB operational policies require Grievance Mechanisms to provide a structured way of receiving and resolving grievances. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders. The mechanism must not impede access to other judicial or administrative remedies, such as law courts (costs to be borne by the aggrieved) and the AfDB Grievances Redress Service and the AfDB Inspection Panel (at no cost to the aggrieved).

The project GRM will be vital in addressing grievances raised by PAPs and other stakeholders regarding project activities and operations. The workers GRM will be utilized by workers on site to raise grievances related to project activities and operations.

The project and workers GRM will be culturally appropriate, accessible, and understandable to all stakeholders and applicable to the entire project life. The GRMs will be communicated to all stakeholders including contractors.

There will be a separate mechanism within the GRM that will be aimed at ensuring safety and confidentiality while receiving complaints related to GBV-SEA/SH through a focal point system (KETRACO) as well as anonymous complaints mechanism managed by the CLO. A clear link will be established by KETRACO (which has full responsibility to manage the SEA and SH), between construction and operations/decommissioning

activities and community level GBV cases such as domestic violence. See Annex G- Grievance Management. This is to ensure that all GBV cases reported at the community level and resulting from or exacerbated by project operations are managed effectively.

### 9.3.7 : Management and Monitoring

#### 9.3.7.1 Management Plans

The ESMP has identified some additional plans that will be prepared by the procured contractor prior to construction commencing on all transmission line:

- Traffic and Transportation Management Plan;
- Construction Environmental and Social Management Plan;
- Waste Management Plan;
- Emergency Preparedness and Response Plan;
- Chance Find Procedure;
- Labour Management Plan
- Stakeholder Engagement Plan
- Local Recruitment Plan
- Community Health and Safety and Security Plan;
- Occupational Health and Safety Plan;
- Grievance Redress Mechanism
- Gender Based Violence (SEA/SH) Management Plan
- Vulnerable and Marginalised Groups Plan
- CSR Plan (to be informed by KETRACO's CSR Policy)
- Child Protection Strategy
- HIV/AIDs Prevention Strategy

The specific management plans are listed in Table 105 along with links to how these relate to the activities and impacts described within the ESIA as well as the identified responsible party for each. Together with this ESMP, these specific plans will form the overall Environmental and Social Management Plans for the Project.

**Table 106- Management Plans**

Plan Name	Includes	Plan Owner
<b>Specific Management Plans</b>		
<b>Traffic &amp; Transportation Management Plan</b>	Controls over prescribed routes, driver training, vehicle maintenance, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures and vetting procedures. Will also include specification for community awareness and safety programs.	Contractor

<b>Construction Management Plan</b>	Plan for the management of the establishment process, including logistics and site management	Contractor
<b>Waste Management Plan</b>	Project-related waste handling procedures for hazardous and non-hazardous wastes.	Contractor
<b>Emergency Preparedness and Response Plan</b>	Administration (policy, purpose, distribution, definitions, etc.), organization of emergency areas (command centers, medical stations, etc.), roles and responsibilities, communication systems, emergency response procedures, emergency resources, training and updating, checklists (role and action list and equipment checklist) and business continuity and contingency. The plan will also include specifications for emergency communications as well as on-going public and community communication and disclosure.	Contractor
<b>Change Find Procedure</b>	Procedural guideline to be followed in the event that previously unknown heritage resources or and burial grounds and graves are exposed or found during the life of the project.	Contractor
<b>Stakeholder Engagement Plan (SEP)</b>	SEP will build on engagement undertaken to date and specify interactions with community and other stakeholders, as well as finalizing the grievance procedure to be used throughout the Project. Community and Employee awareness training and code of conduct procedures.	Contractor
<b>Gender Based Violence (SEA/SH) Management Plan</b>	Plan for mitigating Gender Based Violence (SEA and SH).	Contractor
<b>Employment and Workforce Management Plan</b>	Plan for local training and procurement for operations. Also specifies requirements for contractors during construction. The local recruitment plan will include policies and procedures for hiring of local labour, unskilled, semi- skilled and skilled labour as much as possible, and ensure fair and transparent recruitment considering gender, age, disabilities, and other vulnerabilities present in the project area.	Contractor
<b>Community Health and</b>	The purpose of the CHSSP is to provide a clear set of actions and responsibilities for	Contractor

<b>Safety and Security Plan</b>	the control of impacts affecting the health and safety of the communities within the Project's area of influence. The plan includes measures to respond to exposure to diseases due to worker interaction, environmental change, and safety (traffic, unplanned events, etc.)	
<b>Occupational Health and Safety Plan</b>	Procedures on chemical hazards, fire and explosions, confined spaces and on site-traffic hazards. Communication and training programs. Safety analysis and industrial hygiene surveys procedures. Monitoring, record-keeping and audit procedures.	Contractor
<b>Grievances Redress Mechanism</b>	Procedures for complaints and grievance handling	Contractor

**Source: EMC Consultants, 2019**

KETRACO will delegate certain responsibility but retain oversight and supervision role to construction contractors and supervising engineers as specified in this ESIA/ESMP section that highlights the roles of the contractors. During this phase KETRACO will manage its contractors to ensure that this ESMP is implemented and monitored effectively through contractual mechanisms regular direct oversight. As a contractual requirement, the contractors will be required to demonstrate compliance of their activities against the ESMP. This includes providing resources to ensure compliance of next tier contractors and a process for emergency stop-work orders in response to monitoring triggers. Contractors will be responsible for performing all work:

- In compliance with relevant national and international EHS legislation and regulations, and with other requirements to which the Project subscribes
- In conformance with the Project ESMP, and related management plans for specific aspects; and
- In accordance with contractual technical and quality specifications.

The Project's ESMP and related documentation will be the main contractual documentation to which the contractor(s) will be bound. Contractors will be required to develop their own management plans which show how they will comply with these environmental and social requirements.

In this way, the ESMP will be implemented and controlled using both KETRACO and the contractor management systems. The contractor management systems will therefore:

- Provide the framework that regulates their activities;
- Define responsibilities and reporting relationships for expediting, mitigation and monitoring actions detailed in the ESMP; and

- Specify the mechanisms for inspecting and auditing to ensure that the agreed actions are implemented.

Contractors will be required to self-monitor against their plan and compliance with the plan will be routinely monitored by KETRACO directly or by third parties. Contractors will be required to submit regular reports of monitoring activities and the Project will review these on a regular basis. KETRACO is ultimately responsible for the management and supervision of all Project activities and will have principal responsibility for implementing this ESMP and the mitigation measures.

#### **9.3.7.2 Training and Awareness**

KETRACO will identify, plan, monitor, and record training needs for personnel whose work may have a significant adverse impact upon the environment or social conditions. KETRACO recognizes that it is important that employees at each relevant function and level are aware of the Project's environmental and social policy; potential impacts of their activities; and roles and responsibilities in achieving conformance with the policy and procedures. Training and awareness-raising therefore forms a key element of both EHS and the expediting of this ESMP.

Key staff will, therefore, be appropriately trained in key areas of EHS management and operational control with core skills and competencies being validated on an on-going basis. The identification of training and awareness requirements and expediting of the identified training/awareness events will be the responsibility of the HSE Manager.

Training and awareness are not a requisite solely of contractor's personnel (and subcontractors). It would be important to include an assessment of the need for training and capacity building of KETRACO staff (before and during the construction phase) and at the conclusion of the construction phase and handover of the ESMP, SEP and grievance mechanism. This will be achieved through a formal training process. Employee training will include awareness and competency with respect to:

- environmental and social impacts that could potentially arise from their activities (including, biodiversity and noise);
- legal requirements in relation to environmental and social performance;
- necessity of conforming to the requirements of the ESIA and ESMP, in order to avoid or reduce those impacts;
- activity-specific training on waste management practices, documentation systems and community interactions; and
- Roles and responsibilities to achieve that conformity, including those in respect of change management and emergency response.

Employees responsible for performing site inspections will receive training by drawing on external resources as necessary. Training will be coordinated by the HSE Manager prior to commissioning of the facilities. Upon completion of training and once deemed competent by management, staff will be ready to train other people. Similarly, the Project will require that each of the contractors' institute training programs for its personnel. Each contractor is responsible for site EHS awareness training for personnel working on the job



sites. The contractors are also responsible for identification of any additional training requirements to maintain required competency levels. The contractor training program will be subject to approval by KETRACO and it will be audited to ensure that:

- Training programs are adequate;
- All personnel requiring training have been trained; and
- Competency is being verified.

#### 9.3.7.3 *Communication*

KETRACO will maintain a formal procedure for communications with the regulatory authorities and communities. Dealings will be transparent, and stakeholders will have access to personnel and information to address concerns raised. The Project will implement a grievance mechanism whereby community members can raise any issues of concern. Grievances may be verbal or written and are usually either specific claims for damages/injury or complaints or suggestions about the way that the Project is being implemented. When a grievance has been brought to the attention of the Project team it will be logged and evaluated. The person or group with the grievance is required to present grounds for making a complaint or claiming loss so that a proper and informed evaluation can be made. Where a complaint or claim is considered to be valid, then steps are required to be undertaken to rectify the issue or agree compensation for the loss. In all cases the decision made and the reason for the decision will be communicated to the relevant stakeholders and recorded. Where there remains disagreement on the outcome then an arbitration procedure may be required to be overseen by a third party (e.g., government official). Local community stakeholders will be informed on how to implement the grievance procedures.

#### 9.3.7.4 *Documentation*

KETRACO will control EHS documentation, including management plans; associated procedures; and checklists, forms, and reports, through a formal procedure. All records will be kept on site and will be backed up at several offsite locations (including secure cloud storage facilities). Records will be kept in both hard copy and soft copy formats. And all records will be archived for the life of the project.

Furthermore, the document control procedure will describe the processes that the Project will employ for official communication of both hardcopy and electronic (through the internet) document deliverables. In addition, it will describe the requirement for electronic filing and posting and for assignment of document tracking and control numbers (including revision codes). The EHS Manager is responsible for maintaining a master list of applicable EHS documents and making sure that this list is communicated to the appropriate parties. The EHS Manager is responsible for providing notice to the affected parties of changes or revisions to documents, for issuing revised copies and for checking that the information is communicated within that party's organisation appropriately. The contractors will be required to develop a system for maintaining and controlling its own EHS documentation and describe these systems in their respective EHS plans.

#### 9.3.7.5 *Operational Control Procedures*

Each activity for which a potentially significant environmental or socioeconomic risk or impact is expected will have an operational control associated with it that specifies appropriate procedures, work instructions, best management practices, roles, responsibilities, authorities, monitoring, measurement and record keeping for avoiding or reducing impacts. Operational controls are monitored for compliance and effectiveness on a regular basis through a monitoring and auditing procedure described in the ESMP. Operational control procedures will be reviewed and, where appropriate, amended to include instructions for planning and minimizing impacts, or to at least reference relevant documents that address impact avoidance and mitigation.

#### **9.3.7.6 Managing Changes to Project Activities**

Changes in the Project may occur due to unanticipated situations. Adaptive changes may also occur during the course of the project life cycle. The Project will implement a formal procedure to manage changes in the Project that will apply to all project activities. The objective of the procedure is to ensure that the impact of changes on the health and safety of personnel, the environment, plant and equipment are identified and assessed prior to changes being implemented. The management of change procedure will ensure that:

- Proposed changes have a sound technical, safety, environmental, and commercial justification;
- Changes are reviewed by competent personnel and the impact of changes is reflected in documentation, including operating procedures and drawings;
- Hazards resulting from changes that alter the conditions assessed in the ESIA have been identified and assessed and the impact(s) of changes do not adversely affect the management of health, safety or the environment;
- Changes are communicated to personnel who are provided with the necessary skills, via training, to effectively implement changes; and
- The appropriate KETRACO person accepts the responsibility for the change.

As information regarding the uncertainties becomes available, the Project ESMP will be updated to include that information in subsequent revisions. Environmental and social, as well as engineering feasibility and cost, considerations will be taken into account when choosing between possible alternatives.

## 10 CONCLUSIONS AND RECOMMENDATIONS

### 10.1 Conclusion

This report presents a comprehensive environmental and social impact assessment for the proposed 132 kV double circuit transmission line and proposed measures for mitigating the adverse impacts while enhancing the positive ones during the phases of pre-construction, construction, operation, and maintenance and decommissioning. An evaluation of the possible alternatives for the project activities was also performed.

The following conclusions have been arrived at regarding the proposed 132 kV double circuit Transmission line. The anticipated benefits of the construction and operation and maintenance of the Project are immense. The project will provide a clean/green reliable supply of electricity to the region and the national grid, which comes along with many benefits. For the project components, which are suggested to be maintained and those where alternatives were provided, an evaluation of the positive and negative impacts was performed, and an Environmental and Social Monitoring Plan (ESMP) drawn. All negative impacts can be mitigated following the ESMP.

The negative impacts identified in this ESIA during the planning, construction, operation and decommissioning phase of the project, including waste generation, air pollution, noise pollution, occupational health and safety impacts, community health and safety impacts, traffic, labour influx and gender impacts will be limited to the transmission line ROW/wayleaves and can be mitigated using the measures proposed in the ESMP as well as the preparation and implementation of C-ESMPs including but not limited to:-

- ✓ *Health, Hygiene and Safety Plan*
- ✓ *Labour Management Plan*
- ✓ *Local Recruitment Plan*
- ✓ *Child Protection Strategy*
- ✓ *Grievances Redress Mechanism*
- ✓ *Waste Management Plan*
- ✓ *Contractors Code of Conduct, specific provisions for VAC, SEA and SH*
- ✓ *HIV/AIDS Prevention Strategy*
- ✓ *GBV (SEA/SH) Management Plan*
- ✓ *Stakeholder Engagement Plan*
- ✓ *Vulnerable and Marginalized Groups Plan*
- ✓ *CSR Plan (to be informed by the KETRACO CSR policy)*

Other plans to aid the implementation of the safe project implementation will be included as the project continues.

## 10.2 Budget for ESMP

The costs of incorporating the recommended mitigation measures are defined in the ESMP matrix, and overseen by the KETRACO Project Manager.

The environmental and social department – social safeguards team, valuation, and survey department along with assistance from the KETRACO Technical department will oversee and manage the cost and recommended mitigation measures within the field of expertise including compensation for property, crops and relocation activities. These costs are presented in the proposed project Resettlement Action Plan (RAP).

The following is a summary of the RAP, ESMP and ESMmP budget for the proposed Kabarnet Rumuruti 132 kV TL

**Table 107-RAP, ESMP & ESMmP Implementation estimate costs**

<b>Item</b>	<b>Cost ( Kes)</b>
<i><b>RAP costs</b></i>	<b>568,944,570.11</b>
<i><b>Environmental and social management costs</b></i>	<b>29,130,000.00</b>
<i><b>Environmental and social monitoring costs</b></i>	<b>16,540,000.00</b>
<i><b>Costs to be included in contractor's Boq</b></i>	<b>27,600,000.00</b>
<i><b>Costs that should be part of routine or periodic maintenance</b></i>	<b>11,690,000.00</b>
<i><b>Total</b></i>	<b>653,904,570.11</b>
<i><b>Training/institutional costs 2% of total cost</b></i>	<b>13,078,091.40</b>
<i><b>Grand total</b></i>	<b>666,982,661.51</b>

## 10.3 Recommendations

The adverse impacts on the physical and natural environment will be “in sum total,” can be handled through the provided mitigation measures. There are incremental costs required to achieve these. The contractor will be legally bound to implement this ESMP and any subsequent C-ESMP that will be developed during the construction process. This obligation will be explicitly stated in the ToR, bidding documents and the final executed contract. This proponent shall fully integrate into the TOR of the contractor all the plans and sub plans the contractor shall develop.

Further, the Contractor will be required to have environmental, Health and social/liaison persons charged with primary responsibility of monitoring the implementation of the C-ESMP. They will also be required to submit monthly E&S implementation reports to the Client and the AfDB.

Regarding institutional capacity to carry out the proposed project, KETRACO has established a dedicated Project Implementation Team (PIT) to implement the Project. The PIT will include a project engineer, three site managers, one civil engineer, one accountant, one procurement expert, two socio-economists and two environmentalists. The PIT will be assisted by a consultant with experience in undertaking similar projects in the region. The PIT reports to the KETRACO Board Committee that will oversee project implementation, including the review of annual work plans and budgets. The consultant will prepare the technical specification and draft bid documents for transmission lines and substations. KETRACO will at all times remain responsible for the overall performance of all ESMPs. Currently, KETRACO has 8 NEMA and Environmental Institute of Kenya (EIK) registered professionals, 12 socio-economists, 14 land surveyors, 3 safety officers and 14 land valuers/economists. The Environmental and Social division of KETRACO will monitor compliance of the project to applicable environmental and social standards whereas the KETRACO safety unit ensure safe work management and support the E&S unit to carry out contractor inductions. Its worth, noting that the KETRACO E&S department is well trained and capable to ensure monitoring of the project. From the consultant perspective KETRACO has the capacity to monitor implementation of the Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMnP) developed for the project. The department also has the capacity to undertake training and build the capacity of the contractor to implement both the ESMP and ESMnP.

The proponent is committed to putting in place the proposed measures to mitigate the potential negative environmental, safety, health and social impacts associated with the life cycle of the proposed project. Taking into cognizant the anticipated project benefits to the Country on power stability, reliability and spur on economy; and the adequate mitigation measures provided for the impacts, it is within our expert opinion that NEMA considers, approves and grants an Environmental Impact Assessment License to the proponent and the proponent to implement the project with strict adherence to the proposed ESMP.

Based on the immense project benefits of the clean energy generation/harvesting and transmission, which have been stated above, and the identified negative impacts which can be mitigated in the proposed ESMP, we strongly contend that NEMA will find this ESIA study satisfactory and the project environmentally and socially viable to be permitted to take off.

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## ANNEXES

### **ANNEX A.      Attendance lists**

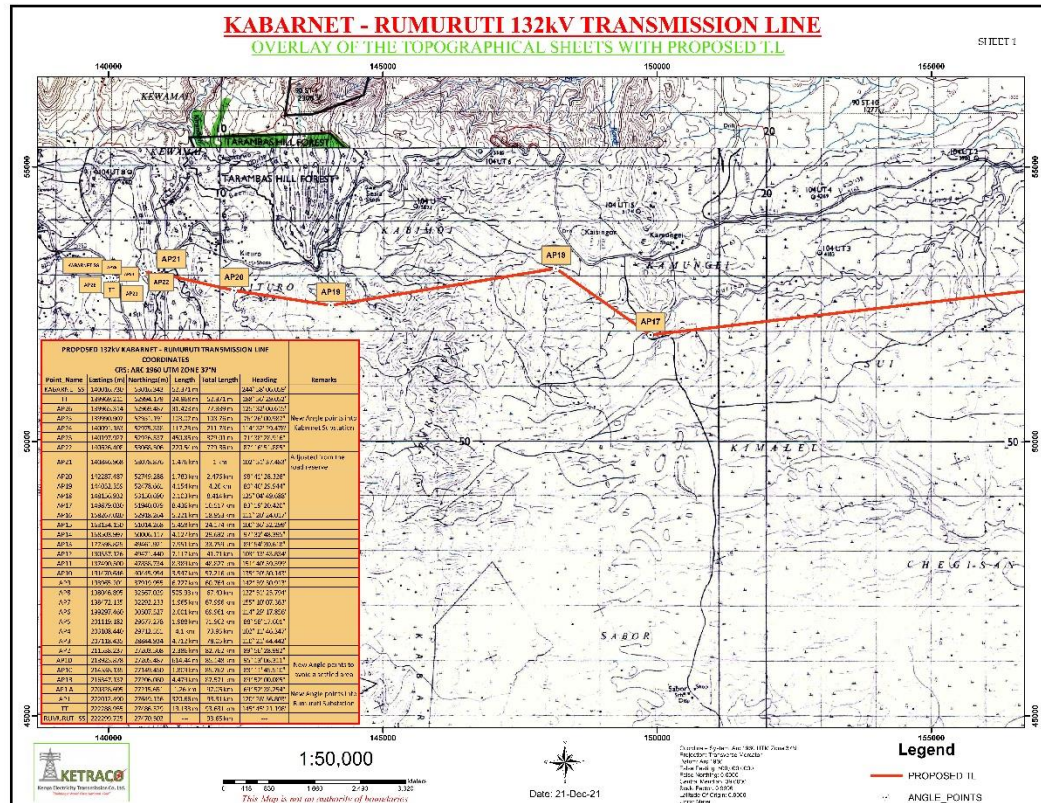
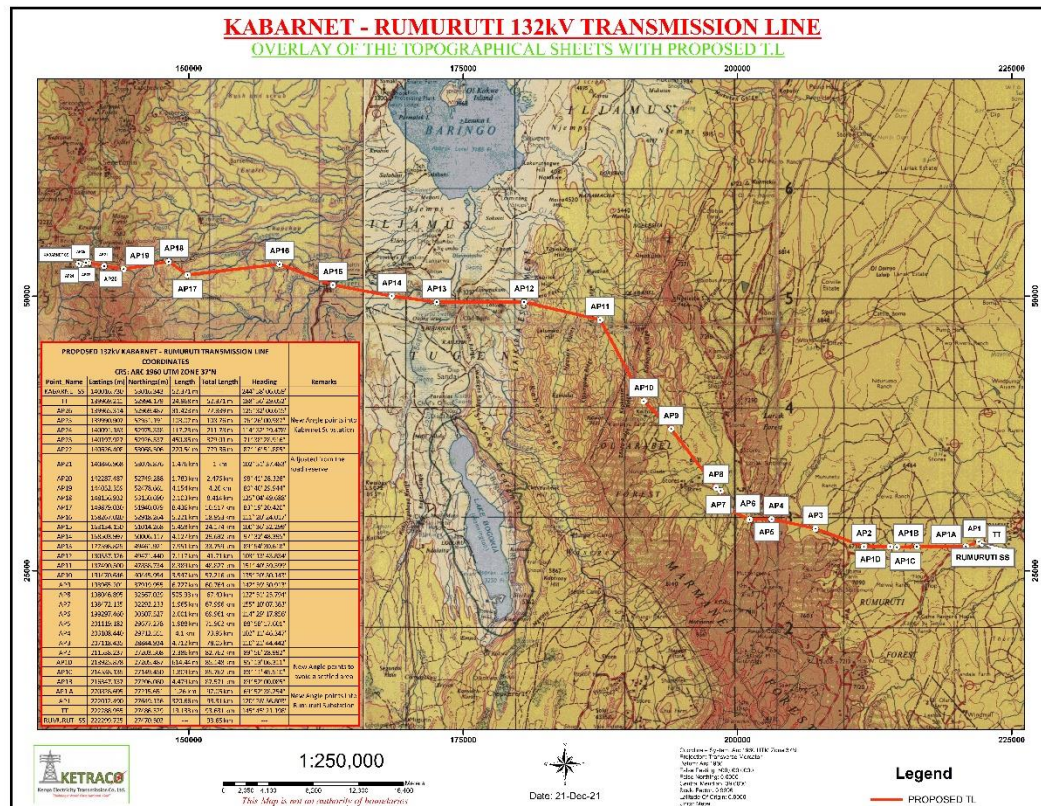
**ANNEX B. Minutes of consultation meetings**

**ANNEX C.      Selected photographs**

**ANNEX D.      Key Informant questionnaires**

## **ANNEX E.      Community questionnaires**

## ANNEX F. Maps of TL route





SHEET 2



SHEET 3





SHEET 4



## SHEET 5





## SHK-16



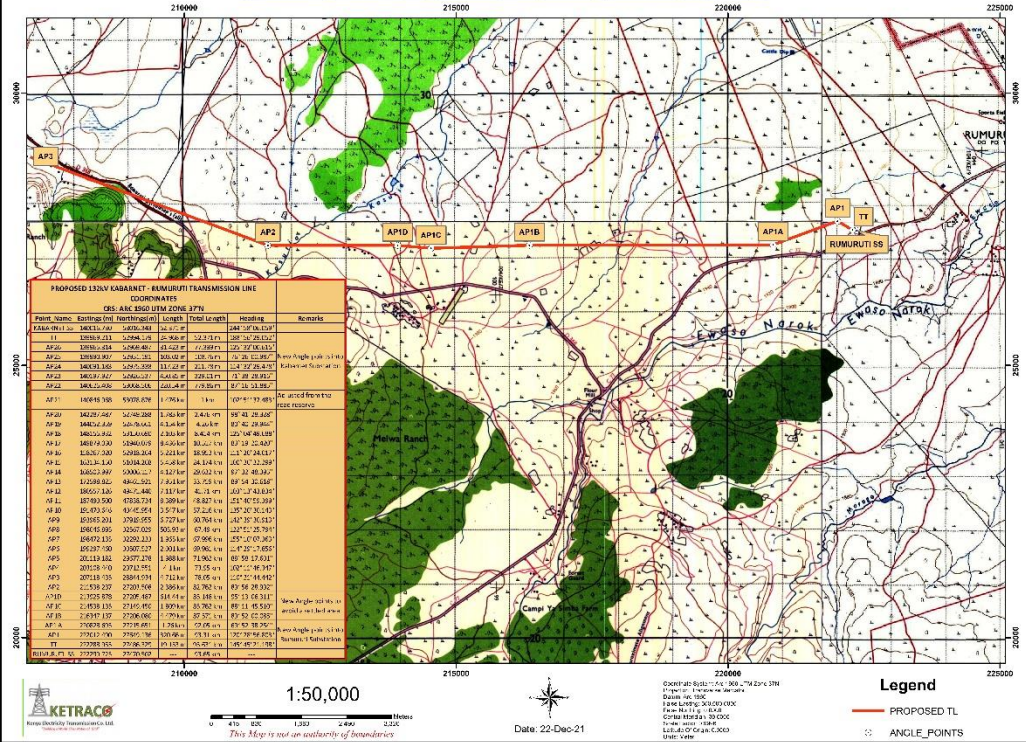
## SHEET 7





# **KABARNET - RUMURUTI 132kV TRANSMISSION LINE** **OVERLAY OF THE TOPOGRAPHICAL SHEETS WITH PROPOSED T.L.**

584941 S



## ANNEX G. Bird Species in Lake Baringo

■ Critically Endangered 
 ■ Endangered 
 ■ Vulnerable 
 ■ Near Threatened

[		
1	Common Ostrich	<i>Struthio camelus</i>
<b>Ducks: Anatidae</b>		
2	White-faced Whistling-Duck	<i>Dendrocygna viduata</i>
3	Fulvous Whistling-Duck	<i>Dendrocygna bicolor</i>
4	White-backed Duck	<i>Thalassornis leuconotus</i>
5	Knob-billed Duck	<i>Sarkidiornis melanotos</i>
6	Egyptian Goose	<i>Alopochen aegyptiaca</i>
7	Spur-winged Goose	<i>Plectropterus gambensis</i>
8	African Pygmy-Goose	<i>Nettapus auritus</i>
9	Garganey	<i>Spatula querquedula</i>
10	Hottentot Teal	<i>Spatula hottentota</i>
11	Northern Shoveler	<i>Spatula clypeata</i>
12	Eurasian Wigeon	<i>Mareca penelope</i>
13	Yellow-billed Duck	<i>Anas undulata</i>
14	Cape Teal	<i>Anas capensis</i>
15	Red-billed Duck	<i>Anas erythrorhyncha</i>
16	Northern Pintail	<i>Anas acuta</i>
17	Eurasian Teal	<i>Anas crecca</i>
18	\Southern Pochard\	<i>Netta erythrophthalma</i>
19	Tufted Duck	<i>Aythya fuligula</i>
20	Maccoa Duck	<i>Oxyura maccoa</i>
<b>Guineafowl: Numididae</b>		
21	Helmeted Guineafowl	<i>Numida meleagris</i>
<b>Pheasants, Grouse, and Allies: Phasianidae</b>		
22	Harlequin Quail	<i>Coturnix delegorguei</i>
23	Hildebrandt's Francolin	<i>Pternistis hildebrandti</i>
24	Yellow-necked Francolin	<i>Pternistis leucoscepus</i>
25	Crested Francolin	<i>Dendroperdix sephaena</i>
<b>Flamingos: Phoenicopteridae</b>		
26	Greater Flamingo	<i>Phoenicopterus roseus</i>
27	Lesser Flamingo	<i>Phoenicoparrus minor</i>
<b>Grebes: Podicipedidae</b>		
28	Little Grebe	<i>Tachybaptus ruficollis</i>
29	Great Crested Grebe	<i>Podiceps cristatus</i>
<b>Pigeons and Doves: Columbidae</b>		
30	Rock Pigeon	<i>Columba livia</i>
31	Speckled Pigeon	<i>Columba guinea</i>

32	Dusky Turtle-Dove	<i>Streptopelia lugens</i>
33	Mourning Collared-Dove	<i>Streptopelia decipiens</i>
34	Ring-necked Dove	<i>Streptopelia capicola</i>
35	Laughing Dove	<i>Streptopelia senegalensis</i>
36	Emerald-spotted Wood-Dove	<i>Turtur chalcospilos</i>
37	Namaqua Dove	<i>Oena capensis</i>
38	African Green-Pigeon	<i>Treron calvus</i>
<b>Bustards: <i>Otididae</i></b>		
39	Kori Bustard	<i>Ardeotis kori</i>
<b>Sandgrouse: <i>Pteroclididae</i></b>		
40	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>
41	Lichtenstein's Sandgrouse	<i>Pterocles lichtensteinii</i>
<b>Bustards: <i>Otididae</i></b>		
42	Black-bellied Bustard	<i>Lissotis melanogaster</i>
<b>Turacos: <i>Musophagidae</i></b>		
43	White-crested Turaco	<i>Tauraco leucolophus</i>
44	White-bellied Go-away-bird	<i>Corythaixoides leucogaster</i>
<b>Cuckoos: <i>Cuculidae</i></b>		
45	Red-chested Cuckoo	<i>Cuculus solitarius</i>
46	Black Cuckoo	<i>Cuculus clamosus</i>
47	Common Cuckoo	<i>Cuculus canorus</i>
48	African Cuckoo	<i>Cuculus gularis</i>
49	Black Coucal	<i>Centropus grillii</i>
50	White-browed Coucal	<i>Centropus superciliosus</i>
51	Pied Cuckoo	<i>Clamator jacobinus</i>
52	Levaillant's Cuckoo	<i>Clamator levaillantii</i>
53	Great Spotted Cuckoo	<i>Clamator glandarius</i>
54	Klaas's Cuckoo	<i>Chrysococcyx klaas</i>
55	African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>
56	Dideric Cuckoo	<i>Chrysococcyx caprius</i>
<b>Nightjars and Allies: <i>Caprimulgidae</i></b>		
57	Standard-winged Nightjar	<i>Caprimulgus longipennis</i>
58	Eurasian Nightjar	<i>Caprimulgus europaeus</i>
59	Sombre Nightjar	<i>Caprimulgus fraenatus</i>
60	Donaldson-Smith's Nightjar	<i>Caprimulgus donaldsoni</i>
61	Swamp Nightjar	<i>Caprimulgus natalensis</i>
62	Plain Nightjar	<i>Caprimulgus inornatus</i>
63	Star-spotted Nightjar	<i>Caprimulgus stellatus</i>
64	Freckled Nightjar	<i>Caprimulgus tristigma</i>

65	Slender-tailed Nightjar	<i>Caprimulgus clarus</i>
<b>Swifts: Apodidae</b>		
66	Scarce Swift	<i>Schoutedenapus myoptilus</i>
67	Alpine Swift	<i>Apus melba</i>
68	Mottled Swift	<i>Apus aequatorialis</i>
69	Common Swift	<i>Apus apus</i>
70	Nyanza Swift	<i>Apus niansae</i>
71	African Swift	<i>Apus barbatus</i>
72	Little Swift	<i>Apus affinis</i>
73	Horus Swift	<i>Apus horus</i>
74	White-rumped Swift	<i>Apus caffer</i>
75	African Palm-Swift	<i>Cypsiurus parvus</i>
<b>Rails, Gallinules, and Coots: Rallidae</b>		
76	African Rail	<i>Rallus caerulescens</i>
77	African Crake	<i>Crex egregia</i>
78	Lesser Moorhen	<i>Gallinula angulata</i>
79	Eurasian Moorhen	<i>Gallinula chloropus</i>
80	Red-knobbed Coot	<i>Fulica cristata</i>
81	Allen's Gallinule	<i>Porphyrio alleni</i>
82	African Swampen	<i>Porphyrio madagascariensis</i>
83	\Striped Crake\	<i>Amauornis marginalis</i>
84	Black Crake	<i>Zapornia flavirostra</i>
85	Baillon's Crake	<i>Zapornia pusilla</i>
<b>Cranes: Gruidae</b>		
86	Black Crowned-Crane	<i>Balearica pavonina</i>
<b>Thick-knees: Burhinidae</b>		
87	Water Thick-knee	<i>Burhinus vermiculatus</i>
88	Eurasian Thick-knee	<i>Burhinus oedicnemus</i>
89	Senegal Thick-knee	<i>Burhinus senegalensis</i>
90	Spotted Thick-knee	<i>Burhinus capensis</i>
<b>Stilts and Avocets: Recurvirostridae</b>		
91	Black-winged Stilt	<i>Himantopus himantopus</i>
92	Pied Avocet	<i>Recurvirostra avosetta</i>
<b>Plovers and Lapwings: Charadriidae</b>		
93	Black-bellied Plover	<i>Pluvialis squatarola</i>
94	Long-toed Lapwing	<i>Vanellus crassirostris</i>
95	Blacksmith Lapwing	<i>Vanellus armatus</i>
96	Spur-winged Lapwing	<i>Vanellus spinosus</i>
97	Black-headed Lapwing	<i>Vanellus tectus</i>



98	Senegal Lapwing	<i>Vanellus lugubris</i>
99	Black-winged Lapwing	<i>Vanellus melanopterus</i>
100	Crowned Lapwing	<i>Vanellus coronatus</i>
101	Wattled Lapwing	<i>Vanellus senegallus</i>
102	Lesser Sand-Plover	<i>Charadrius mongolus</i>
103	Greater Sand-Plover	<i>Charadrius leschenaultii</i>
104	Caspian Plover	<i>Charadrius asiaticus</i>
105	Kittlitz's Plover	<i>Charadrius pecuarius</i>
106	Common Ringed Plover	<i>Charadrius hiaticula</i>
107	Little Ringed Plover	<i>Charadrius dubius</i>
108	Three-banded Plover	<i>Charadrius tricollaris</i>
<b>Painted-Snipes: <i>Rostratulidae</i></b>		
109	Greater Painted-Snipe	<i>Rostratula benghalensis</i>
<b>Jacanas: <i>Jacanidae</i></b>		
110	African Jacana	<i>Actophilornis africanus</i>
<b>Sandpipers and Allies: <i>Scolopacidae</i></b>		
111	Whimbrel	<i>Numenius phaeopus</i>
112	Bar-tailed Godwit	<i>Limosa lapponica</i>
113	Black-tailed Godwit	<i>Limosa limosa</i>
114	Ruddy Turnstone	<i>Arenaria interpres</i>
115	Ruff	<i>Calidris pugnax</i>
116	Curlew Sandpiper	<i>Calidris ferruginea</i>
117	Temminck's Stint	<i>Calidris temminckii</i>
118	Sanderling	<i>Calidris alba</i>
119	Little Stint	<i>Calidris minuta</i>
120	Jack Snipe	<i>Lymnocyrtus minimus</i>
121	Terek Sandpiper	<i>Xenus cinereus</i>
122	Great Snipe	<i>Gallinago media</i>
123	Common Snipe	<i>Gallinago gallinago</i>
124	African Snipe	<i>Gallinago nigripennis</i>
125	Common Sandpiper	<i>Actitis hypoleucos</i>
126	Green Sandpiper	<i>Tringa ochropus</i>
127	Spotted Redshank	<i>Tringa erythropus</i>
128	Common Greenshank	<i>Tringa nebularia</i>
129	Marsh Sandpiper	<i>Tringa stagnatilis</i>
130	Wood Sandpiper	<i>Tringa glareola</i>
131	Common Redshank	<i>Tringa totanus</i>
<b>Pratincoles and Coursers: <i>Glareolidae</i></b>		
132	Temminck's Courser	<i>Cursorius temminckii</i>
133	Three-banded Courser	<i>Rhinoptilus cinctus</i>

134	Collared Pratincole	<i>Glareola pratincola</i>
135	Black-winged Pratincole	<i>Glareola nordmanni</i>
<b>Gulls, Terns, and Skimmers: <i>Laridae</i></b>		
136	Gray-hooded Gull	<i>Chroicocephalus cirrocephalus</i>
137	Black-headed Gull	<i>Chroicocephalus ridibundus</i>
138	Pallas's Gull	<i>Ichthyaetus ichthyaetus</i>
139	Lesser Black-backed Gull	<i>Larus fuscus</i>
140	Little Tern	<i>Sternula albifrons</i>
141	Gull-billed Tern	<i>Gelochelidon nilotica</i>
142	Caspian Tern	<i>Hydroprogne caspia</i>
143	White-winged Tern	<i>Chlidonias leucopterus</i>
144	Whiskered Tern	<i>Chlidonias hybrida</i>
145	Common Tern	<i>Sterna hirundo</i>
146	African Skimmer	<i>Rynchops flavirostris</i>
<b>Storks: <i>Ciconiidae</i></b>		
147	African Openbill	<i>Anastomus lamelligerus</i>
148	Black Stork	<i>Ciconia nigra</i>
149	Abdim's Stork	<i>Ciconia abdimii</i>
150	Woolly-necked Stork	<i>Ciconia episcopus</i>
151	White Stork	<i>Ciconia ciconia</i>
152	Saddle-billed Stork	<i>Ephippiorhynchus senegalensis</i>
153	Marabou Stork	<i>Leptoptilos crumenifer</i>
154	Yellow-billed Stork	<i>Mycteria ibis</i>
<b>Anhingas: <i>Anhingidae</i></b>		
155	African Darter	<i>Anhinga rufa</i>
<b>Cormorants and Shags: <i>Phalacrocoracidae</i></b>		
156	Long-tailed Cormorant	<i>Microcarbo africanus</i>
157	Great Cormorant	<i>Phalacrocorax carbo</i>
<b>Pelicans: <i>Pelecanidae</i></b>		
158	Great White Pelican	<i>Pelecanus onocrotalus</i>
159	Pink-backed Pelican	<i>Pelecanus rufescens</i>
<b>Hamerkop: <i>Scopidae</i></b>		
160	Hamerkop	<i>Scopus umbretta</i>
<b>Herons, Egrets, and Bitterns: <i>Ardeidae</i></b>		
161	Little Bittern	<i>Ixobrychus minutus</i>
162	Dwarf Bittern	<i>Ixobrychus sturmii</i>
163	Gray Heron	<i>Ardea cinerea</i>
164	Black-headed Heron	<i>Ardea melanocephala</i>
165	Goliath Heron	<i>Ardea goliath</i>

166	Purple Heron	<i>Ardea purpurea</i>
167	Great Egret	<i>Ardea alba</i>
168	Intermediate Egret	<i>Ardea intermedia</i>
169	Little Egret	<i>Egretta garzetta</i>
170	Western Reef-Heron	<i>Egretta gularis</i>
171	Black Heron	<i>Egretta ardesiaca</i>
172	Cattle Egret	<i>Bubulcus ibis</i>
173	Squacco Heron	<i>Ardeola ralloides</i>
174	\Madagascar Pond-Heron\	<i>Ardeola idae</i>
175	Striated Heron	<i>Butorides striata</i>
176	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
<b>Ibises and Spoonbills: <i>Threskiornithidae</i></b>		
177	Glossy Ibis	<i>Plegadis falcinellus</i>
178	African Sacred Ibis	<i>Threskiornis aethiopicus</i>
179	Hadada Ibis	<i>Bostrychia hagedash</i>
180	African Spoonbill	<i>Platalea alba</i>
<b>Osprey: <i>Pandionidae</i></b>		
181	Osprey	<i>Pandion haliaetus</i>
<b>Hawks, Eagles, and Kites: <i>Accipitridae</i></b>		
182	Black-winged Kite	<i>Elanus caeruleus</i>
183	Scissor-tailed Kite	<i>Chelictinia riocourii</i>
184	African Harrier-Hawk	<i>Polyboroides typus</i>
185	Egyptian Vulture	<i>Neophron percnopterus</i>
186	European Honey-buzzard	<i>Pernis apivorus</i>
187	White-headed Vulture	<i>Trigonoceps occipitalis</i>
188	Lappet-faced Vulture	<i>Torgos tracheliotos</i>
189	Hooded Vulture	<i>Necrosyrtes monachus</i>
190	White-backed Vulture	<i>Gyps africanus</i>
191	Rueppell's Griffon	<i>Gyps rueppelli</i>
192	Bateleur	<i>Terathopius ecaudatus</i>
193	Short-toed Snake-Eagle	<i>Circaetus gallicus</i>
194	Brown Snake-Eagle	<i>Circaetus cinereus</i>
195	Bat Hawk	<i>Macheiramphus alcinus</i>
196	Martial Eagle	<i>Polemaetus bellicosus</i>
197	Long-crested Eagle	<i>Lophaetus occipitalis</i>
198	Lesser Spotted Eagle	<i>Clanga pomarina</i>
199	Wahlberg's Eagle	<i>Hieraaetus wahlbergi</i>
200	Booted Eagle	<i>Hieraaetus pennatus</i>
201	Tawny Eagle	<i>Aquila rapax</i>
202	Steppe Eagle	<i>Aquila nipalensis</i>
203	Imperial Eagle	<i>Aquila heliaca</i>

204	Verreaux's Eagle	<i>Aquila verreauxii</i>
205	African Hawk-Eagle	<i>Aquila spilogaster</i>
206	Dark Chanting-Goshawk	<i>Melierax metabates</i>
207	Gabar Goshawk	<i>Micronisus gabar</i>
208	Grasshopper Buzzard	<i>Butastur rufipennis</i>
209	Eurasian Marsh-Harrier	<i>Circus aeruginosus</i>
210	African Marsh-Harrier	<i>Circus ranivorus</i>
211	Pallid Harrier	<i>Circus macrourus</i>
212	Montagu's Harrier	<i>Circus pygargus</i>
213	African Goshawk	<i>Accipiter tachiro</i>
214	Shikra	<i>Accipiter badius</i>
215	Levant Sparrowhawk	<i>Accipiter brevipes</i>
216	Eurasian Sparrowhawk	<i>Accipiter nisus</i>
217	Black Kite	<i>Milvus migrans</i>
218	African Fish-Eagle	<i>Haliaeetus vocifer</i>
219	[Common Buzzard]	<i>Buteo buteo</i>
220	Augur Buzzard	<i>Buteo augur</i>
<b>Barn-Owls: Tytonidae</b>		
221	Barn Owl	<i>Tyto alba</i>
<b>Owls: Strigidae</b>		
222	African Scops-Owl	<i>Otus senegalensis</i>
223	Northern White-faced Owl	<i>Ptilopsis leucotis</i>
224	Spotted Eagle-Owl	<i>Bubo africanus</i>
225	Verreaux's Eagle-Owl	<i>Bubo lacteus</i>
226	Pearl-spotted Owlet	<i>Glaucidium perlatum</i>
<b>Mousebirds: Coliidae</b>		
227	Speckled Mousebird	<i>Colius striatus</i>
228	Blue-naped Mousebird	<i>Urocolius macrourus</i>
<b>Trogon: Trogonidae</b>		
229	Narina Trogon	<i>Apaloderma narina</i>
<b>Hoopoes: Upupidae</b>		
230	Eurasian Hoopoe	<i>Upupa epops</i>
<b>Woodhoopoes and Scimitarbills: Phoeniculidae</b>		
231	Green Woodhoopoe	<i>Phoeniculus purpureus</i>
232	Violet Woodhoopoe	<i>Phoeniculus damarensis</i>
233	Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>
234	Abyssinian Scimitarbill	<i>Rhinopomastus minor</i>
<b>Hornbills: Bucerotidae</b>		
235	Northern Ground-Hornbill (Abyssinian Ground-Hornbill)	<i>Bucorvus abyssinicus</i>
236	Crowned Hornbill	<i>Lophoceros alboterminatus</i>

237	Hemprich's Hornbill	<i>Lophoceros hemprichii</i>
238	African Gray Hornbill	<i>Lophoceros nasutus</i>
239	Northern Red-billed Hornbill	<i>Tockus erythrorhynchus</i>
240	Eastern Yellow-billed Hornbill	<i>Tockus flavirostris</i>
241	Jackson's Hornbill	<i>Tockus jacksoni</i>
<b>Kingfishers: <i>Alcedinidae</i></b>		
242	Malachite Kingfisher	<i>Corythornis cristatus</i>
243	African Pygmy-Kingfisher	<i>Ispidina picta</i>
244	Gray-headed Kingfisher	<i>Halcyon leucocephala</i>
245	Woodland Kingfisher	<i>Halcyon senegalensis</i>
246	Brown-hooded Kingfisher	<i>Halcyon albiventris</i>
247	Striped Kingfisher	<i>Halcyon chelicuti</i>
248	Giant Kingfisher	<i>Megaceryle maxima</i>
249	Pied Kingfisher	<i>Ceryle rudis</i>
<b>Bee-eaters: <i>Meropidae</i></b>		
250	White-fronted Bee-eater	<i>Merops bullockoides</i>
251	Little Bee-eater	<i>Merops pusillus</i>
252	White-throated Bee-eater	<i>Merops albicollis</i>
253	Blue-cheeked Bee-eater	<i>Merops persicus</i>
254	Madagascar Bee-eater	<i>Merops superciliosus</i>
255	European Bee-eater	<i>Merops apiaster</i>
256	Northern Carmine Bee-eater	<i>Merops nubicus</i>
<b>Rollers: <i>Coraciidae</i></b>		
257	European Roller	<i>Coracias garrulus</i>
258	Abyssinian Roller	<i>Coracias abyssinicus</i>
259	Lilac-breasted Roller	<i>Coracias caudatus</i>
260	Rufous-crowned Roller	<i>Coracias naevius</i>
261	Broad-billed Roller	<i>Eurystomus glaucurus</i>
<b>African Barbets: <i>Lybiidae</i></b>		
262	Red-and-yellow Barbet	<i>Trachyphonus erythrocephalus</i>
263	D'Arnaud's Barbet	<i>Trachyphonus darnaudii</i>
264	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>
265	Red-fronted Barbet	<i>Tricholaema diademata</i>
266	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>
267	Black-throated Barbet	<i>Tricholaema melanocephala</i>
268	White-headed Barbet	<i>Lybius leucocephalus</i>
<b>Honeyguides: <i>Indicatoridae</i></b>		
269	Lesser Honeyguide	<i>Indicator minor</i>
270	Scaly-throated Honeyguide	<i>Indicator variegatus</i>
271	Greater Honeyguide	<i>Indicator indicator</i>
<b>Woodpeckers: <i>Picidae</i></b>		

272	Cardinal Woodpecker	<i>Chloropicus fuscescens</i>
273	Bearded Woodpecker	<i>Chloropicus namaquus</i>
274	Mountain Gray Woodpecker	<i>Chloropicus spodocephalus</i>
275	Nubian Woodpecker	<i>Campethera nubica</i>
276	Golden-tailed Woodpecker	<i>Campethera abingoni</i>
<b>Falcons and Caracaras: <i>Falconidae</i></b>		
277	Pygmy Falcon	<i>Polihierax semitorquatus</i>
278	Lesser Kestrel	<i>Falco naumanni</i>
279	Eurasian Kestrel	<i>Falco tinnunculus</i>
280	Greater Kestrel	<i>Falco rupicoloides</i>
281	Fox Kestrel	<i>Falco alopex</i>
282	Gray Kestrel	<i>Falco ardosiaceus</i>
283	Red-necked Falcon	<i>Falco chicquera</i>
284	Amur Falcon	<i>Falco amurensis</i>
285	Eleonora's Falcon	<i>Falco eleonora</i>
286	Sooty Falcon	<i>Falco concolor</i>
287	Eurasian Hobby	<i>Falco subbuteo</i>
288	African Hobby	<i>Falco cuvierii</i>
289	Lanner Falcon	<i>Falco biarmicus</i>
290	Peregrine Falcon	<i>Falco peregrinus</i>
291	Taita Falcon	<i>Falco fasciinucha</i>
<b>Parrots: <i>Psittacidae</i></b>		
292	Meyer's Parrot	<i>Poicephalus meyeri</i>
<b>Cuckooshrikes: <i>Campephagidae</i></b>		
293	Black Cuckooshrike	<i>Campephaga flava</i>
<b>Old World Orioles: <i>Oriolidae</i></b>		
294	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
295	(African Golden Oriole)	<i>Oriolus auratus</i>
296	African Black-headed Oriole	<i>Oriolus larvatus</i>
<b>Wattle-eyes and Batises: <i>Platysteiridae</i></b>		
297	Chinspot Batis	<i>Batis molitor</i>
298	Gray-headed Batis	<i>Batis orientalis</i>
299	Pygmy Batis	<i>Batis perkeo</i>
<b>Vangas, Helmetshrikes and Allies: <i>Vangidae</i></b>		
300	White Helmetshrike	<i>Prionops plumatus</i>
<b>Bushshrikes: <i>Malaconotidae</i></b>		
301	Brubru	<i>Nilaus afer</i>
302	Northern Puffback	<i>Dryoscopus gambensis</i>
303	Brown-crowned Tchagra	<i>Tchagra australis</i>
304	Three-streaked Tchagra	<i>Tchagra jamesi</i>
305	Tropical Boubou	<i>Laniarius major</i>

306	Black-headed Gonolek	<i>Laniarius erythrogaster</i>
307	Slate-colored Boubou	<i>Laniarius funebris</i>
308	Sulphur-breasted Bushshrike	<i>Telophorus sulfureopectus</i>
309	Gray-headed Bushshrike	<i>Malaconotus blanchoti</i>
<b>Drongos: <i>Dicruridae</i></b>		
310	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>
<b>Monarch Flycatchers: <i>Monarchidae</i></b>		
311	African Paradise-Flycatcher	<i>Terpsiphone viridis</i>
<b>Shrikes: <i>Laniidae</i></b>		
312	Red-backed Shrike	<i>Lanius collurio</i>
313	Isabelline Shrike	<i>Lanius isabellinus</i>
314	[Lesser Gray Shrike]	<i>Lanius minor</i>
315	Gray-backed Fiscal	<i>Lanius excubitoroides</i>
316	Somali Fiscal	<i>Lanius somalicus</i>
317	Northern Fiscal	<i>Lanius humeralis</i>
318	Masked Shrike	<i>Lanius nubicus</i>
319	Woodchat Shrike	<i>Lanius senator</i>
320	White-rumped Shrike	<i>Eurocephalus ruppelli</i>
<b>Crows, Jays, and Magpies: <i>Corvidae</i></b>		
321	Pied Crow	<i>Corvus albus</i>
322	Fan-tailed Raven	<i>Corvus rhipidurus</i>
323	White-necked Raven	<i>Corvus albicollis</i>
<b>Tits, Chickadees, and Titmice: <i>Paridae</i></b>		
324	Somali Tit	<i>Melaniparus thruppi</i>
<b>Penduline-Tits: <i>Remizidae</i></b>		
325	Mouse-colored Penduline-Tit	<i>Anthoscopus musculus</i>
326	African Penduline-Tit	<i>Anthoscopus caroli</i>
<b>Larks: <i>Alaudidae</i></b>		
327	Fischer's Sparrow-Lark	<i>Eremopterix leucopareia</i>
328	Pink-breasted Lark	<i>Calendulauda poecilosterna</i>
329	Singing Bushlark	<i>Mirafraga cantillans</i>
<b>African Warblers: <i>Macrospenidae</i></b>		
330	Northern Crombec	<i>Sylvietta brachyura</i>
331	Red-faced Crombec	<i>Sylvietta whytii</i>
<b>Cisticolas and Allies: <i>Cisticolidae</i></b>		
332	Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>
333	Gray Wren-Warbler	<i>Calamonastes simplex</i>
334	Gray-backed Camaroptera**	<i>Camaroptera brevicaudata</i>
335	Buff-bellied Warbler	<i>Phyllolais pulchella</i>
336	Brown-tailed Apalis**	<i>Apalis viridiceps</i>
337	Tawny-flanked Prinia	<i>Prinia subflava</i>



338	Pale Prinia	<i>Prinia somalica</i>
339	Red-fronted Warbler	<i>Prinia rufifrons</i>
340	Rattling Cisticola	<i>Cisticola chiniana</i>
341	Winding Cisticola**	<i>Cisticola marginatus</i>
342	Zitting Cisticola	<i>Cisticola juncidis</i>
<b>Reed Warblers and Allies: Acrocephalidae</b>		
343	Eastern Olivaceous Warbler	<i>Iduna pallida</i>
344	Upcher's Warbler	<i>Hippolais languida</i>
345	Olive-tree Warbler	<i>Hippolais olivetorum</i>
346	Sedge Warbler	<i>Acrocephalus schoenobaenus</i>
347	Marsh Warbler	<i>Acrocephalus palustris</i>
348	Eurasian Reed Warbler	<i>Acrocephalus scirpaceus</i>
349	Basra Reed Warbler	<i>Acrocephalus griseldis</i>
350	Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>
351	Great Reed Warbler	<i>Acrocephalus arundinaceus</i>
<b>Grassbirds and Allies: Locustellidae</b>		
352	Little Rush-Warbler	<i>Bradypterus baboecala</i>
<b>Swallows: Hirundinidae</b>		
353	Plain Martin	<i>Riparia paludicola</i>
354	Bank Swallow	<i>Riparia riparia</i>
355	Banded Martin	<i>Riparia cincta</i>
356	Rock Martin	<i>Ptyonoprogne fuligula</i>
357	Barn Swallow	<i>Hirundo rustica</i>
358	Ethiopian Swallow	<i>Hirundo aethiopica</i>
359	Wire-tailed Swallow	<i>Hirundo smithii</i>
360	Red-rumped Swallow	<i>Cecropis daurica</i>
361	Lesser Striped Swallow	<i>Cecropis abyssinica</i>
362	Common House-Martin	<i>Delichon urbicum</i>
<b>Bulbuls: Pycnonotidae</b>		
363	Northern Brownbul	<i>Phyllastrephus strepitans</i>
364	Common Bulbul	<i>Pycnonotus barbatus</i>
<b>Leaf Warblers: Phylloscopidae</b>		
365	Willow Warbler	<i>Phylloscopus trochilus</i>
<b>Sylviid Warblers, Parrotbills, and Allies: Sylviidae</b>		
366	Eurasian Blackcap	<i>Sylvia atricapilla</i>
367	Garden Warbler	<i>Sylvia borin</i>
368	Barred Warbler	<i>Sylvia nisoria</i>
369	Brown Parisoma	<i>Sylvia lugens</i>
370	Greater Whitethroat	<i>Sylvia communis</i>
<b>White-eyes, Yuhinas, and Allies: Zosteropidae</b>		
371	Pale White-eye	<i>Zosterops abyssinicus</i>

372	African Yellow White-eye	<i>Zosterops senegalensis</i>
<b>Laughingthrushes and Allies: <i>Leiothrichidae</i></b>		
373	Rufous Chatterer	<i>Turdoides rubiginosa</i>
374	Brown Babbler	<i>Turdoides plebejus</i>
<b>Oxpeckers: <i>Buphagidae</i></b>		
375	Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>
376	Yellow-billed Oxpecker	<i>Buphagus africanus</i>
<b>Starlings: <i>Sturnidae</i></b>		
377	Wattled Starling	<i>Creatophora cinerea</i>
378	Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>
379	Red-winged Starling	<i>Onychognathus morio</i>
380	Bristle-crowned Starling	<i>Onychognathus salvadorii</i>
381	Magpie Starling	<i>Speculipastor bicolor</i>
382	Rueppell's Starling	<i>Lamprotornis purpuroptera</i>
383	Superb Starling	<i>Lamprotornis superbus</i>
384	Lesser Blue-eared Starling	<i>Lamprotornis chloropterus</i>
385	Greater Blue-eared Starling	<i>Lamprotornis chalybaeus</i>
<b>Thrushes and Allies: <i>Turdidae</i></b>		
386	African Thrush	<i>Turdus pelios</i>
<b>Old World Flycatchers: <i>Muscicapidae</i></b>		
387	Spotted Flycatcher	<i>Muscicapa striata</i>
388	African Gray Flycatcher	<i>Bradornis microrhynchus</i>
389	Pale Flycatcher	<i>Agricola pallidus</i>
390	Gray Tit-Flycatcher	<i>Fraseria plumbeus</i>
391	Ashy Flycatcher	<i>Fraseria caerulescens</i>
392	Silverbird	<i>Melaenornis semipartitus</i>
393	Rufous-tailed Scrub-Robin	<i>Cercotrichas galactotes</i>
394	Red-backed Scrub-Robin	<i>Cercotrichas leucophrys</i>
395	White-browed Robin-Chat	<i>Cossypha heuglini</i>
396	Spotted Morning-Thrush	<i>Cichladusa guttata</i>
397	White-throated Robin	<i>Irania gutturalis</i>
398	Thrush Nightingale	<i>Luscinia luscinia</i>
399	Common Nightingale	<i>Luscinia megarhynchos</i>
400	Common Redstart	<i>Phoenicurus phoenicurus</i>
401	Rufous-tailed Rock-Thrush	<i>Monticola saxatilis</i>
402	Whinchat	<i>Saxicola rubetra</i>
403	African Stonechat	<i>Saxicola torquatus</i>
404	Mocking Cliff-Chat	<i>Thamnolaea cinnamomeiventris</i>
405	Northern Wheatear	<i>Oenanthe oenanthe</i>
406	Capped Wheatear	<i>Oenanthe pileata</i>
407	Isabelline Wheatear	<i>Oenanthe isabellina</i>

408	Pied Wheatear	<i>Oenanthe pleschanka</i>
409	Familiar Chat	<i>Oenanthe familiaris</i>
410	Brown-tailed Chat	<i>Oenanthe scotocerca</i>
411	Abyssinian Wheatear	<i>Oenanthe lugubris</i>
<b>Sunbirds and Spiderhunters: <i>Nectariniidae</i></b>		
412	Eastern Violet-backed Sunbird	<i>Anthreptes orientalis</i>
413	Pygmy Sunbird	<i>Hedydipna platura</i>
414	Hunter's Sunbird	<i>Chalcomitra hunteri</i>
415	Bronze Sunbird	<i>Nectarinia kilimensis</i>
416	Golden-winged Sunbird	<i>Drepanorhynchus reichenowi</i>
417	Beautiful Sunbird	<i>Cinnyris pulchellus</i>
418	Shining Sunbird	<i>Cinnyris habessinicus</i>
419	Variable Sunbird	<i>Cinnyris venustus</i>
<b>Weavers and Allies: <i>Ploceidae</i></b>		
420	White-billed Buffalo-Weaver	<i>Bubalornis albirostris</i>
421	White-headed Buffalo-Weaver	<i>Dinemellia dinemelli</i>
422	Speckle-fronted Weaver	<i>Sporopipes frontalis</i>
423	White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>
424	Gray-headed Social-Weaver	<i>Pseudonigrita arnaudi</i>
425	Red-headed Weaver	<i>Anaplectes rubriceps</i>
426	Little Weaver	<i>Ploceus luteolus</i>
427	Spectacled Weaver	<i>Ploceus ocularis</i>
428	Northern Masked-Weaver	<i>Ploceus taeniopterus</i>
429	Lesser Masked-Weaver	<i>Ploceus intermedius</i>
430	Southern Masked-Weaver	<i>Ploceus velatus</i>
431	Vitelline Masked-Weaver	<i>Ploceus vitellinus</i>
432	Village Weaver	<i>Ploceus cucullatus</i>
433	Black-headed Weaver	<i>Ploceus melanocephalus</i>
434	Golden-backed Weaver	<i>Ploceus jacksoni</i>
435	Chestnut Weaver	<i>Ploceus rubiginosus</i>
436	Cardinal Quelea	<i>Quelea cardinalis</i>
437	Red-billed Quelea	<i>Quelea quelea</i>
438	Northern Red Bishop	<i>Euplectes franciscanus</i>
439	Yellow-crowned Bishop	<i>Euplectes afer</i>
440	Fire-fronted Bishop	<i>Euplectes diadematus</i>
441	White-winged Widowbird	<i>Euplectes albonotatus</i>
442	Fan-tailed Widowbird	<i>Euplectes axillaris</i>
<b>Waxbills and Allies: <i>Estrildidae</i></b>		
443	Crimson-rumped Waxbill	<i>Estrilda rhodopyga</i>
444	Common Waxbill	<i>Estrilda astrild</i>

445	Black-faced Waxbill	<i>Estrilda erythronotos</i>
446	Black-cheeked Waxbill	<i>Estrilda chamosyna</i>
447	Red-cheeked Cordonbleu	<i>Uraeginthus bengalus</i>
448	Blue-capped Cordonbleu	<i>Uraeginthus cyanocephalus</i>
449	Purple Grenadier	<i>Granatina ianthinogaster</i>
450	Green-winged Pytilia	<i>Pytilia melba</i>
451	Red-billed Firefinch	<i>Lagonosticta senegala</i>
452	African Firefinch	<i>Lagonosticta rubricata</i>
453	Cut-throat	<i>Amadina fasciata</i>
454	Quailfinch	<i>Ortygospiza atricollis</i>
455	Gray-headed Silverbill	<i>Odontospiza griseicapilla</i>
456	Bronze Mannikin	<i>Spermestes cucullata</i>
457	African Silverbill	<i>Euodice cantans</i>
<b>Indigobirds: Viduidae</b>		
458	Pin-tailed Whydah	<i>Vidua macroura</i>
459	Eastern Paradise-Whydah	<i>Vidua paradisaea</i>
460	Steel-blue Whydah	<i>Vidua hypocherina</i>
461	Straw-tailed Whydah	<i>Vidua fischeri</i>
462	Village Indigobird	<i>Vidua chalybeata</i>
463	Purple Indigobird	<i>Vidua purpurascens</i>
<b>Old World Sparrows: Passeridae</b>		
464	House Sparrow	<i>Passer domesticus</i>
465	Northern Gray-headed Sparrow	<i>Passer griseus</i>
466	Parrot-billed Sparrow	<i>Passer gongonensis</i>
467	Chestnut Sparrow	<i>Passer eminibey</i>
468	Yellow-spotted Bush Sparrow	<i>Gymnornis pyrgita</i>
<b>Wagtails and Pipits: Motacillidae</b>		
469	Western Yellow Wagtail	<i>Motacilla flava</i>
470	African Pied Wagtail	<i>Motacilla aguimp</i>
471	White Wagtail	<i>Motacilla alba</i>
472	African Pipit	<i>Anthus cinnamomeus</i>
473	Long-billed Pipit	<i>Anthus similis</i>
474	Tawny Pipit	<i>Anthus campestris</i>
475	Tree Pipit	<i>Anthus trivialis</i>
476	Red-throated Pipit	<i>Anthus cervinus</i>
477	Golden Pipit	<i>Tmetothylacus tenellus</i>
478	Rosy-throated Longclaw	<i>Macronyx ameliae</i>
<b>Finches, Euphonias, and Allies: Fringillidae</b>		
479	Yellow-fronted Canary	<i>Crithagra mozambicus</i>
480	African Citril	<i>Crithagra citrinelloides</i>
481	Black-throated Canary	<i>Crithagra atrogularis</i>

482	White-bellied Canary	<i>Crithagra dorsostriatus</i>
483	Northern Grosbeak-Canary	<i>Crithagra donaldsoni</i>
<b>Old World Buntings: <i>Emberizidae</i></b>		
484	Ortolan Bunting	<i>Emberiza hortulana</i>
485	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>
486	Golden-breasted Bunting	<i>Emberiza flaviventris</i>
487	Somali Bunting	<i>Emberiza poliopleura</i>

## ANNEX H. BIRDS OF ILLARIAK FOREST AND ITS ENVIRONS

No.	Common Name	Scientific Name
184.	Abyssinian White-eye	<i>Zosterops abyssinicus</i>
185.	African Pipit	<i>Anthus cinnamomeus</i>
186.	African Spoonbill	<i>Platalea alba</i>
187.	African Thrush	<i>Turdus pelios</i>
188.	African Dusky Flycatcher	<i>Muscicapa adusta</i>
189.	African Fish Eagle	<i>Haliaeetus vocifer</i>
190.	African Grey Flycatcher	<i>Melaenornis microrhynchus</i>
191.	African Grey Woodpecker	<i>Dendropicos goertae</i>
192.	African Paradise Flycatcher	<i>Terpsiphone viridis</i>
193.	African Pied Wagtail	<i>Motacilla aguimp</i>
194.	African Sacred Ibis	<i>Threskiornis aethiopicus</i>
195.	Amethyst Sunbird	<i>Chalcomitra amethystine</i>
196.	Anteater Chat	<i>Myrmecocichla aethiops</i>
197.	Arrow-marked Babbler	<i>Turdoides jardineii</i>
198.	Augur Buzzard	<i>Buteo augur</i>
199.	Baglafecht Weaver	<i>Ploceus baglafecht</i>
200.	Barn Swallow	<i>Hirundo rustica</i>
201.	Black Crake	<i>Zapornia flavirostra</i>
202.	Black Cuckooshrike	<i>Campephaga flava</i>
203.	Black Sparrowhawk	<i>Accipiter melanoleucus</i>
204.	Black Saw-wing	<i>Psalidoprocne pristoptera holomelas</i>
205.	Black-backed Puffback	<i>Dryoscopus cubla</i>
206.	Black-bellied Bustard	<i>Lissotis melanogaster</i>
207.	Black-chested Snake Eagle	<i>Circaetus pectoralis</i>
208.	Black-crowned Tchagra	<i>Tchagra senegalus</i>
209.	Black-headed Heron	<i>Ardea melanocephala</i>
210.	Black-headed Oriole	<i>Oriolus larvatus</i>
211.	Black-lored Babbler	<i>Turdoides sharpie</i>
212.	Blacksmith Lapwing	<i>Vanellus armatus</i>
213.	Black-winged Kite	<i>Elanus caeruleus</i>
214.	Blue-naped Mousebird	<i>Urocolius macrourus</i>
215.	Brimstone Canary	<i>Crithagra sulphurata</i>
216.	Bronzy Sunbird	<i>Nectarinia kilimensis</i>
217.	Brown Parisoma	<i>Curruca lugens</i>
218.	Brown-crowned Tchagra	<i>Tchagra australis</i>
219.	Brubru	<i>Nilaus afer</i>
220.	Cabanis's Greenbul	<i>Phyllastrephus cabanisi</i>
221.	Cape Robin-Chat	<i>Cossypha caffra</i>
222.	Cape Turtle Dove	<i>Streptopelia capicola</i>

223.	Chinspot Batis	<i>Batis molitor</i>
224.	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>
225.	Cinnamon-chested Bee-eater	<i>Merops oreobates</i>
226.	Collared Sunbird	<i>Hedydipna collaris</i>
227.	Common Bulbul	<i>Pycnonotus barbatus</i>
228.	Common Buzzard	<i>Buteo buteo</i>
229.	Common Cuckoo	<i>Cuculus canorus</i>
230.	Common Greenshank	<i>Tringa nebularia</i>
231.	Common Sandpiper	<i>Actitis hypoleucos</i>
232.	Common Swift	<i>Apus apus</i>
233.	Common Waxbill	<i>Estrilda astrild</i>
234.	Common Whitethroat	<i>Curruca communis</i>
235.	Common House Martin	<i>Delichon urbicum</i>
236.	Common Rock Thrush	<i>Monticola saxatilis</i>
237.	Crested Francolin	<i>Dendroperdix sephaena</i>
238.	Crowned Lapwing	<i>Vanellus coronatus</i>
239.	Crowned Eagle	<i>Stephanoaetus coronatus</i>
240.	Dark-capped Bulbul	<i>Pycnonotus tricolor</i>
241.	Denham's Bustard	<i>Neotis denhami</i>
242.	Dusky Turtle Dove	<i>Streptopelia lugens</i>
243.	Eastern Bronze-naped Pigeon	<i>Columba delegorguei</i>
244.	Egyptian Goose	<i>Alopochen aegyptiaca</i>
245.	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>
246.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
247.	Ethiopian Swallow	<i>Hirundo aethiopica</i>
248.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
249.	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
250.	European Bee-eater	<i>Merops apiaster</i>
251.	European Roller	<i>Coracias garrulus</i>
252.	Fan-tailed Raven	<i>Corvus rhipidurus</i>
253.	Fawn-colored Lark	<i>Calendulauda africanoides</i>
254.	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>
255.	Garden Warbler	<i>Sylvia borin</i>
256.	Golden-breasted Bunting	<i>Emberiza flaviventris</i>
257.	Greater Honeyguide	<i>Indicator indicator</i>
258.	Greater Kestrel	<i>Falco rupicoloides</i>
259.	Greater Blue-eared Starling	<i>Lamprotornis chalybaeus</i>
260.	Green Sandpiper	<i>Tringa ochropus</i>
261.	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>
262.	Grey Heron	<i>Ardea cinerea</i>
263.	Grey Cuckooshrike	<i>Ceblepyris caesius</i>
264.	Grey-backed Camaroptera	<i>Camaroptera brevicaudata</i>
265.	Grey-backed Fiscal	<i>Lanius excubitoroides</i>
266.	Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>
267.	Hadada Ibis	<i>Bostrychia hagedash</i>



268.	Hamerkop	<i>Scopus umbrette</i>
269.	Hartlaub's Turaco	<i>Tauraco hartlaubi</i>
270.	Helmeted Guineafowl	<i>Numida meleagris</i>
271.	Hildebrandt's Starling	<i>Lamprotornis hildebrandti</i>
272.	Isabelline Wheatear	<i>Oenanthe isabelline</i>
273.	Kenya Sparrow	<i>Passer rufocinctus</i>
274.	Kenya Yellow-rumped Seedeater	<i>Crithagra reichenowi</i>
275.	Lanner Falcon	<i>Falco biarmicus</i>
276.	Laughing Dove	<i>Streptopelia senegalensis</i>
277.	Lesser Kestrel	<i>Falco naumanni</i>
278.	Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>
279.	Lichtenstein's Sandgrouse	<i>Pterocles lichtensteinii</i>
280.	Lilac-breasted Roller	<i>Coracias caudatus</i>
281.	Little Bee-eater	<i>Merops pusillus</i>
282.	Little Grebe	<i>Tachybaptus ruficollis</i>
283.	Little Swift	<i>Apus affinis</i>
284.	Long-crested Eagle	<i>Lophaetus occipitalis</i>
285.	Long-tailed Widowbird	<i>Euplectes progne</i>
286.	Malachite Kingfisher	<i>Corythornis cristatus</i>
287.	Marico Sunbird	<i>Cinnyris mariquensis</i>
288.	Marsh Warbler	<i>Acrocephalus palustris</i>
289.	Meyer's Parrot	<i>Poicephalus meyeri</i>
290.	Montagu's Harrier	<i>Circus pygargus</i>
291.	Mottled Swift	<i>Tachymarptis aequatorialis</i>
292.	Namaqua Dove	<i>Oena capensis</i>
293.	Narina Trogon	<i>Apaloderma narina</i>
294.	Northern Crombec	<i>Sylvietta brachyura</i>
295.	Northern Fiscal	<i>Lanius humeralis</i>
296.	Northern Wheatear	<i>Oenanthe oenanthe</i>
297.	Northern Grey-headed Sparrow	<i>Passer griseus</i>
298.	Northern Yellow White-eye	<i>Zosterops senegalensis</i>
299.	Nubian Woodpecker	<i>Campethera nubica</i>
300.	Olive Thrush	<i>Turdus olivaceus</i>
301.	Orange-breasted Bushshrike	<i>Chlorophoneus sulfureopectus</i>
302.	Pallid Harrier	<i>Circus macrourus</i>
303.	Pied Crow	<i>Corvus albus</i>
304.	Pied Kingfisher	<i>Ceryle rudis</i>
305.	Pin-tailed Whydah	<i>Vidua macroura</i>
306.	Plain-backed Pipit	<i>Anthus leucophrys</i>
307.	Purple Grenadier	<i>Granatina ianthinogaster</i>
308.	Purple Roller	<i>Coracias naevius</i>
309.	Rattling Cisticola	<i>Cisticola chiniana</i>
310.	Red-backed Shrike	<i>Lanius collurio</i>
311.	Red-billed Teal	<i>Anas erythrorhyncha</i>
312.	Red-capped Lark	<i>Calandrella cinerea</i>

313.	Red-cheeked Cordonbleu	<i>Uraeginthus bengalus</i>
314.	Red-eyed Dove	<i>Streptopelia semitorquata</i>
315.	Red-faced Crombec	<i>Sylvietta whytii</i>
316.	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>
317.	Red-headed Weaver	<i>Anaplectes rubriceps</i>
318.	Red-throated Pipit	<i>Anthus cervinus</i>
319.	Red-winged Starling	<i>Onychognathus morio</i>
320.	Reed Cormorant	<i>Microcarbo africanus</i>
321.	Rock Martin	<i>Ptyonoprogne fuligula</i>
322.	Rueppell's Robin-Chat	<i>Cossypha semirufa</i>
323.	Rufous Chatterer	<i>Argya rubiginosa</i>
324.	Rufous-naped Lark	<i>Mirafrapa africana</i>
325.	Ruppell's Starling	<i>Lamprotornis purpuroptera</i>
326.	Scaly-throated Honeyguide	<i>Indicator variegatus</i>
327.	Scarlet-chested Sunbird	<i>Chalcomitra senegalensis</i>
328.	Secretarybird	<i>Sagittarius serpentarius</i>
329.	Slate-colored Boubou	<i>Laniarius funebris</i>
330.	Southern Black Flycatcher	<i>Melaenornis pammellina</i>
331.	Speckled Mousebird	<i>Colius striatus</i>
332.	Speke's Weaver	<i>Ploceus spekei</i>
333.	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>
334.	Spotted Flycatcher	<i>Muscicapa striata</i>
335.	Spotted Thick-knee	<i>Burhinus capensis</i>
336.	Streaky Seedeater	<i>Crithagra striolata</i>
337.	Striated Heron	<i>Butorides striata</i>
338.	Superb Starling	<i>Lamprotornis superbus</i>
339.	Tambourine Dove	<i>Turtur tympanistra</i>
340.	Tawny-flanked Prinia	<i>Prinia subflava</i>
341.	Thrush Nightingale	<i>Luscinia Luscinia</i>
342.	Tree Pipit	<i>Anthus trivialis</i>
343.	Trumpeter Hornbill	<i>Bycanistes buccinator</i>
344.	Tullberg's Woodpecker	<i>Campethera tullbergi</i>
345.	Variable Sunbird	<i>Cinnyris venustus</i>
346.	Verreaux's Eagle-Owl	<i>Bubo lacteus</i>
347.	Wailing Cisticola	<i>Cisticola lais</i>
348.	Western Cattle Egret	<i>Bubulcus ibis</i>
349.	Western Marsh Harrier	<i>Circus aeruginosus</i>
350.	Whinchat	<i>Saxicola rubetra</i>
351.	White Stork	<i>Ciconia Ciconia</i>
352.	White-bellied Bustard	<i>Eupodotis senegalensis</i>
353.	White-bellied Go-away-bird	<i>Crinifer leucogaster</i>
354.	White-bellied Tit	<i>Melaniparus albiventris</i>
355.	White-breasted Cormorant	<i>Phalacrocorax lucidus</i>
356.	White-browed Coucal	<i>Centropus superciliosus</i>
357.	White-browed Robin-Chat	<i>Cossypha heuglini</i>

358.	White-eyed Slaty Flycatcher	<i>Melaenornis fischeri</i>
359.	Willow Warbler	<i>Phylloscopus trochilus</i>
360.	Wood Sandpiper	<i>Tringa glareola</i>
361.	Woolly-necked Stork	<i>Ciconia episcopus</i>
362.	Yellow Bishop	<i>Euplectes capensis</i>
363.	Yellow-breasted Apalis	<i>Apalis flava</i>
364.	Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>
365.	Yellow-throated Longclaw	<i>Macronyx croceus</i>
366.	Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>

**Source: QC Pass /EMC Consultants**

## ANNEX I. AMBIENT ENVIRONMENTAL MEASUREMENTS

### Air Emission Measurements

Location	Proxy	PM10 ( $\mu\text{g}/\text{m}^3$ )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	21	50 $\mu\text{g}/\text{m}^3$ 24hrs	50 $\mu\text{g}/\text{m}^3$ 24hrs
Kimalel Day and Boarding School	MP2	39		
Patakwanin Primary School	MP3	26		
Ol'ngarua Village	MP4	53		
Gatundia Village	MP5	28		

### Weather Conditions

Sunlight	Sunny
Precipitation	None
Wind	Still
Temperature	30°C
Cloud Cover	Sparse
Date	28th August 2019
Duration of Measurements	1 hour

### Ambient Air Emission: Air Quality Data – Sulphur Dioxide, SO<sub>2</sub>

Location	Proxy	SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	<8.1	20 $\mu\text{g}/\text{m}^3$ 24hrs	80 $\mu\text{g}/\text{m}^3$ 24hrs
Kimalel Day and Boarding School	MP2	<8.1		
Patakwanin Primary School	MP3	<8.1		
Ol'ngarua Village	MP4	<8.1		
Gatundia Village	MP5	<8.1		

### Weather Conditions

Sunlight	Sunny
Precipitation	None

Wind	Still
Temperature	30°C
Cloud Cover	Sparse
Date	28th August 2019
Duration of Measurements	1hour

#### Ambient Air Emission: Air Quality Data – Nitrogen Dioxide

Location	Proxy	NO <sub>2</sub> (µg/m <sup>3</sup> )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	16	40 µg/m <sup>3</sup> Annual 200 µg/m <sup>3</sup> 1hr average	80 µg/m <sup>3</sup> 24hrs
Kimalel Day and Boarding School	MP2	20		
Patakwani Primary School	MP3	23		
Ol'ngarua Village	MP4	20		
Gatundia Village	MP5	22		

#### Weather Conditions

Sunlight	Sunny
Precipitation	None
Wind	Still
Temperature	30 Degrees Celcius
Date	28 <sup>TH</sup> August 2018
Duration of Measurements	1hour

#### Ambient Noise Emission Measurements

##### Ambient Noise Level

Location	Proxy	LA Eq	LA Max	LA Min
Cheplogoi Siri Medical Clinic	MP1	42.1	48.1	40.8
Kimalel Day and Boarding School	MP2	36.4	41.7	40.3
Patakwani Primary School	MP3	31.0	35.0	30.2
Ol'ngarua Village	MP4	35.1	42.0	34.5
Gatundia Village	MP5	47.2	52.1	50.3

#### Weather Conditions

Sunlight	Sunny
Precipitation	None
Wind	Still

Temperature	30 °C
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#### Air Emission

Location	Proxy	PM10 ( $\mu\text{g}/\text{m}^3$ )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	21	50 $\mu\text{g}/\text{m}^3$ 24hrs	50 $\mu\text{g}/\text{m}^3$ 24hrs
Kimalel Day and Boarding School	MP2	39		
Patakwani Primary School	MP3	26		
Ol'ngarua Village	MP4	53		
Gatundia Village	MP5	28		

Source: EMC Consultants field data

#### Weather Conditions

Sunlight	Sunny
Precipitation	None
Wind	Still
Temperature	30 Degrees Celcius
Cloud Cover	Sparse
Date	28th August 2019
Duration of Measurements	1hour

Source: EMC Consultants Field Data

#### Ambient Air Emission: Air Quality Data – Sulphur Dioxide, SO<sub>2</sub>

Location	Proxy	SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	<8.1	20 $\mu\text{g}/\text{m}^3$ 24hrs	80 $\mu\text{g}/\text{m}^3$ 24hrs
Kimalel Day and Boarding School	MP2	<8.1		
Patakwani Primary School	MP3	<8.1		
Ol'ngarua Village	MP4	<8.1		
Gatundia Village	MP5	<8.1		

Source: EMC Consultants Field Data

#### Weather Conditions

Sunlight	Sunny
Precipitation	None

Wind	Still
Temperature	30 Degrees Celcius
Cloud Cover	Sparse
Date	28 <sup>TH</sup> August 2019
Duration of Measurements	1hour

**Source: EMC Consultants Field Data**

**Ambient Air Emission: Air Quality Data – Nitrogen Dioxide**

Location	Proxy	NO <sub>2</sub> (µg/m <sup>3</sup> )	WHO AQG	EMCA (Air Qual. Reg. 2014)
Cheplogoi Siri Medical Clinic	MP1	16	40 µg/m <sup>3</sup> Annual 200 µg/m <sup>3</sup> 1hr average	80 µg/m <sup>3</sup> 24hrs
Kimalel Day and Boarding School	MP2	20		
Patakwanin Primary School	MP3	23		
Ol'ngarua Village	MP4	20		
Gatundia Village	MP5	22		

**Source: EMC Consultants Field data**

**Weather Conditions**

Sunlight	Sunny
Precipitation	None
Wind	Still
Temperature	30 Degrees Celcius
Date	28 <sup>TH</sup> August 2019
Duration of Measurements	1hour

**Source: EMC Consultants Field Data**

**Ambient Noise Level**

Location	Proxy	LAEq	LA Max	LA Min
Cheplogoi Siri Medical Clinic	MP1	42.1	48.1	40.8
Kimalel Day and Boarding School	MP2	36.4	41.7	40.3
Patakwanin Primary School	MP3	31.0	35.0	30.2
Ol'ngarua Village	MP4	35.1	42.0	34.5
Gatundia Village	MP5	47.2	52.1	50.3

**Source: EMC Consultants Field data**

**Weather conditions**

Sunlight	Sunny
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Precipitation	None
Wind	Still
Temperature	30 Degrees Celsius
Date	28th August 2019
Duration of Measurements	1 hour

**Source: EMC Consultants Field Data**

## ANNEX J.

## AIR EMISSION CALIBRATION REPORT

## Calibrate report

Product	Air Quality Monitor System	Model	AQM-09
Quantity	1pcs	Cali date	June ,25, 2021
Product No.	OC20210624615600		
Appearance	<input checked="" type="checkbox"/> Clean <input checked="" type="checkbox"/> Non corrosive <input checked="" type="checkbox"/> No damage		
Gas type	H2S: ppm      SO <sub>2</sub> :ppb      NO <sub>2</sub> :ppb      O <sub>3</sub> :ppb      TVOC:ppm PM2.5:ug/m <sup>3</sup> PM10:ug/m <sup>3</sup> TSP:ug/m <sup>3</sup> Temperature and humidity: °C/%RH		
Accuracy	± 3%F.S		
resolution	0.1ppm    1ppb    1ug/m <sup>3</sup>		
Response time	≤ 30S		
Survey range	H2S:0-100ppm      NO <sub>2</sub> :0-2000ppb      SO <sub>2</sub> :0-2000ppb O <sub>3</sub> :0-2000ppb      TVOC:0-50ppm PM2.5:0-1000ug/m <sup>3</sup> PM10:0-1000ug/m <sup>3</sup> TSP:0-1000ug/m <sup>3</sup> Temperature: -20-50°C      Humidity:0%-100%RH		
Signal output mode	4G LTE		
Power supply voltage	AC 240V/50Hz		
Power dissipation	≤ 30W		
Working temperature and humidity range	-20°C-50°C / 0%RH-100%RH		
Testing condition indoor	Temperature: 25°C    Humidity: 60%RH		
Calibration gas	NO <sub>2</sub> SO <sub>2</sub> O <sub>3</sub> TVOC    H <sub>2</sub> S		
Cali gas test	1.H <sub>2</sub> S: Cali gas concentration: <u>100</u> ppm      Inspect concentration: <u>98.2</u> ppm 2.NO <sub>2</sub> : Cali gas concentration: <u>1000</u> ppb      Inspect concentration: <u>997</u> ppb 3.SO <sub>2</sub> : Cali gas concentration: <u>1000</u> ppb      Inspect concentration: <u>998</u> ppb 4.O <sub>3</sub> : Cali gas concentration: <u>1000</u> ppb      Inspect concentration: <u>996</u> ppb 5.TVOC: Cali gas concentration: <u>50</u> ppm      Inspect concentration: <u>49.3</u> ppm 6.PM2.5:Measured value: <u>42</u> ug/m <sup>3</sup> PM10:Measured value: <u>47</u> ug/m <sup>3</sup> TSP:Measured value: <u>52</u> ug/m <sup>3</sup> 7.Temperature: Measured value: <u>25.4</u> °C      Humidity:Measured value: <u>51</u> %RH		
Test result	Qualified		
Remark			

Check:



Approval:



Tester:



Company: Henan Oceanus Import &amp; Export Co., Ltd.

Date: June,25, 2021

## **ANNEX K. GRIEVANCE MANAGEMENT**

Grievance redressal is a critical component of effective ESMP implementation. The purpose of GRM is to provide a forum to the internal and external stakeholders to voice their concerns, queries, and issues with the project. Such a mechanism would provide the stakeholders with one project personnel or one channel through which their queries will be channeled and will ensure timely responses to each query. This will allow for trust to be built amongst the stakeholders and prevent the culmination of small issues into major community unrest. The GRM will be accessible and understandable for all stakeholders in the project and for the entire project life. The GRM will be communicated to all relevant stakeholders and will also be applicable for any contractor that will occupy and/or use land during the construction and operations phase.

AfDB standards require Grievance Mechanisms to provide a structured way of receiving and resolving grievances. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities and is at no cost (except legal redress through courts) and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders.

The mechanism must not impede access to other judicial or administrative remedies. This section contains the following:

Grievance definition and categories and GRM principles; and

The process of receiving, documenting, addressing, and closing grievances.

### **GRIEVANCE DEFINITION/CATEGORIES**

As stated earlier, a grievance is a concern or complaint raised by an individual or a group within communities affected by company operations. Both concerns and complaints can result from either real or perceived impacts of a company's operations and may be filed in the same manner and handled with the same procedure. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts or perceived impacts. Based on the understanding of the project area and the stakeholders, an indicative list of the types of grievances have been identified for the project, as can be seen below: -

#### **I. Internal Grievances:**

Grievances from Employees (including both direct and indirect employees, including local workers and migrant workers through contractors):

Complaints pertaining to amount of wage, salary, other remuneration or benefits as per Company's Human Resource policy;

Gender discrimination;

Workplace Sexual harassment;

Violence against children e.g., child labour.

Issues related to workers organization;

Labour Accommodation;

Health and Safety issues; and

Extended working hours.

II. **External Grievances:**

- Grievances from community members:
- Issues related to sexual exploitation and abuse by project workers against community members;
- Issues related to gender-based violence at the community-level e.g., domestic violence;
- Issues related to child labour and protection;
- Issues related to transportation and traffic;
- Increase in environment pollution;
- Impact on community health;
- Disturbances to locals due to influx of migrant workers in the area;
- Issues arising out of sharing of employment and business opportunity; and
- Concerns over the impact on local cultures and customs.

The list of grievances will be regularly updated as and when the new one arises.

**Internal Grievance Mechanism**

During consultations, it was revealed that the client will hire a Community Liaison Officer (CLO) who will serve to meet all community liaison responsibilities. The KETRACO Socioeconomist will assist the contractor social specialist in grievances management, (the bidding documents will reflect these requirements). The grievance mechanism will be advertised and announced to affected stakeholders so that they are aware of their rights to submit comments and how to go about it. The grievance mechanism will be founded on the following principles:

Responsibilities will be adequately assigned: A responsible person or team will be constituted and mandated to organise the resolution of grievances. This will enable the system run without undue impediments.

The process will be accorded due importance: It is important for affected communities and other stakeholder groups seeking to have their complaints resolved, to perceive the grievance management process as transparent and fair. The KETRACO grievance management process will enhance outcomes and give people satisfaction that their complaints have been heard, even if the outcome is less than optimal.

The grievance procedures will be readily understandable, accessible, and culturally appropriated by the local population. From the outset, clarification will be made on who is expected to use this procedure. The people will be assured that there will be neither costs nor retribution associated with lodging a grievance. The entire process (from how a complaint is received and reviewed, through to how decisions are made and what possibilities may exist for appeal) will be made as transparent as possible through good communication.

The Mechanism will be scaled as needed for the Project: The KETRACO grievance mechanisms will be designed to fit the context and needs of the project. As much as possible, it will have relatively simple means of addressing complaints, such as through community meetings, community liaison personnel and suggestion boxes allowing for anonymity. It

may also need a more formalized process and mechanism, and a higher level of dedicated resources for receiving, recording, tracking, and resolving complaints. The grievance mechanisms will not be taken as a substitute for community engagement process or vice-versa. The two are complementary and will be made mutually reinforcing. Not all grievances shall be handled in the same way. KETRACO will consider creating different levels of redress within the grievance mechanism that correspond to the scale and seriousness of the complaint.

The process will be documented and publicized: The process will be put in writing and publicized. KETRACO recognizes that the GRM cannot be effective if nobody knows about it. Thus, the grievance procedures will be put into writing, publicized, and explained to relevant stakeholder groups. The people will be informed on where to go and whom to talk to if they have a complaint and understand what the process will be for handling it. As with all information, it will be provided in a format and language readily understandable to the local population and/or communicated orally where it's established that literacy levels are low. It will not be overly complicated to use nor will it require legal counsel to complete. The process will be made accessible: Projects that make it easy for people to raise concerns and feel confident that these will be heard and acted upon can reap the benefits of both a good reputation and better community relations. One of the best ways to achieve this is to localize your points of contact. Hire people with the right skills, training, and disposition for community liaison work and get them into the field as quickly as possible. Maintaining a regular presence in the local communities greatly helps to personalize the relationship with the company and engender trust. Talking with a familiar face who comes to the village regularly, or lives nearby, creates an informal atmosphere in which grievances can be aired and sorted out, or referred up the chain of command. This is usually more convenient and less intimidating to people than having to travel distances to the company offices during business hours to file a formal complaint.

Response time will be defined, and transparency upheld: KETRACO will publicly commit to a certain time frame in which all recorded complaints will be responded to and ensure this response time is enforced. This will help allay frustration by letting people know when they can expect to be contacted by KETRACO personnel and/or receive a response to their complaint. Combining this with a transparent process by which stakeholders can understand how decisions are reached will inspire confidence in the KETRACO system. During critical times such as construction, there will be immediate responses to time-sensitive complaints. A related issue is making sure that the community liaison officer has the authority to resolve basic complaints herself, as well as a direct reporting line to senior managers if the issue is more serious or costly to address.

Good record-keeping and feedback: a grievance logbook will be kept where necessary, and a sophisticated database will be maintained where required. Written records of all complaints will be kept as this is critical for effective grievance management. The record shall contain the name of the individual or organization; the date and nature of the complaint; any follow-up actions taken; the final result; and how and when this decision was communicated to the complainant. Overly personal data such as national identity and phone numbers will be optional and kept confidential unless required to disclose to

authorities. In addition to informing the complainant of the outcome (in writing where appropriate), as part of the broader community engagement process KETRACO will report back periodically to communities and other stakeholder groups as to how the company has been responding to the grievances it has received.

There will be a separate reporting and documentation mechanisms for GBV (SEA and SH) cases that are discrete and anonymous. The KETRACO Community Liaison Officer (CLO) will support the Social Specialist to establish the system to handle these complaints that will include reference to confidentiality, safety, and survivor-centred approach. All registration of the data will be confidential and anonymized. KETRACO will recruit a CLO with experience in community engagement and liaison as well as GBV-SEA/SH management. The CLO will assist KETRACO's social specialist in GBV-SEA/SH management.

Access to legal remedies will not be impeded: If the project is unable to resolve a complaint, it may be appropriate to enable complainants to have recourse to external experts. These may include public defenders, legal advisors, or NGOs. The client may find that it can work in collaboration with these third parties and affected communities to find successful resolution of the issues. However, this is not always possible, and situations may arise where complainants will choose to pursue legal recourse. In this case, KETRACO will not impede access to these mechanisms.

#### Sample Grievance Recording Form

<b>GRIEVANCE REGISTRATION</b>	
<b>CASE No.</b>	<b>DATE</b>
Name	
Department/Contractor Name	
Phone Number	
Details of Grievance	
Name of Person Recording Grievance	
Designation of Person Recording Grievance	
Proposed Date of Response to Grievance	
Signature of Recording Person	Signature of Complainant
<b>GRIEVANCE REDRESS RESPONSE</b>	
<b>Date of Redress</b>	

### Decision of CLO (Give full details)

Source: EMC Consultants, 2019

### Maintaining a Grievance Register

Each grievance thus received, shall be recorded in a grievance register. The format for the grievance register shall be as follows.

Table 107: Sample Grievance Recording Form

Date	GR #	Name of Grievant	Ward/Village	Grievance Details	Concerned Department	Name of Recording Person	Present Status	Remarks

Source: EMC Consultants, 2019

This grievance register shall be updated at each stage of the grievance redressal. Once the grievance is recorded in the register, a preliminary analysis shall be undertaken by the Community Liaison Officers for KETRACO and contractors to ensure that the grievance is within the scope of the GRM.

### EXTERNAL GRIEVANCE MECHANISM

The process to be followed for the redressal of the external stakeholder grievances is summarized below



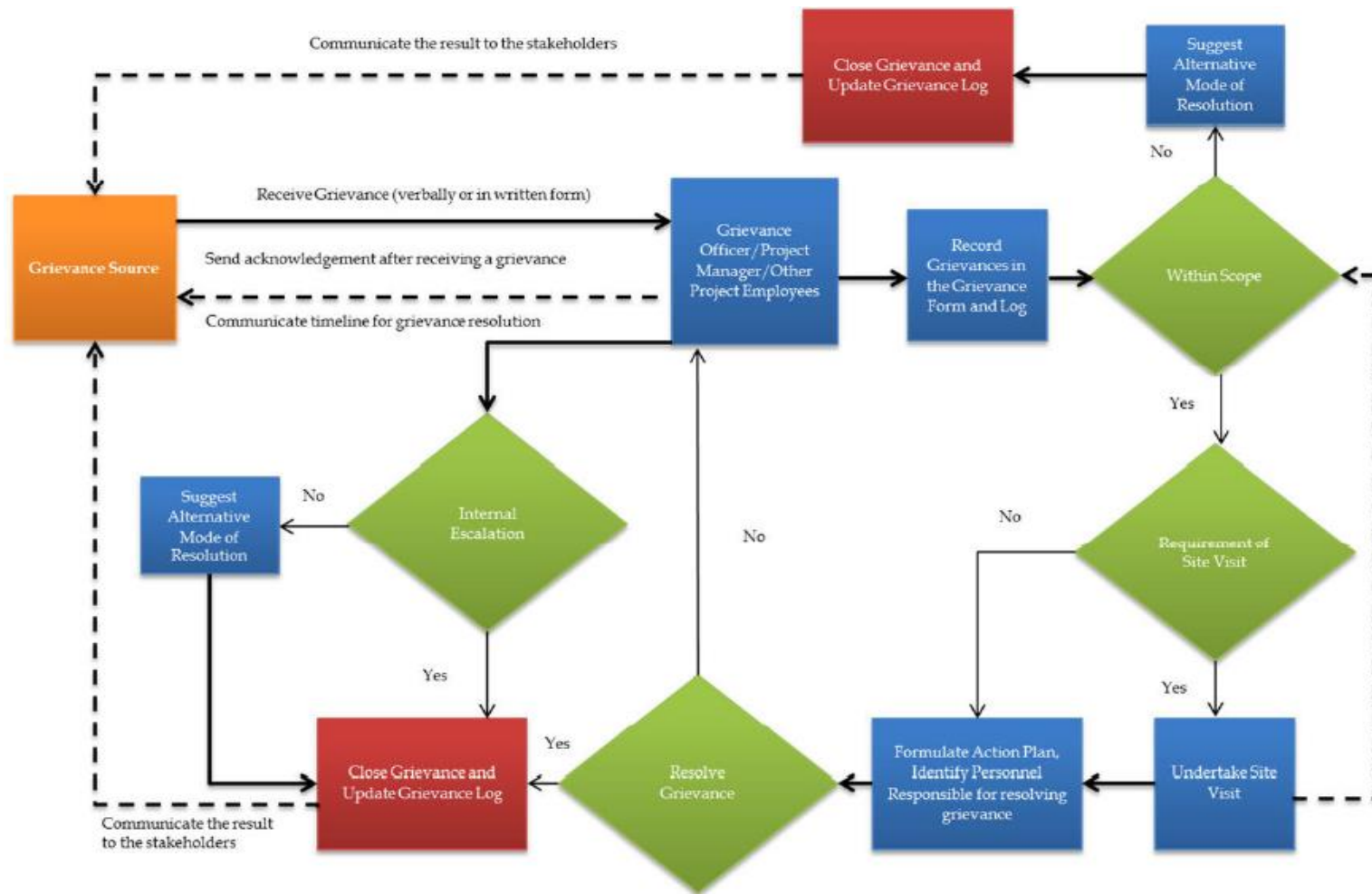


Figure 0-68: GRM Steps  
Source: EMC Consultants, 2019

### **Publicizing and Disclosure of the GRM**

The GRM and other project-specific management plans will be disclosed to PAPs in culturally appropriate languages, formats, and techniques (e.g., FGDs, public barazas etc.) and considering any disability, mobility and literacy challenges in a timeframe that ensures meaningful consultations.

### **Receiving and Recording Grievances**

As part of the GRM, the grievances from the stakeholder or their representatives may be communicated verbally (in person or over a telephonic conversation) or in written form (in the format given below) to the project representatives or to the CLO directly. If the grievance is received directly by the CLO or other project representatives, it will be recorded directly into the Grievance Form as soon as the personnel return to site. A sample grievance form is as follows.

Sample Grievance Recording Form

<b>GRIEVANCE REGISTRATION</b>	
<b>CASE No.</b>	<b>DATE</b>
Name	
Department/Contractor Name	
Phone Number	
Details of Grievance	
Name of Person Recording Grievance	
Designation of Person Recording Grievance	
Proposed Date of Response to Grievance	
Signature of Recording Person	Signature of Complainant
<b>GRIEVANCE REDRESSAL RESPONSE</b>	
<b>Date of Redress</b>	
<b>Decision of CLO (Give full details)</b>	

Source: EMC Consultants, 2019

All project staff and community members will be informed that they must pass all grievances, communications to the CLOs on site as soon as possible after they are received. Details of the person lodging the grievance shall be noted and passed along with the grievance. The CLO in turn will communicate all grievances to the Environmental and Social Officers for the contractor or KETRACO. For assisting the communication of grievances, a register will be maintained at the project office at which any individual/group

can come have their complaint registered. Village leaders and government departments will also be advised to pass any complaints they receive to the site level community liaison officer.

### **Maintaining a Grievance Register**

Each grievance thus received, shall be recorded in a grievance register. This grievance register shall be updated at each stage of the grievance redressal. Once the grievance is recorded in the register, a preliminary analysis shall be undertaken by the social officer to ensure that the grievance is within the scope of the GRM.

### **Acknowledgment of Grievance**

Upon the completion of the recording of the grievance, the stakeholder will be provided with an acknowledgment of the receipt, along with a summary of the grievance.

### **Box 10.1 Sample Acknowledgement Receipt for Claimant**

This receipt is acknowledgement of grievance registration by _____, resident of village _____ on date _____ His case number is _____ and the date for response is _____  <b>Full name &amp; signature of recording person</b> _____
--

In case the grievance is assessed to be out of the scope of the GRM, a communication towards the same shall be made to the grievant, and an alternative mode of redressal shall be suggested.

### **Site Inspection and Resolution**

For the purpose of verifying and resolving the grievances received, site inspection may not be required in all the cases. Depending upon the sensitivity of the issue, requirement of a site inspection will be identified.

A site inspection will be undertaken by the site level community liaison officers or the project member assigned by the contractor's Environment and Social officer. The purpose of the site inspection will be to check the validity and severity of the grievance.

For this purpose, the personnel may also undertake discussions with the concerned external stakeholder. The inspection will be undertaken within ten days of receiving the grievance. The assigned individual will then work with other relevant members of the Project team to investigate the problem and identify measures to resolve the grievance as appropriate. The personnel to be involved in the grievance resolution shall be dependent upon the nature of the grievance.

### **Resolution, Escalation, and Closure**

Based on the understanding thus developed, the CLO, in consultation with the concerned departments, shall identify a suitable resolution to the issue. This could involve provision of information to clarify the situation, undertaking measures to remedy actual problems or compensate for any damage that has been caused either by financial compensation or compensation in-kind, and introduction of mitigation measures to prevent recurrence of the problem in the future. This resolution shall be accordingly communicated to the grievant within 10 working days of completing the site investigation.

### **Update of Records**

The records of the grievance register shall be updated every working week with the present status of the grievance. Once the grievance is resolved, and the same has been communicated to the grievant, the grievance shall be closed in the grievance register. The grievance register should also provide an understanding of the manner in which the grievance was resolved. These instances shall then serve as references for any future grievances of similar nature.

### **GBV (SEA/SH) GRM**

There will be a separate survivor focused reporting and documentation mechanisms for GBV (SEA and SH) cases that are discrete from the standard GRM, that will be utilized by survivors or their representatives, to ensure all GBV cases are reported and handled confidentially. PAPs and all workers/staff will be made aware of these mechanisms through awareness sessions and staff inductions respectively. KETRACO's and Contractor's CLOs, supported by the KETRACO and contractors' Social Expert will be the focal points and will establish the system to handle these complaints that will include reference to confidentiality, safety, and survivor-centered approach. All registration of the data will be confidential and anonymized.

### **GRM Monitoring and Implementation**

It is important to monitor GRM to ensure that the grievances are addressed and resolved. The monitoring of the GRM implementation will be undertaken on a monthly basis by the KETRACO team. Monitoring will include:

Auditing the implementation of the GRM;

Monitoring the formal and informal consultation activities conducted with the stakeholder groups with respect to GRM;

Tracking feedback received from engagement activities;

Recording and tracking commitments made to communities; and

Assessing the efficacy of the engagement activities in terms of the desired outcomes and the participation of the stakeholder groups.

### **GRM Reporting**

The performance of the GRM will be reviewed on a quarterly basis during the implementation period. For the purpose of review, the quarterly reports will be considered for analysis and discussion. Based on these reports, a Grievance Redressal Report will be prepared.

## African Development Bank Grievances Redress Mechanism

An individual, a community of persons, an organization, association, society or other grouping of individuals) and/or by a qualified representative of the affected persons can seek the bank's assistance when they feel that the project is adversely impacting on their environment and social well-being. The bank has a system of addressing aggrieved person's issues and ensures that issues of non-compliance are addressed thereby protecting the people's rights and interests

A request for compliance review/problem solving should have the following information:

- A reference to the project, stating all the relevant facts including the harm suffered by or threat to the affected parties;
- How the parties have been or are likely to be materially and adversely affected by the Bank Group's act or omission, and what rights or interests of the parties were directly affected;
- When requesting a compliance review, an explanation of how Bank Group policies, procedures or contractual documents were violated;
- An indication if there has been any previous communication between the affected parties and the Bank Group concerning the issue (s) raised in the request;
- In the case of requests relating to matters previously submitted to the BCRM, a statement specifying what new evidence or changed circumstances justify revisiting the issue; and
- If some of the above information cannot be provided, an explanation should be included.

In addition to this, documents that need to be attached to the request include:

- Relevant correspondence with Bank Group staff, if any;
- A description of the location of the affected parties or area affected by the project; and
- Any other evidence supporting the request.

If some of the information listed above cannot be provided, an explanation should be included in the request.

There is however no specific format required for the request. The requestor is free to submit their requests orally or through writing with the help of BCRM. For request submitted in writing, they should be dated and signed by the requestor. They should also provide their names, contact addresses and an address to which correspondence shall be sent (if different from the Requestors' address (es)). The Requestors and any other interested persons may, however, request that their identities be kept confidential, and if so, the reasons for such confidentiality. Requests must be sent to the Director of the **Compliance Review and Mediation Unit (BCRM)**, African Development Bank Group (AfDB) through:

Compliance	Review	and	Mediation	Unit	(CRMU)	-	AfDB
BP	1387		Abidjan	01,	Cote		d'Ivoire
Immeuble du Centre de Commerce International d'Abidjan (CCIA) - Avenue Jean Paul II  ,							Floor
14 <sup>th</sup>							
BCRM_info@afdb.org(link				sends			e-mail)
Tel: +225 27 20 26 20 56 (CRMU Front Office)							

### **Other Administrative Grievance Redress Mechanism**

Kenya has in place institutions a justice system that provide grievance redress on environmental and land issues (including bio-physical and socio-economic) for which PAPs and stakeholders have a right to access at their own costs and at any time even without going through the internal, external GRM described in section 10.1.1 and 10.2 including World Bank GRM as described in 10.3.1 and 10.3.2. These include: -

#### **1. Environment and Land Court**

A superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land.

#### **2. Land Acquisition Tribunal (The Tribunal)**

A court of law that hears disputes related to the compulsory land acquisition process and in determining such disputes, confirm, vary, or quash the decision of the NLC. Tribunal has first instance jurisdiction to hear such disputes with the Environment and Land Court (ELC) exercising appellate jurisdiction.

#### **3. Commission on Administrative Justice**

The Commission on Administrative Justice (Ombudsman Office) is the formal feedback and complaints handling mechanism in Kenya. Its mandate is to receive and address complaints against public officers and public institutions to improve service delivery.

#### **4. National Environmental Tribunal**

The National Environmental Tribunal is a quasi-judicial tribunal established pursuant to the provisions of the Environmental Management and Co-ordination Act Cap 387 (EMCA). Its mandate generally is to hear any disputes regarding the exercise of power by the National Environmental Management Authority (NEMA).

#### **5. National Environmental Complaints Committee**

The National Environmental Complaints Committee (NECC) was established under Section 31 of the Environmental Management and Co-ordination Act Cap 387. It was formerly known as the Public Complaints Committee (PCC) but its name changed in the EMCA Cap 387. It is an important institution in the assessment of the condition of the environment in Kenya. It plays an important role in the facilitation of alternative dispute resolution mechanisms relating to environmental matters.



## ANNEX L. KCAA APPROVAL



## KENYA CIVIL AVIATION AUTHORITY

KCAA/OPS/2406/2 VOL.8 (13)

06 July 2021

**FCPA Fernandez Barasa**

Managing Director,  
Kenya Electricity Transmission Co. Ltd,  
Kawi Complex, South C  
P.O. BOX 34942-00100

**NAIROBI**

Dear *MD*,

### INSPECTION AND APPROVAL OF HEIGHTS FOR SEVERAL NEW TRANSMISSION LINE TOWERS.

Reference is made to your letter Ref: KETRACO/4/WA/3/3/MW/dk dated 26 January 2021 as well as subsequent emails on the above mentioned subject.

Kenya Civil Aviation Authority has analyzed the proposed transmission lines routing and height for the wayleave in order to ensure safety of aircraft operations within the Kenyan Airspace.

Height approval is hereby granted for **FIVE (5)** transmission lines as tabulated below:

NO.	LINE NAME	ANGLE POINT	COORDINATES IN WGS-84		REQUESTED HEIGHT (M)	APPROVED HEIGHT (M)	REMARKS
			LATITUDE	LONGITUDE			
1.	Menengai-Olkalau-Rumuruti Transmission Line	AP1	0°11'56.19"S	36° 3'21.21"E	40	40	Nil
		AP2	0°10'34.24"S	36° 6'32.74"E	40	40	Nil
		AP3	0°10'40.23"S	36° 6'47.24"E	40	40	Nil
		AP4	0°11'10.36"S	36° 7'2.23"E	40	40	Nil
		AP5	0°11'41.29"S	36° 7'19.87"E	40	40	Nil
		AP6	0°12'14.61"S	36° 7'55.08"E	40	40	Nil
		AP7	0°12'38.82"S	36° 8'31.85"E	40	40	Nil
		AP8	0°12'34.30"S	36° 9'32.09"E	40	40	Nil
		AP9	0°12'3.05"S	36°10'24.21"E	40	40	Nil
		AP10	0°11'49.93"S	36°10'33.59"E	40	40	Nil
		AP11	0°11'37.82"S	36°11'7.09"E	40	40	Nil

Aviation House, JKIA  
P.O. Box 30163-00100 GPO Nairobi  
Tel: +254 020 6827470 - 5, +254 734 000 491/492, +254 728 606 586/70, +254 709 725 000  
Fax: +254 020 6827 808, 6822 300

Website: [www.kcaa.or.ke](http://www.kcaa.or.ke)  
Email: [info@kcaa.or.ke](mailto:info@kcaa.or.ke)



	AP12	0°10'50.31"S	36°12'43.62"E	40	40	Nil
	AP13	0°10'26.60"S	36°13'26.21"E	40	40	Nil
	AP14	0°10'13.97"S	36°13'56.26"E	40	40	Nil
	AP15	0°10'5.61"S	36°14'7.13"E	40	40	Nil
	AP16	0°10'1.86"S	36°14'15.22"E	40	40	Nil
	AP17	0°10'1.54"S	36°14'23.08"E	40	40	Nil
	AP18	0° 9'52.67"S	36°14'42.63"E	40	40	Nil
	AP19	0° 9'41.69"S	36°14'51.42"E	40	40	Nil
	AP20	0° 9'40.71"S	36°15'22.49"E	40	40	Nil
	AP21	0° 9'6.17"S	36°16'21.01"E	40	40	Nil
	AP22	0° 9'2.16"S	36°16'41.47"E	40	40	Nil
	AP23	0° 8'48.96"S	36°17'14.11"E	40	40	Nil
	AP24	0° 8'12.63"S	36°18'10.83"E	40	40	Nil
	AP25	0° 7'54.59"S	36°18'51.06"E	40	40	Nil
	AP26	0° 7'55.43"S	36°19'10.88"E	40	40	Nil
	AP27	0° 8'0.41"S	36°19'40.67"E	40	40	Nil
	AP28	0° 7'59.14"S	36°20'22.65"E	40	40	Nil
	AP29	0° 8'8.45"S	36°21'1.04"E	40	40	Nil
	AP30	0° 8'7.51"S	36°21'13.47"E	40	40	Nil
	AP31	0° 7'39.63"S	36°21'29.32"E	40	40	Nil
	AP32	0° 7'21.57"S	36°21'50.49"E	40	40	Nil
	AP33	0° 7'14.26"S	36°22'23.85"E	40	40	Nil
	AP34	0° 7'7.07"S	36°22'39.26"E	40	40	Nil
	AP35	0° 7'5.77"S	36°22'45.02"E	40	40	Nil
	AP36	0° 6'47.94"S	36°23'4.22"E	40	40	Nil
	AP37	0° 6'26.37"S	36°23'17.21"E	40	40	Nil
	AP38	0° 5'3.28"S	36°23'12.12"E	40	40	Nil
	AP39	0° 4'0.04"S	36°22'49.45"E	40	40	Nil
	AP40	0° 1'39.72"S	36°22'41.97"E	40	40	Nil
	AP41	0° 0'48.15"S	36°23'53.71"E	40	40	Nil
	AP42	0° 0'16.59"N	36°25'11.86"E	40	40	Nil
	AP43	0° 0'11.86"N	36°25'52.71"E	40	40	Nil
	AP44	0° 1'5.79"N	36°26'51.92"E	40	40	Nil
	AP45	0° 1'2.56"N	36°27'59.01"E	40	40	Nil
	AP46	0° 1'59.65"N	36°28'58.43"E	40	40	Nil

		AP47	0° 4'13.09"N	36°29'16.91"E	40	40	Nil
		AP48	0° 6'35.00"N	36°30'48.98"E	40	40	Nil
		AP49	0°10'54.36" N	36°30'52.12"E	40	40	Nil
		AP50	0°13'6.28"N	36°30'33.38"E	40	40	Nil
		AP51	0°13'39.16" N	36°30'4.93"E	40	40	Nil
		AP52	0°14'43.54" N	36°30'24.53"E	40	40	Nil
2.	Isinya-Konza Transmissi on Line	TT ISINYA	1°46'19.51"S	36°49'40.98"E	40	40	Nil
		IK01	1°46'19.08"S	36°49'36.65"E	40	40	Nil
		IK02	1°46'30.34"S	36°49'34.53"E	40	40	Nil
		IK03	1°46'46.33"S	36°49'47.93"E	40	40	Nil
		IK04	1°46'41.74"S	36°50'13.14"E	40	40	Nil
		IK05	1°46'12.21"S	36°51'0.62"E	40	40	Nil
		IK06	1°46'4.54"S	36°51'3.57"E	40	40	Nil
		IK07	1°45'40.14"S	36°53'41.02"E	40	40	Nil
		IK08	1°45'16.70"S	36°56'1.37"E	40	40	Nil
		IK09	1°44'55.61"S	36°58'31.15"E	40	40	Nil
		IK010	1°44'36.51"S	37° 0'38.36"E	40	40	Nil
		IK011	1°44'28.26"S	37° 3'58.57"E	40	40	Nil
		IK012	1°44'18.83"S	37° 5'15.93"E	40	40	Nil
		IK013	1°42'58.27"S	37° 8'5.00"E	40	40	Nil
		IK014	1°42'5.69"S	37° 8'56.81"E	40	40	Nil
		IK015	1°41'46.86"S	37° 9'21.90"E	40	40	Nil
		TT KONZA	1°41'48.01"S	37° 9'27.85"E	40	40	Nil
3.	Kabarnet-Rumuruti Transmissi on Line	Rumur uti SS	0°14'44.30" N	36°30'23.68"E	40	40	Nil
		AP1	0°14'35.56" N	36°30'3.90"E	40	40	Nil
		AP2	0°14'35.29" N	36°24'33.80"E	40	40	Nil
		AP3	0°15'28.66" N	36°22'10.95"E	40	40	Nil
		AP4	0°15'56.86" N	36°20'1.34"E	40	40	Nil
		AP5	0°15'55.70" N	36°18'57.06"E	40	40	Nil

		AP6	0°16'22.70" N	36°17'58.18"E	40	40	Nil
		AP7	0°17'20.76" N	36°17'31.49"E	40	40	Nil
		AP8	0°17'29.69" N	36°17'17.75"E	40	40	Nil
		AP9	0°20'23.81" N	36°15'5.80"E	40	40	Nil
		AP10	0°21'45.96" N	36°13'45.16"E	40	40	Nil
		AP11	0°25'46.41" N	36°11'36.47"E	40	40	Nil
		AP12	0°26'39.44" N	36° 7'52.41"E	40	40	Nil
		AP13	0°26'39.03" N	36° 3'35.26"E	40	40	Nil
		AP14	0°26'56.67" N	36° 1'22.95"E	40	40	Nil
		AP15	0°27'29.39" N	35°58'29.44"E	40	40	Nil
		AP16	0°28'31.25" N	35°55'52.17"E	40	40	Nil
		AP17	0°27'59.31" N	35°51'21.21"E	40	40	Nil
		AP18	0°28'38.66" N	35°50'25.56"E	40	40	Nil
		AP19	0°28'16.74" N	35°48'12.98"E	40	40	Nil
		AP20	0°28'25.52" N	35°47'15.96"E	40	40	Nil
		AP21	0°28'36.13" N	35°46'29.78"E	40	40	Nil
		Kabarn et SS	0°28'35.47" N	35°46'2.93"E	40	40	Nil
4.	Awendo- Masaba Transmissi on Line	AW1	0°53'29.53"S	34°31'26.36"E	40	40	Nil
		AW2	0°53'32.07"S	34°31'9.81"E	40	40	Nil
		AW3	0°53'45.87"S	34°31'1.86"E	40	40	Nil
		AW4	0°54'3.66"S	34°31'2.08"E	40	40	Nil
		AW5	0°55'2.58"S	34°31'5.08"E	40	40	Nil
		AW6	0°55'52.78"S	34°31'50.76"E	40	40	Nil
		AW7	0°57'0.43"S	34°32'54.29"E	40	40	Nil

		AW8	0°57'49.13"S	34°32'56.67"E	40	40	Nil
		AW9	0°58'44.63"S	34°33'0.51"E	40	40	Nil
		AW10	0°59'54.20"S	34°33'4.14"E	40	40	Nil
		AW11	0°59'58.97"S	34°32'59.20"E	40	40	Nil
		AW12	1° 2'14.82"S	34°33'0.24"E	40	40	Nil
		AW13	1° 3'21.64"S	34°32'58.95"E	40	40	Nil
		AW14	1° 4'37.23"S	34°33'5.51"E	40	40	Nil
		AW15	1° 7'2.73"S	34°33'9.05"E	40	40	Nil
5.	Machakos-Mwala-Ekalakala Transmission Line	Machakos SSTN	1°33'51.00"S	37°14'49.40"E	40	40	Nil
		AP1	1°34'2.04"S	37°15'28.41"E	40	40	Nil
		AP2	1°34'11.86"S	37°16'15.39"E	40	40	Nil
		AP3	1°33'38.60"S	37°18'44.29"E	40	40	Nil
		AP4	1°33'24.04"S	37°19'44.58"E	40	40	Nil
		AP5	1°31'34.68"S	37°22'29.34"E	40	40	Nil
		AP6	1°31'8.23"S	37°22'46.56"E	40	40	Nil
		AP7	1°30'8.50"S	37°23'15.17"E	40	40	Nil
		AP8	1°27'24.47"S	37°25'27.00"E	40	40	Nil
		AP9	1°26'49.67"S	37°25'44.43"E	40	40	Nil
		AP10	1°26'21.77"S	37°25'57.96"E	40	40	Nil
		AP11	1°25'49.18"S	37°26'17.57"E	40	40	Nil
		Mwala SSTN	1°25'0.76"S	37°26'57.76"E	40	40	Nil
		AP13	1°21'38.35"S	37°26'41.14"E	40	40	Nil
		AP14	1°18'51.45"S	37°26'7.18"E	40	40	Nil
		AP15	1°16'9.90"S	37°27'49.78"E	40	40	Nil
		AP16	1°14'40.87"S	37°28'8.80"E	40	40	Nil
		AP17	1°13'10.12"S	37°28'26.41"E	40	40	Nil
		AP18	1°12'4.16"S	37°28'52.95"E	40	40	Nil
		AP19	1° 8'26.28"S	37°28'42.95"E	40	40	Nil
		AP20	1° 7'0.90"S	37°27'5.45"E	40	40	Nil

		AP21	1° 6'5.82"S	37°25'10.28"E	40	40	Nil
		AP22	1° 4'18.24"S	37°24'13.32"E	40	40	Nil
		T-OFF (@EKA LAKAL A)	1° 2'24.23"S	37°23'42.22"E	40	40	Nil

**Please note that the following conditions shall apply: -**

1. The heights of the power lines and wayleaves shall not be increased without prior approval by the Director General of Kenya Civil Aviation Authority.
2. Maralal-Rumuruti, Kilifi-Malindi and Sultan Hamud- Loitoktok transmission Lines require inspection by the Authority before issuance of approval.
3. This approval does not override any other Government requirements.

Yours *S. Kibe*,



Capt. Gilbert M. Kibe  
**DIRECTOR GENERAL**





## **BIODIVERSITY ASSESSMENT REPORT**

**FOR**

### **APPROXIMATELY 95KM KABARNET-RUMURUTI 132KV DOUBLE CIRCUIT TRANSMISSION LINE TRAVERSING LAIKIPIA AND BARINGO COUNTIES**

**Addressing Issue 1:** Provide a comprehensive biodiversity assessment report including cumulative analysis of impacts and mitigation measures.

**October 2022**

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## **ABBREVIATION/ACRONYMS**

AfDB	African Development Bank
BMP	Biodiversity Management Plan
EBA	Endemic Bird Area
EMCA	Environmental Management and Co-ordination Act.
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
HSES	Health, Safety, Environment and Social
IBA	Important Bird Area
KTRNIP	Kenya Transmission Network Improvement Project
PDO	Project Development Objectives
PIT	Project Implementation Team
RoW	Right of Way
TL	Transmission Line

## 1 INTRODUCTION

The proposed construction of the Kabarnet-Rumuruti 132kV double circuit transmission line (the “Project”) is to be jointly financed by the African Development Bank (AfDB) and Korea Exim bank. The project aims to improve the power systems and electricity access and reliability, in line with the Kenya Growth and Development Strategy. The Project Development Objectives (PDO) are to: (i) increase the capacity of transmission system; and (ii) increase access to electricity in Kenya.

The project will essentially involve the construction of a 132kV transmission line from Kabarnet substation in Baringo County and terminate at Rumuruti substation in Laikipia County. The proposed Kabarnet – Rumuruti 132/33KV transmission line is part of Kenya Transmission Network Improvement Project (KTRNIP).

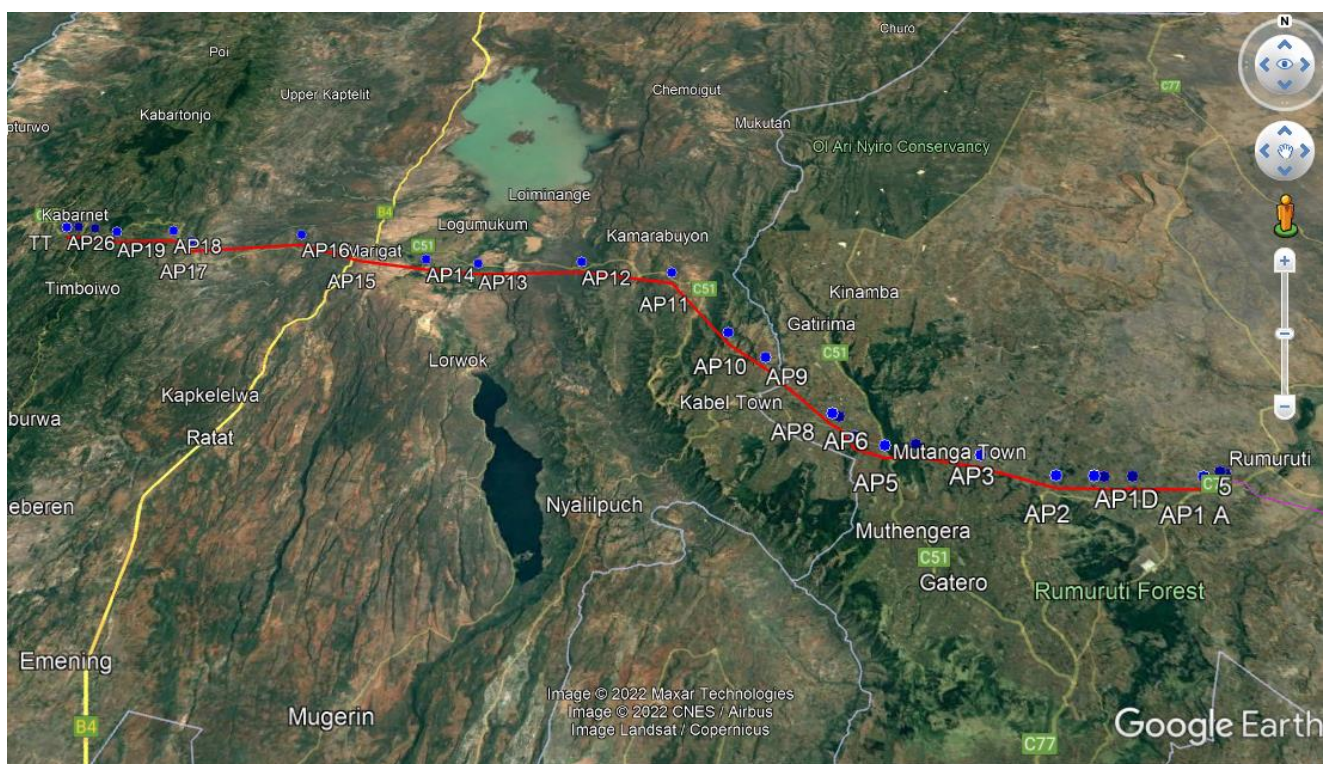


Figure 1-Image of the Transmission Line on google Earth.

## 2 BIOLOGICAL ENVIRONMENT IN AREAS TRAVERSED BY THE TRANSMISSION LINE

### 2.1 BARINGO COUNTY

#### 2.1.1 Flora

The vegetation condition index for the county is 81.89. The above normal greenness has been attributed to the cumulative effects of good rainfall performance for the last few months. The performance of the long rains season has been above normal, and this has contributed to the good conditions of the natural vegetation.

The quantity of forage in most parts of the project area is fair after the rains. The quality of the available pasture was also fair. Following the rainfall received it is expected that the forage will improve fairly. The distance to grazing areas has reduced owing to improving pasture and browse conditions

Baringo County has 25 gazetted forests where majority are indigenous and are found in Kabarnet, Kabartonjo, Tenges, Lembus, Saimo, Sacho and Ol' Arabel and Eldama Ravine. The main exotic species include: *Grevellea Rabusta*, *Cuppressus lusitanic* and *Eucalyptus saligna*. *Prosopis juliflora*. Kipng'ochoch forest in Sacho is one of the 10 forest blocks under Tenges Forest station and is an example of a well conserved indigenous forest where visitors and nature lovers view the entire Lake Baringo basin, fluorspar mines, Laikipia ranges, Elgeyo escarpment, Kerio Valley, and other touristic attractions that the county offers. The county is classified as arid and semi-arid since most of East Pokot, Baringo Central, Baringo South, Baringo North, Mogotio sub-counties are arid and semi-arid except for Koibatek sub-county, which is in a highland zone. Bushland and thickets is the most common tree species belong to the deciduous genera *Acacia* and *Commiphora* occupying major proportion of the line route. The understory consists of shrubby herbs less than one meter high, such as *Acalypha*, *Barleria* and *Aerva*. At lower elevations where rainfall is less consistent, vegetation becomes semi-desert scrubland. *Acacia* and *Commiphora* are joined by *Euphorbia* and *Aloe*, as well as grass species such as *Dactyloctenium aegyptium* and *Panicum turgidum*. Important evergreens include *Boscia*, *Dobera*, *Salvadora*, *Grewia* and *Cadaba*. Additionally, Lake Bogoria supports 53 plant families and approximately 210 plant species. Six broad vegetation types can be classified according to physiognomic representation. They include riverine forest, wooded bushland, bushed thicket, bushland, bushed grassland, and swamps. Depressions (wadis) harbour varied vegetation types such as those found in the Lobo swamps and grasslands.

Evergreen and semi-deciduous bushland cover large areas along stream, valley, and other inhospitable areas. *Spirulina platensis* and other species of phytoplankton, which occur depending on season and water chemistry, dominate the lake's open water. A small forest of *Ficus* sp. occurs at the southern end of the lake associated with freshwater springs. Because of the gentle topography of the land around Lake Bogoria, human beings have settled on it and disturbed it. This has promoted the invasion of *Prosopis juliflora* (Mathenge weed) which is rampant especially adjacent to major settlements

Baringo District has a forest cover of 24,346.9 hectares. The gazetted forests cover a total area of 22,953.7 hectares, representing about 94% of the District's forest area. Most of the gazetted forests are in highlands, where they are threatened by encroachment due to the high demand for agricultural land.

The proposed transmission line will pass through Kinyo Forests in Baringo County which is managed by the Kenya Forest Service. Authority will be obtained from KFS before commencement of construction to pass the transmission line project through the forest.



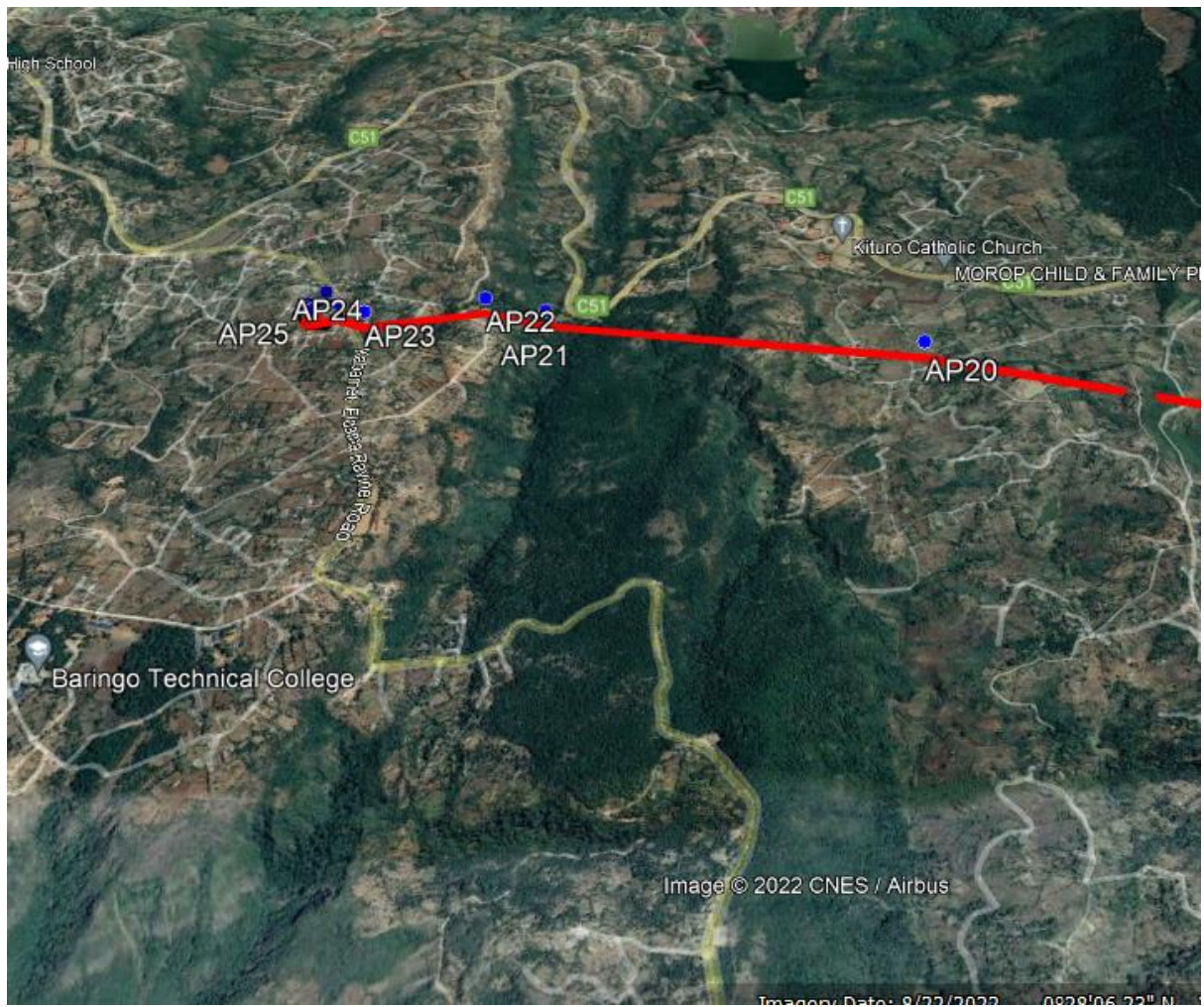


Figure 2- Transmission Line traversing through Kinyo Forest, Baringo

The Transmission line passes approximately 6km from Ol-Arabel Forest as depicted in Figure 3 below.

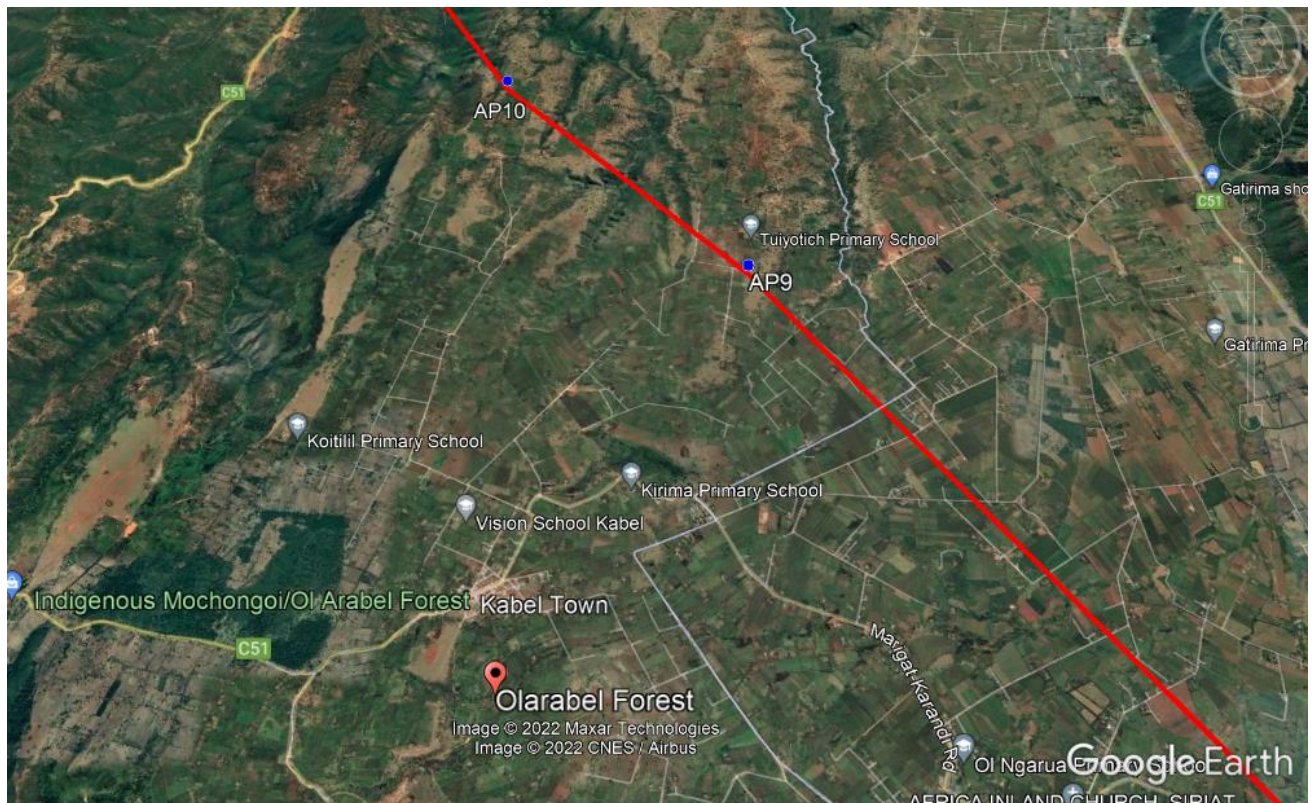


Figure 3- Transmission Line approximately 6km from Ol-Arabel Forest

### 2.1.2 Avifauna and Endemic Bird Area (EBA) and Important Bird Area (IBA) Site

Birdlife in the project area is supported by the numerous ecosystem types found within the confines of the transmission line. Despite this, birdlife is sparsely populated and scattered in the area. They included: Fork-tailed Drongo, Yellow-vented Bulbul, Superb Starling, Rupelles Long tailed Glossy Starling, White-crested Helmet Shrike, Kori Bustard, Northern White-crowned Shrike, Brown-necked Crow, Mourning Dove, White-bellied Cuckoo, Martial Eagle, Abyssinian Roller, Rufous-crowned Roller, Blue-headed Coucal, African Scops Owl, Greyheaded Kingfisher, Pied Kingfisher, Pied Wagtail, White-browed Sparrow-Weaver, Crested Lark, Variable Sunbird, Shinning Sunbird, Speckled Pigeon, Blue-headed Bee-eater, Carmine Bee-eater, Paradise Flycatcher, Namaqua Dove, White-headed Buffalo Weaver, White-browed Sparrow-Weaver, Nubian Woodpecker, Ring-neck Dove, Eastern Pale Chanting Goshawk, Sacred Ibis, Lesser Flamingo, Greater Flamingo, Lesser Egret, Intermediate Egret, Greater Egret, Goliath Heron, Yellow-billed Stork, Red-billed Hornbill, White-headed Moosebird, Somali Ostrich and African Hoopoe among others.

The transmission line crosses tiny sections of Endemic Bird Areas in Baringo Central, in Kabarnet but does not cross any Important Bird Area. Some of the birds found in Baringo Central area are bat hawk and majestic verrwaux eagle. Others include flycatcher, African fish eagle, marabou storks, shikra, white-faced scops owl, Hemprich's hornbill, African darter and the African skimmer. Birds found within Lake Baringo area are Hemprich's Hornbill, Jackson Hornbill, Bristle-crowned Starling, Brown-tailed Rock Chat, Fox Kestrel, Somali Fiscal, Mouse-coloured Penduline-tit, Somali Tit, Fan-tailed Raven, Brown Babbler, Parrot-billed Sparrow, White-billed Buffalo Weaver and Little Weaver.



### 2.1.3 Arthropods

The ecosystem has a rich diversity of invertebrate species, including insects such as: Odonata (Dragonflies), Orthoptera (Grasshoppers and crickets), Isoptera (termites), Coleoptera (Beetles), Lepidoptera (Butterflies and Moths), Diptera (Flies and Mosquitoes), Hymenoptera (Wasps and Bees), Blattodea (Cockroaches) and Phasmida (Walking sticks). Arachnids present include ticks, spiders and scorpions.



Figure 4-Traditional beehives in Marigat, Baringo County

### 2.1.4 Reptiles

The semi-arid to arid climate in the block creates a suitable environment for reptilian life and thus it is expected that many reptilian species are present. They include Snakes, Lizards, Tortoise, Crocodile, Gecko and Skinks. Reptiles found in Baringo Central and Baringo south sub counties are Black Mamba, Puff Adder, Boomslang and Spitting Cobra as well as Monitor Lizards, Crocodiles and a central pit shared by endangered tortoises and harmless Stripe Bellied Sand Snakes. Crocodiles are mainly found in Lake Baringo.



Figure 5-Red headed agama lizard



### 2.1.5 Mammals

The Baringo central and Baringo south subcounty habitats are numerous and diverse. A few live observations were made but most of the mammalian life observed were made indirectly by signs of their activity. The animals include Greater kudu, Dik dik, Cape hare, Silver backed jackal, Hedgehog, Porcupine, Impala, Elephant, Buffalo, Grants gazelle, Cheetah, Leopard, Lion, Vervet monkey, Olive baboon and Hyena, among others. There are no wildlife dispersal routes or migratory corridors in the areas traversed by the line based on secondary literature and confirmed by Kenya Wildlife Service.

*The proposed transmission line has not traversed any wildlife migratory route.*

## 2.2 LAIKIPIA COUNTY

### 2.2.1 Flora

There are six gazetted and one non-gazetted forest in Laikipia covering a total area of 580 square kilometres. Mukogodo is the main natural forest within the county. Artificial forests include Lariak, Marmanet, Ng'arua, Rumuruti and Shamaneik with sections of natural vegetation. *The proposed transmission line passes through Lariak forest in Laikipia East subcounty.* The county is endowed with several natural resources. These include pasture rangeland, forest, wildlife, undulating landscapes, and rivers among others.

Laikipia is in a transition zone for three major vegetation types; 'Somalia-Masai Semi-desert Grassland and Shrubland', 'Somalia-Masai *Acacia Commiphora* Bushland and Thicket', and 'Afromontane Undifferentiated Montane Vegetation'. Here, the savannahs of eastern Africa grade into both the semi-arid lands of the Horn of Africa and the montane elements of Mount Kenya and the Aberdares Range. The resultant great diversity of vegetation types, ecotones, and mosaics accounts, in part, for the high biological diversity of Laikipia.

The primary vegetation types are grassland, bushland, woodland, and, on the higher ground, dry forest. Dry forest is typically dominated by pencil cedar *Juniperus procera* (Cupressaceae), wild olive *Olea europaea* (Oleaceae), podocarp *Afrocarpus gracilior* (Podocarpaceae), eucalypt *Eucalyptus divinerum* (Ebenaceae), acokanthera *Acokanthera schimperi* (Apocynaceae), and croton *Croton megalocarpus* (Euphorbiaceae). Riparian forest is a scarce, but biologically important, vegetation type in Laikipia. It is often dominated by fever trees *Acacia xanthophloea* (Fabaceae). Other large trees in the riparian forest include Gerrard's acacia *Acacia gerrardii* (Fabaceae), *A. gracilior*, water pear *Syzygium guineense* (Myrtaceae), water berry *Syzygium cordatum* (Myrtaceae), cape chestnut *Calodendrum capense* (Rutaceae), East African greenheart *Warburgia ugandensis* (Canellaceae), and figs *Ficus spp.* (Moraceae) (especially sycamore fig *F. sycamorus*).

### 2.2.2 Forests

The county has gazetted forest area totalling to 580 Km<sup>2</sup> comprising of both the indigenous and plantation forests. The indigenous forests include Mukogodo and Rumuruti, which are under threat from encroachment. The plantation forests include Marmanet and Shamaneik. Laikipia has a network of 10 main forests, which play important social and economic roles. Forests are under the responsibility of the Kenya Forest Service. Forest provides essential services to people, livestock, and wildlife in Laikipia, including watershed protection, dry season grazing, a wide range of traditional non-timber forest products (food and medicinal plants, fungi etc.), habitats and forage, and timber products such as firewood. They also provide a sink for carbon.

The transmission line traverses Lariak forest over 1.8kms (13.5 acres) between AP 019 to AP 020. Lariak Forest is a gazetted forest and is part of the broader Marmanet forests on the eastern escarpment of the Rift Valley under the management of Kenya Forest Service. The species of trees in the forest include *Juniperus procera*, *Premna maxina*, *Dombeya goetzianii*, *Teclea noblis*, *Ekebergia*, *Celtis Africana*, *Olea hochstotterii*, *Prunus africanum*, *Podocarpus gracilior*, *Podocarpus milanjanus*. *The proposed transmission line traverses Lariak forest in Likipia West. The proponent will obtain authority from KFS before commencement of construction. KFS conditions shall be dully complied with by the proponent.*

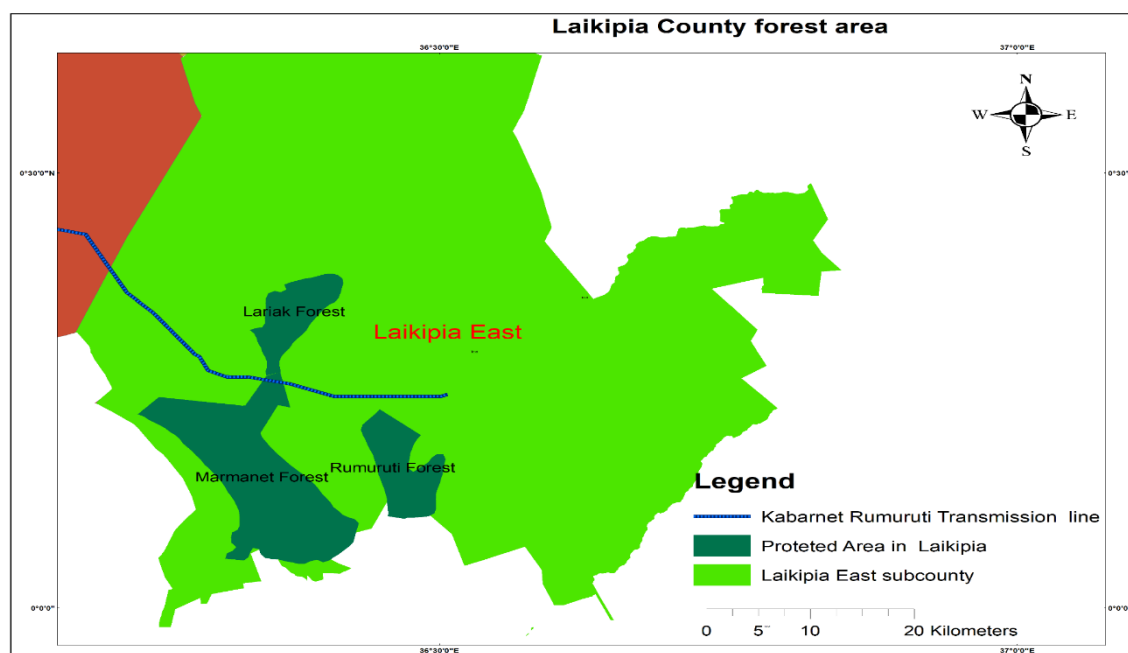


Figure 6-Description of how the TL traverses Lariak Forest

### 2.2.3 Rangelands

Rangelands cover more than 70% of Laikipia. They are characterised by a patchwork of conservation and grazing areas, which are under high pressures. 37 % of Laikipia is under large-scale ranching under extensive livestock production. Pastoralist communities use approximately 32% of the County land area including 10% of “abandoned land” (240,000 acres of land purchases in the 1970s and abandoned due to insufficient rainfall for cultivation). Intense land degradation threatening communities’ livelihood base has occurred in communally owned areas. *In Laikipia East Sub County , the land is individually owned and mainly comprises of farm land and pasture land.*

### 2.2.4 Fauna

The County is recognised as one of the most important areas for conservation in east Africa for numerous reasons including the diversity of its wildlife, the number of endangered species it holds (including wild dogs, Grevy's zebras and half of the population of Kenya’s black rhinoceros) and having one of the largest contiguous areas under conservation. The highest densities of wildlife are found in on what is referred as private protected areas (i.e., mixed ranches) with community protected areas acting as dispersal areas (AFD, 2013). Among the

major wildlife species found in this county are the lion, leopard, elephant, buffalo, and the rhinoceros though there are other smaller species also in abundance particularly the African Wild dog and gazelles. According to classification, the endangered species in the region includes among others African wild dog (*Lycaon pictus*), Grévy's zebra (*Equus grevyi*), Lelwel hartebeest (including Jackson's hartebeest) *Alcelaphus buselaphus lelwel*. Vulnerable Species include: Savanna elephant (*Loxodonta Africana*), Lion (*Panthera leo*), Cheetah (*Acinonyx jubatus*), Common hippopotamus (*Hippopotamus amphibious*), Reticulated giraffe (*Giraffa reticulate*), Chanler's mountain reedbuck (*Redunca fulvorufula chanleri*) and Eastern patas monkey (*Erythrocebus patas pyrrhonotus*). Near threatened species include Thomson's gazelle (*Eudorcas thomsonii*), White rhinoceros (*Ceratotherium simum*), Leopard (*Panthera pardus*) etc. Critically Endangered spp include Black rhinoceros (*Diceros bicornis*). Least Concern includes: Impala, Waterbuck, Greater kudu, Bushbuck, Spotted hyena, African clawless otter, Monkey, Hyrax. *The transmission line traverses as indicated above, Lariak Forest in Laikipia East subcounty, which is part of the broader of the Marmanet forests on the eastern escarpment of the Rift Valley. The transmission line does not traverse any wildlife migratory route.*

### **2.2.5 Insects**

Laikipia is home to insects of more species than all its other creatures and plants combined. Laikipia's most conspicuous and colourful insects are butterflies, of which more than 150 species have been recorded. A commonly seen butterfly is the widely occurring *Citrus Swallowtail*, *Papilio demodocus*, whose dark upper wings bear flashy lemon-yellow markings. Other common butterflies are the *Pansies*, *Junonia spp.*, Blueeyed (*J. oenone*) and Yellow (*J. hierta*). The Guineafowl Butterfly, *Hamanumida daedalus*, dark grey and speckled like the bird from which it gets its name, is typically seen floating low over paths in Acacia woodland. *Orange Tips*, *Colotis spp.*, of several species frequent the Laikipia savannahs, sometimes in large numbers.

### **2.2.6 Reptiles and Amphibians**

The combination of a moderate climate (neither too hot and dry nor too cold and wet) with a diverse array of habitats ensures that Laikipia supports many species of reptiles and amphibians. Dangerous snakes that typically seek refuge in rock crevices and on kopjes in Laikipia include the Puff Adder, *Bitis arietans*, Africa's most dangerous snake, and the Black-necked Spitting Cobra, *Naja nigricollis*. The large, unmistakable African Rock Python, *Python sebae*, is most often seen near water. The Leopard Tortoise, *Geochelone pardalis*, is found in most habitat types.

The amphibians are nearly all nocturnal. Lizards typically seen basking on rocks or mounds, or in trees and bushes are by far the most conspicuous reptiles. Snakes, while abundant, are much more secretive, usually moving off before they can be seen. In the open grasslands, you can expect to see several terrestrial lizards, including the Variable Skink, *Mabuya varia*, typically brownish and speckled with a pale flank stripe. The Grass-top Skink, *M. megalura*, slender and brown with a dark lateral stripe, has tiny limbs and an extraordinarily long tail (accounting for as much as two-thirds of its length), allowing it to slide swiftly through and over clumps of grass. The Yellow-throated Plated Lizard, *Gerrhosaurus flavigularis*, a large, long-tailed brown lizard with paired yellow dorso lateral stripes, may be seen emerging from holes, while Speke's Sand Lizard, *Heliobolus spekii*, a small,

mottled brown species with black barred pale dorsal stripes, typically darts about on more open ground. Fast-moving Sand Snakes, *Psammophis* spp., often startled on grassland tracks into making off in haste, may include the sleek Northern Stripe-bellied Sand Snake, *P. sudanensis*, which has a brown back and two prominent yellow dorso lateral stripes. Larger species found on Laikipia's grasslands are the Olive Sand Snake, *P. mossambicus*, which is uniformly olive-brown, and the Speckled Sand Snake, *P. punctulatus*, often more than 1.5 m long, with black and yellow dorsal stripes and a striking orange head. Common in grasslands are the dark-striped, pale grey-brown Kenya Striped Skaapsteker, *Psammophylax multisquamis*, and the pale olive-grey-brown Mole Snake, *Pseudaspis cana*, a stout burrowing species with a short, pointed head.

As home to some 450 of Kenya's estimated 1,100 bird species, Laikipia is a birder's paradise. Majority of the birds found in the county are distributed within the various ecosystems around, some of the birdlife observed include among others: White-faced whistling duck, Knob-billed duck, African black duck, Madagascar pond heron, African spoonbill, Black stork, Great white pelican, Great cormorant, Lesser kestrel, Red-footed falcon, Sooty falcon, African fish eagle, Eastern chanting goshawk, Western marsh harrier, African hawk-eagle, Corncrake, Red-knobbed coot, white-throated-bee-eater, Black-winged stilt, Greater painted snipe, Wood sandpiper, Red-fronted parrot, Common cuckoo, Barn owl, Little bee-eater, Crowned hornbill, Jackson's widowbird etc. Along the transmission route, there is an Endemic Bird Area (EBA), Kenyan Mountains traversed by the transmission line. The bird species located in the EBA are described above.

Figure 7-Laikipia County Project Area EBA and IBA

### **3 BIODIVERSITY MANAGEMENT PLAN**

The purpose of this Biodiversity Management Plan (BMP) is to act as an instrument to be used by KETRACO to ensure that sound ecological management practices are incorporated during the Construction and Operational Phases of this Project. This BMP should be read in conjunction with the Project's Environmental & Social Impact Assessment (ESIA) study report.

#### **3.1 OBJECTIVES OF THE BMP**

The objectives of the Biodiversity Management Plan include:

- i. Elimination or mitigation of negative impacts resulting from the Project.
- ii. Enhancement of benefits that will arise from the development of the transmission line project.
- iii. Compliance with Kenyan legislation, lenders requirements, as well as international guidelines and best practice.
- iv. Ongoing maintenance of goodwill and good relations with communities, civil society, and the government, especially at the local and national level.

#### **3.2 STATUTORY APPLICATION**

Key policies, laws and regulations that are applicable to Biodiversity management in Kenya have been referenced in preparation of this BMP. Some of these legislations include

- i. Environmental Management and Coordination Act, EMCA, 1999;
- ii. Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources, and Benefit Sharing) Regulations, 2006;
- iii. Water Act, 2016;
- iv. Wildlife and Conservation Act 2013,
- v. Environmental Management and Coordination (Wetlands, Riverbanks, Lake shores and Sea Shores) Regulations, 2009;
- vi. Public Health Act (Chapter 242);
- vii. Forest Conservation and Management Act, 2016
- viii. Penal Code (Cap. 63).
- ix. International best practices such as:
  - a. AfDB's Operational safeguard 3 – Biodiversity, renewable resources, and ecosystem services,
  - b. IFC's Environmental, Health, and Safety (EHS) guidelines.

#### **3.3 IMPACTS OF THE PROPOSED PROJECT TO BIODIVERSITY**

##### **3.3.1 Impact on Flora**

According to data from the survey carried out for the ESIA, some of the areas to be crossed by the transmission line are of a considerable biodiversity, particularly where the project traverses' forests. To clear a Right of Way (RoW) for the project infrastructure, it will be necessary to clear some vegetation. This will cause impacts, such as loss of biodiversity, fragmentation of habitat, changes in light conditions and possible invasion by invasive alien species (e.g., *mathenge*), whose competitiveness and growth rate are considered high.

Table 1-Summary of Potential Impacts to Flora

Construction Phase	Operation Phase
Loss and fragmentation of areas of native forest due to project infrastructure and RoW Change in the structure of the vegetation communities	<ul style="list-style-type: none"> <li>Fragmentation of habitat</li> <li>Spread of invasive alien species</li> </ul>

This impact of the project on flora along the transmission line will be direct and permanent in nature, since trees and vegetation will be removed to clear the RoW, install the infrastructure, and carry out regular maintenance, and along that strip no tree regeneration whose height may compromise the safety of the transmission lines is allowed.

### 3.3.1.1 Impact Assessment

#### Construction Phase

This direct impact is permanent, since the tree and shrub vegetation will be removed to clear the RoW, install the infrastructure, and carry out regular maintenance, and along that strip no tree regeneration whose height may compromise the safety of the transmission lines is allowed. The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity in most of the areas. The impact is direct and negative, resulting from the vegetation removal and disturbance during the construction phase. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is medium. Based on the analysis provided above, the impact of vegetation removal, habitat fragmentation and degradation will be a **moderate** negative impact pre-mitigation.

Table 2-Pre-Mitigation Impact Assessment- Flora during Construction

Impact	Flora and Vegetation during Construction			
Impact Nature	Negative	Positive	Neutral	
	Disturbance to vegetation and habitat loss and fragmentation as a result of the RoW or degradation to environment and habitat during			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the existing vegetation along the transmission line			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The effect is considered permanent as the areas where vegetation will be removed for the construction of the line will have to be permanently kept with vegetation for maintenance purposes during the operational phase.			
Impact Extent	Local	Regional	International	
	Impact is limited to AoI			

Impact Scale	The impact is considered medium scale. Although the impact will occur across the whole length of the proposed transmission line RoW and access roads, large sections of the lines are in built up areas with modified habitat (i.e., urban areas, agricultural land and along the existing corridor) and thus there is a decreased risk of impacts to vegetation in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor	Low	Medium		High	
Sensitivity/Value/ Importance*	Although the transmission line will cross some disturbed and modified habitats that occur along the transmission line RoW, it will also cross a sensitive forest patches and river. The sensitivity is considered medium.				
Impact Significance	Negligible	Minor	Moderate		Major
	Considering the impact magnitude is large and the sensitivity is medium, the overall significance is of moderate significance.				

### Operation Phase

During the operational phase there is the potential for impacts on vegetation and flora as a result of the existence of the transmission line, particularly due to the maintenance including periodic clearing of the RoW which perpetuate habitat fragmentation.

The impact is directly negative, will be permanent during the project life period, maintenance will be conducted periodically. The extent of the impact is restricted to the Project RoW and therefore local in nature.

Based on the analysis provided above, the impact of direct loss of vegetation and flora and degradation and fragmentation of habitat will be of **moderate** significance pre-mitigation.

Table 3-Pre-Mitigation Impact Assessment- Flora during Operations

Impact	Flora and Vegetation during Operations			
Impact Nature	Negative	Positive	Neutral	
	Disturbance to vegetation and potential grow of invasive species as result of the maintenance works during operation			
Impact Type	Direct	Indirect	Induced	
	Impact is as a result of a direct interaction between the transmission line infrastructure in the RoW			
Impact Duration	Temporary	Short Term	Long Term	Permanent
	The effect is considered permanent as the RoW will be kept free of vegetation during operation			
	Local	Regional	International	



Impact Extent	Impact is limited to AoI				
Impact Scale	The impact is considered low scale as most of the impacts related to vegetation removal occurred during the construction phase. However, there will be a degree of habitat fragmentation.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered medium as the proposed transmission line will traverse Lariak forest. During operation, maintenance clearing along the ROW will lead to vegetation removal.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is small and the sensitivity is low, the overall significance is considered to be of moderate significance.				

### 3.3.1.2 Mitigation

The following standard mitigation measures will be employed:

- Vegetation will be removed only as necessary.
- Rivers, watercourses, and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing.
- Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary.
- There should be no deviation from the access road position without prior discussions with the authorities.
- Firewood collection by the project's employees should be strictly forbidden.
- Materials (e.g. pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and
- Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible.

### Decommissioning Impact on Flora

The impacts on flora and vegetation will be **minor** and temporary impacts as the decommissioning work will take place on areas already modified by the transmission line infrastructure. It is not expected that the activities will result in negative impacts on any sensitive species. Based on the analysis provided above, the impact of vegetation removal, habitat fragmentation and degradation will be **negligible**.

### 3.3.1.3 Residual Impact

Table 4 summarises the residual impact after implementing the mitigation measures.

Table 4-Residual Impact Significance-Flora

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disturbance to vegetation and habitat loss and fragmentation because of the ROW or degradation to environment and habitat	Construction	Moderate	Minor
Disturbance to vegetation and potential grow of invasive species as result of the maintenance works	Operation	Minor	Negligible
Disturbance to vegetation and potential grow of invasive species as result of decommissioning of the project	Decommissioning	Negligible	Negligible

### 3.3.2 Impacts on Fauna

The natural environment along the transmission line has been largely transformed along with the reception of the section of where the line crosses Lariak Forest. The open space, plantation areas, cultivation and vegetable farms that have been observed within the transmission line routes are modified areas and have no natural fauna of any importance. Moreover, fauna in cultivated areas unlikely to have any conservational significance. The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity.

However, in the sections of the transmission line, where it crosses inside the Lariak Forest, the inherent fauna will be directly affected. The cutting down of the trees which are a habitat to various fauna as well as the disturbance associated with the construction will adversely affected the fauna. The potential impacts are restricted to disturbance of wildlife in terms of their feeding and general movements, and only at the point of intense construction activities, i.e., at the towers. Disturbance could be caused by presence of labour force, noise, and vibration. The other possibility is by hunting for game meat by construction workers. Fauna species in the Lariak Forest include African hare, kirks Dik Dik, impala, Thompsons Gazelle, spring Hare, Bush squirrel, porcupine, warthog, black faced vervet monkey, Impala, and honey Badger.

#### 3.3.2.1 Impact Assessment

##### Construction Phase

During construction, fauna within the near surrounds of the development area will be disturbed due to cutting down of natural vegetation in the affected forest area, noise, vibration and human and vehicle presence. Disturbance impacts during construction are likely to be temporary and short lived. Impacts as the construction work will be progressive (overall program of 18-24 months). Although disturbance and displacement impacts are likely to be temporary and limited in their magnitude, if combined with the impacts of direct habitat loss, it could lead to disturbance of wild fauna. Based on the survey carried out for the ESIA, it is not expected that there will be any sensitive species in the Project area of international or local importance.

The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity except for Lariak Forest. The impact is direct and negative; resulting from the land take and disturbance during construction. The extent of the impact is presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is medium. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be a **Moderate** negative impact pre-mitigation.

Table 5-Pre-Mitigation Impact Assessment- Fauna during Construction

Impact	Avifauna during Construction				
Impact Nature	Negative	Positive	Neutral		
	Disturbance to avifauna species and loss of habitat as a result of the RoW or degradation to environment during construction.				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the fauna population along the transmission lines				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as it will only occur during the construction period				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of the transmission line RoW's and access roads, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered low due to the disturbed and modified habitats that occur along the transmission line RoW.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is low, the overall significance is considered to be of minor significance.				

### Operation Phase

During the operational phase there is the no significant impacts expected on fauna populations as a result of the transmission line and pylons and by electrocution. The extent of the impact is restricted

to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be low. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be of Minor significance pre-mitigation.

Table 6-Pre-Mitigation Impact Assessment- Fauna during Operations

Impact		Fauna during Operations			
Impact Nature	Negative	Positive	Neutral		
	Increase in fauna mortality during operation				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the erection of the transmission lines and the fauna species along the RoW				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered permanent throughout the life cycle of the project				
Impact Extent	Local	Regional	International		
	Impact is limited to the Project Area of Influence (AoI)				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of each of the transmission line RoW's, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.				
Frequency	The frequency is expected to be occasional				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude is expected to be small due to wildlife mortality				
Resource/ Receptor Sensitivity	Low	Medium	High		
	The sensitivity is considered low, birds of conservational significance are not expected along the transmission line RoW.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the magnitude of the impact is small and the sensitivity is low the overall significance is considered to be of minor significance				

### 3.3.2.2 Mitigation Measures

The following mitigation measures are recommended:

- All areas disturbed by construction activities shall be landscaped and rehabilitated.
- Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be cut unless it is growing in the road access area

- Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise road kills.
- No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)
- All animal dens near the work areas must be marked as no-go areas.
- Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.

### Decommissioning Impacts on Fauna

The impacts on fauna will be **minor** and temporary impacts as the decommissioning work will take place on areas already modified by the transmission line infrastructure. The modified areas have low sensitivity with no natural fauna of unique importance or conservational significance. The impact of direct loss of fauna and degradation of habitat will be **negligible**.

#### 3.3.2.3 Residual Impact

Table 7 summarises the residual impact after mitigation.

Table 7-Residual Impact Significance-Fauna

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Significance (Post Mitigation)
Disturbance to fauna species and degradation to environment during construction	Construction	Moderate	Minor
Disturbance to fauna species and degradation to environment during operation and maintenance.	Operation	Minor	Negligible
Disturbance to fauna species and degradation to environment during decommissioning	Decommissioning	Negligible	Negligible

### 3.3.3 Impacts on Avifauna

In terms of avi-fauna, project potential impacts will be focused on the avian populations within the development area and near surrounds, by habitat loss associated with the construction activities, such as displacement from breeding and foraging habitat and habitat degradation; there are also indirect impacts associated with changes to ecosystem and biophysical processes.

Table 8-Potential Impacts to Avian Fauna

Construction Phase	Operation Phase
<ul style="list-style-type: none"> <li>• Disturbance due to noise, vibration and human and vehicle presence</li> <li>• Loss of habitat as a result of RoW or other project infrastructure</li> </ul>	Bird strikes along transmission lines

### Baseline Condition

Along the project route and within the project area of influence, the transmission line does not cross into any area designated as an IBA and therefore the bird strike impacts associated with transmission lines is not likely to occur especially to important bird species. The line however passes through 2 Endemic Bird Areas within both Counties (Mount Kenya and Serengeti Plains) where bird life are known to range and thus will be exposed to potential strikes and electrocution. Within the Lariak Forest, there are bird species which are likely to be affected by the transmission line (bird strikes), however, these species are categorized as species of Least Concern (LC) under the IUCN Red List. Below is the list of birds in Lariak forest and its environs.

Table 9-list of birds in Lariak forest and its environs.

No.	Common Name	Scientific Name
1.	Abyssinian White-eye	<i>Zosterops abyssinicus</i>
2.	African Pipit	<i>Anthus cinnamomeus</i>
3.	African Spoonbill	<i>Platalea alba</i>
4.	African Thrush	<i>Turdus pelios</i>
5.	African Dusky Flycatcher	<i>Muscicapa adusta</i>
6.	African Fish Eagle	<i>Haliaeetus vocifer</i>
7.	African Grey Flycatcher	<i>Melaenornis microrhynchus</i>
8.	African Grey Woodpecker	<i>Dendropicos goertae</i>
9.	African Paradise Flycatcher	<i>Terpsiphone viridis</i>
10.	African Pied Wagtail	<i>Motacilla aguimp</i>
11.	African Sacred Ibis	<i>Threskiornis aethiopicus</i>
12.	Amethyst Sunbird	<i>Chalcomitra amethystine</i>
13.	Anteater Chat	<i>Myrmecocichla aethiops</i>
14.	Arrow-marked Babbler	<i>Turdoides jardineii</i>
15.	Augur Buzzard	<i>Buteo augur</i>
16.	Baglafecht Weaver	<i>Ploceus baglafecht</i>
17.	Barn Swallow	<i>Hirundo rustica</i>
18.	Black Crake	<i>Zapornia flavirostra</i>
19.	Black Cuckooshrike	<i>Campephaga flava</i>
20.	Black Sparrowhawk	<i>Accipiter melanoleucus</i>
21.	Black Saw-wing	<i>Psaldoprocne pristopectera holomelas</i>
22.	Black-backed Puffback	<i>Dryoscopus cubla</i>
23.	Black-bellied Bustard	<i>Lissotis melanogaster</i>
24.	Black-chested Snake Eagle	<i>Circaetus pectoralis</i>
25.	Black-crowned Tchagra	<i>Tchagra senegalus</i>
26.	Black-headed Heron	<i>Ardea melanocephala</i>
27.	Black-headed Oriole	<i>Oriolus larvatus</i>
28.	Black-lored Babbler	<i>Turdoides sharpie</i>
29.	Blacksmith Lapwing	<i>Vanellus armatus</i>
30.	Black-winged Kite	<i>Elanus caeruleus</i>

31.	Blue-naped Mousebird	<i>Urocolius macrourus</i>
32.	Brimstone Canary	<i>Crithagra sulphurata</i>
33.	Bronzy Sunbird	<i>Nectarinia kilimensis</i>
34.	Brown Parisoma	<i>Curruca lugens</i>
35.	Brown-crowned Tchagra	<i>Tchagra australis</i>
36.	Brubru	<i>Nilaus afer</i>
37.	Cabanis's Greenbul	<i>Phyllastrephus cabanisi</i>
38.	Cape Robin-Chat	<i>Cossypha caffra</i>
39.	Cape Turtle Dove	<i>Streptopelia capicola</i>
40.	Chinspot Batis	<i>Batis molitor</i>
41.	Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>
42.	Cinnamon-chested Bee-eater	<i>Merops oreobates</i>
43.	Collared Sunbird	<i>Hedydipna collaris</i>
44.	Common Bulbul	<i>Pycnonotus barbatus</i>
45.	Common Buzzard	<i>Buteo buteo</i>
46.	Common Cuckoo	<i>Cuculus canorus</i>
47.	Common Greenshank	<i>Tringa nebularia</i>
48.	Common Sandpiper	<i>Actitis hypoleucos</i>
49.	Common Swift	<i>Apus apus</i>
50.	Common Waxbill	<i>Estrilda astrild</i>
51.	Common Whitethroat	<i>Curruca communis</i>
52.	Common House Martin	<i>Delichon urbicum</i>
53.	Common Rock Thrush	<i>Monticola saxatilis</i>
54.	Crested Francolin	<i>Dendroperdix sephaena</i>
55.	Crowned Lapwing	<i>Vanellus coronatus</i>
56.	Crowned Eagle	<i>Stephanoaetus coronatus</i>
57.	Dark-capped Bulbul	<i>Pycnonotus tricolor</i>
58.	Denham's Bustard	<i>Neotis denhami</i>
59.	Dusky Turtle Dove	<i>Streptopelia lugens</i>
60.	Eastern Bronze-naped Pigeon	<i>Columba delegorguei</i>
61.	Egyptian Goose	<i>Alopochen aegyptiaca</i>
62.	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>
63.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
64.	Ethiopian Swallow	<i>Hirundo aethiopica</i>
65.	Ethiopian Boubou	<i>Laniarius aethiopicus</i>
66.	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
67.	European Bee-eater	<i>Merops apiaster</i>
68.	European Roller	<i>Coracias garrulus</i>
69.	Fan-tailed Raven	<i>Corvus rhipidurus</i>
70.	Fawn-colored Lark	<i>Calendulauda africanoides</i>
71.	Fork-tailed Drongo	<i>Dicrurus adsimilis</i>
72.	Garden Warbler	<i>Sylvia borin</i>
73.	Golden-breasted Bunting	<i>Emberiza flaviventris</i>



74.	Greater Honeyguide	<i>Indicator indicator</i>
75.	Greater Kestrel	<i>Falco rupicoloides</i>
76.	Greater Blue-eared Starling	<i>Lamprotornis chalybaeus</i>
77.	Green Sandpiper	<i>Tringa ochropus</i>
78.	Green Wood Hoopoe	<i>Phoeniculus purpureus</i>
79.	Grey Heron	<i>Ardea cinerea</i>
80.	Grey Cuckooshrike	<i>Cebilepyris caesius</i>
81.	Grey-backed Camaroptera	<i>Camaroptera brevicaudata</i>
82.	Grey-backed Fiscal	<i>Lanius excubitoroides</i>
83.	Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>
84.	Hadada Ibis	<i>Bostrychia hagedash</i>
85.	Hamerkop	<i>Scopus umbrette</i>
86.	Hartlaub's Turaco	<i>Tauraco hartlaubi</i>
87.	Helmeted Guineafowl	<i>Numida meleagris</i>
88.	Hildebrandt's Starling	<i>Lamprotornis hildebrandti</i>
89.	Isabelline Wheatear	<i>Oenanthe isabelline</i>
90.	Kenya Sparrow	<i>Passer rufocinctus</i>
91.	Kenya Yellow-rumped Seedeater	<i>Crithagra reichenowi</i>
92.	Lanner Falcon	<i>Falco biarmicus</i>
93.	Laughing Dove	<i>Streptopelia senegalensis</i>
94.	Lesser Kestrel	<i>Falco naumanni</i>
95.	Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>
96.	Lichtenstein's Sandgrouse	<i>Pterocles lichtensteinii</i>
97.	Lilac-breasted Roller	<i>Coracias caudatus</i>
98.	Little Bee-eater	<i>Merops pusillus</i>
99.	Little Grebe	<i>Tachybaptus ruficollis</i>
100.	Little Swift	<i>Apus affinis</i>
101.	Long-crested Eagle	<i>Lophaetus occipitalis</i>
102.	Long-tailed Widowbird	<i>Euplectes progne</i>
103.	Malachite Kingfisher	<i>Corythornis cristatus</i>
104.	Marico Sunbird	<i>Cinnyris mariquensis</i>
105.	Marsh Warbler	<i>Acrocephalus palustris</i>
106.	Meyer's Parrot	<i>Poicephalus meyeri</i>
107.	Montagu's Harrier	<i>Circus pygargus</i>
108.	Mottled Swift	<i>Tachymarptis aequatorialis</i>
109.	Namaqua Dove	<i>Oena capensis</i>
110.	Narina Trogon	<i>Apaloderma narina</i>
111.	Northern Crombec	<i>Sylvietta brachyura</i>
112.	Northern Fiscal	<i>Lanius humeralis</i>
113.	Northern Wheatear	<i>Oenanthe oenanthe</i>
114.	Northern Grey-headed Sparrow	<i>Passer griseus</i>
115.	Northern Yellow White-eye	<i>Zosterops senegalensis</i>
116.	Nubian Woodpecker	<i>Campethera nubica</i>

117.	Olive Thrush	<i>Turdus olivaceus</i>
118.	Orange-breasted Bushshrike	<i>Chlorophoneus sulfureopectus</i>
119.	Pallid Harrier	<i>Circus macrourus</i>
120.	Pied Crow	<i>Corvus albus</i>
121.	Pied Kingfisher	<i>Ceryle rudis</i>
122.	Pin-tailed Whydah	<i>Vidua macroura</i>
123.	Plain-backed Pipit	<i>Anthus leucophrys</i>
124.	Purple Grenadier	<i>Granatina ianthinogaster</i>
125.	Purple Roller	<i>Coracias naevius</i>
126.	Rattling Cisticola	<i>Cisticola chiniana</i>
127.	Red-backed Shrike	<i>Lanius collurio</i>
128.	Red-billed Teal	<i>Anas erythrorhyncha</i>
129.	Red-capped Lark	<i>Calandrella cinerea</i>
130.	Red-cheeked Cordonbleu	<i>Uraeginthus bengalus</i>
131.	Red-eyed Dove	<i>Streptopelia semitorquata</i>
132.	Red-faced Crombec	<i>Sylvietta whytii</i>
133.	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>
134.	Red-headed Weaver	<i>Anaplectes rubriceps</i>
135.	Red-throated Pipit	<i>Anthus cervinus</i>
136.	Red-winged Starling	<i>Onychognathus morio</i>
137.	Reed Cormorant	<i>Microcarbo africanus</i>
138.	Rock Martin	<i>Ptyonoprogne fuligula</i>
139.	Rueppell's Robin-Chat	<i>Cossypha semirufa</i>
140.	Rufous Chatterer	<i>Argya rubiginosa</i>
141.	Rufous-naped Lark	<i>Mirafrapa africana</i>
142.	Ruppell's Starling	<i>Lamprotornis purpuroptera</i>
143.	Scaly-throated Honeyguide	<i>Indicator variegatus</i>
144.	Scarlet-chested Sunbird	<i>Chalcomitra senegalensis</i>
145.	Secretarybird	<i>Sagittarius serpentarius</i>
146.	Slate-colored Boubou	<i>Laniarius funebris</i>
147.	Southern Black Flycatcher	<i>Melaenornis pammelaina</i>
148.	Speckled Mousebird	<i>Colius striatus</i>
149.	Speke's Weaver	<i>Ploceus spekei</i>
150.	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>
151.	Spotted Flycatcher	<i>Muscicapa striata</i>
152.	Spotted Thick-knee	<i>Burhinus capensis</i>
153.	Streaky Seedeater	<i>Crithagra striolata</i>
154.	Striated Heron	<i>Butorides striata</i>
155.	Superb Starling	<i>Lamprotornis superbus</i>
156.	Tambourine Dove	<i>Turtur tympanistra</i>
157.	Tawny-flanked Prinia	<i>Prinia subflava</i>
158.	Thrush Nightingale	<i>Luscinia luscinia</i>
159.	Tree Pipit	<i>Anthus trivialis</i>

160.	Trumpeter Hornbill	<i>Bycanistes buccinator</i>
161.	Tullberg's Woodpecker	<i>Campethera tullbergi</i>
162.	Variable Sunbird	<i>Cinnyris venustus</i>
163.	Verreaux's Eagle-Owl	<i>Bubo lacteus</i>
164.	Wailing Cisticola	<i>Cisticola lais</i>
165.	Western Cattle Egret	<i>Bubulcus ibis</i>
166.	Western Marsh Harrier	<i>Circus aeruginosus</i>
167.	Whinchat	<i>Saxicola rubetra</i>
168.	White Stork	<i>Ciconia Ciconia</i>
169.	White-bellied Bustard	<i>Eupodotis senegalensis</i>
170.	White-bellied Go-away-bird	<i>Crinifer leucogaster</i>
171.	White-bellied Tit	<i>Melaniparus albiventris</i>
172.	White-breasted Cormorant	<i>Phalacrocorax lucidus</i>
173.	White-browed Coucal	<i>Centropus superciliosus</i>
174.	White-browed Robin-Chat	<i>Cossypha heuglini</i>
175.	White-eyed Slaty Flycatcher	<i>Melaenornis fischeri</i>
176.	Willow Warbler	<i>Phylloscopus trochilus</i>
177.	Wood Sandpiper	<i>Tringa glareola</i>
178.	Woolly-necked Stork	<i>Ciconia episcopus</i>
179.	Yellow Bishop	<i>Euplectes capensis</i>
180.	Yellow-breasted Apalis	<i>Apalis flava</i>
181.	Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>
182.	Yellow-throated Longclaw	<i>Macronyx croceus</i>
183.	Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>

### 3.3.3.1 Impact Assessment

#### Construction Phase

During construction, avifauna within the near surrounds of the development area will be disturbed due to noise, vibration, and human and vehicle presence. Disturbance impacts during construction are likely to be temporary and short lived. Impacts as the construction work will be progressive (overall program of 18-24 months). Although disturbance and displacement impacts are likely to be temporary and limited in their magnitude, if combined with the impacts of direct habitat loss, it could lead to disturbance of wild fauna. Based on the survey carried out for the ESIA, it is not expected that there will be any sensitive species of international or local importance in the Project area.

The habitats within the transmission line RoW are primarily modified and are considered to have a low sensitivity. The impact is direct and negative; resulting from the land take and disturbance during construction. The extent of the impact presented is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is medium. Based on the analysis provided above, the impact of the project to avifauna will be a **Moderate** negative impact pre-mitigation.

Table 10-Pre-Mitigation Impact Assessment- Avifauna during Construction

Impact	Avifauna during Construction		
	Negative	Positive	Neutral

Impact Nature	Disturbance to avifauna species and loss of habitat as a result of the RoW or degradation to environment during construction				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the project (i.e., construction activities) and the fauna population along the transmission lines				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The effect is considered temporary as it will only occur during the construction period				
Impact Extent	Local	Regional	International		
	Impact is limited to AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of the transmission line RoW's and access roads, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to fauna in these areas.				
Frequency	Once off				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity/Value/ Importance*	Low	Medium	High		
	The sensitivity is considered low due to the disturbed and modified habitats that occur along the transmission line RoW. Only small sections of the Forest and areas near the forest may have moderate sensitivity				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude is medium and the sensitivity is low, the overall significance is considered to be of moderate significance.				

### Operation Phase

During operation, there is the potential for bird strikes to occur along the transmission lines. This is most likely for large bird species, migrating species and species which have a varied flight pattern (dipping and circling). During the operational phase there is the potential for impacts on avian populations as a result of direct strike with the transmission line and pylons (bird collision) and by electrocution. A number of species of large birds suffer losses resulting from electrocution. This would mainly affect birds associated with the site; and electrocutions on power supply structures by raptors and other medium sized birds on passage. Birds sitting on power poles and /or conductors could cause short circuits between energized wires or short to ground especially numerous medium and large sized birds using the power poles as perching, roosting, and even nesting sites. Birds are able to cause electrical faults (short circuits on power lines through Bird pollution). The species of bird which are most likely to be impacted by collision with transmission lines are large species (such as raptors

and waterfowl), birds that regularly migrate across the path of the transmission line (either daily or seasonal migration) and species whose flight patterns result in an increased time spent at transmission line height in the area of the development (predominantly display flight activities such as looping or circling repeatedly in the area). None of the species such as raptors and waterfowls are found within the proposed transmission route.

Collisions are a significant threat posed by overhead lines to birds. Collision with power lines is a lesser-known problem than electrocution and is harder to detect because it can occur at any point along the transmission line. Collision risk is influenced by the topography of surrounding terrain and the proximity of lines and pylons to nests and other areas used frequently by local species. Potential impact through collision could occur along river valleys that are mostly utilized by birds especially during the dry season. In most cases the impact of collision would lead to immediate death or fatal injuries.

Lake Baringo & Lake Bogoria are important bird areas though they are not within the transmission line route. There are wildlife within Baringo and Laikipia Counties though there is no wildlife migratory route traversing the transmission line route. The impact on avian populations as a result of direct strike with the transmission line and pylons (bird collision) and by electrocution is directly negative, will be permanent as the lines will be in place throughout the project life. The extent of the impact is restricted to the Project RoW and therefore local in nature. The magnitude of the impact is considered to be low. Based on the analysis provided above, the impact of direct loss and degradation of habitat will be of **Minor** significance pre-mitigation

Table 11-Pre-Mitigation Impact Assessment- Avifauna during Operations

Impact		Avifauna during Operations			
Impact Nature	Negative	Positive	Neutral		
	Increase in bird mortality due to bird strikes during operation				
Impact Type	Direct	Indirect	Induced		
	Impact is as a result of a direct interaction between the erection of the transmission lines and the bird species along the RoW				
Impact Duration	Temporary	Short Term	Long Term	Permanent	
	The impact is considered permanent throughout the project life.				
Impact Extent	Local	Regional	International		
	Impact is limited to the Project AoI				
Impact Scale	The impact is considered medium scale. Although the impact could occur across the whole length of each of the transmission line RoW's, large sections of the lines are in built up urban areas and there is a decreased risk of impacts to Avifauna in these areas.				
Frequency	The frequency is expected to be occasional				
Impact	Positive	Negligible	Small	Medium	Large

Magnitude	The impact magnitude is expected to be small due to bird mortality		
Resource/ Receptor Sensitivity	Low	Medium	High
	The sensitivity is considered low, birds of conservation significance are not expected along the transmission line RoW.		
Impact Significance	Negligible	Minor	Moderate
	Considering the magnitude of the impact is small and the sensitivity is low the overall significance is considered to be of minor significance		

### 3.3.3.2 Mitigation Measures

In addition to the controls mentioned above, as well as those specified for mitigating impacts to flora and vegetation the following mitigation measures are recommended during operations:

- In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;
- Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure
- Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires
- Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;
- No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)
- Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.
- All terminal structures (transformers) should be constructed with sufficient insulation on jumper wires and surge arrestors
- Contractor should consider installing line marking to increase the visibility of the line. There are three general types of line marking devices: aerial marker spheres, spirals, and suspended devices

### Decommissioning Impacts on Avifauna

Avifauna within the surrounds of the activities may be disturbed by noise, vehicles, and human presence during decommissioning. The disturbance will be temporary and short lived, and the impact will be **negligible**.

### 3.3.3.3 Residual Impact

The impact significance is **Minor** after mitigation measures during construction and **Negligible** post mitigation for operations. There will be some habitat loss because of the construction, however the habitat is modified and not expected to have conservational value.

Table 12-Residual Impact Significance-Impacts on Avifauna

Impact	Project Phase	Significance (Pre-Mitigation)	Residual Impact Significance (Post Mitigation)
Disturbance to avifauna species and degradation to environment during construction	Construction	Moderate	Minor
Increase in bird mortality due to bird strikes during operation	Operation	Minor	Negligible
Disturbance to avifauna species and degradation to environment during decommissioning	Decommissioning	Negligible	Negligible



## 4 ESMP FOR BIODIVERSITY MANAGEMENT

### 4.1 CONSTRUCTION PHASE

Table 13- ESMP for Biodiversity Management during the construction Phase

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>Construction Phase</b>				
<b>Impact on Flora</b>	Loss of biodiversity.  Fragmentation of habitat.	<b>1:</b> Avoidance of impacts should be prioritized. , it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.	1,500,000	Contractor Civil Engineer & Environmental Team Implementation role)
		<b>2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;		
		<b>3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;		
		<b>4:</b> There should be no deviation from the access road position without prior discussions with the authorities;		
		<b>5:</b> Firewood collection by the project's employees should be strictly forbidden.		
		<b>6:</b> Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;		
				KETRACO Civil Engineer & Environmental Safeguards Team (Supervisory and monitoring role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>7:</b> Materials (e.g., pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and</p> <p><b>8:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		
<b>Impact on Fauna</b>	-Disturbance due to noise, vibrations, and vehicle presence.	<p><b>1:</b> All areas disturbed by construction activities shall be landscaped and rehabilitated;</p> <p><b>2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p> <p><b>6:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>7:</b> Restrict construction to day time</p> <p><b>8:</b> Apply applicable protected areas regulations</p>	1,100,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team (Supervisory and monitoring role)</p>

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		9: No blockage of wildlife migratory routes		
Impact on Avifauna	-Disturbance due to noise, vibrations, and vehicle presence.	1: In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;	8,000,000	Contractor Civil Engineer & Environmental Team Implementation role)
		2: Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energized parts of transmission infrastructure		
		3: Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energized wires		
		4: Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;	2,700,000	
		5: No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)		

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>6:</b> All animal dens in close proximity to the work areas must be marked as no-go areas.</p> <p><b>7:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p>		<p>KETRACO Civil Engineer &amp; Environmental Safeguards Team</p> <p>(Supervisory and monitoring role)</p>

## 4.2 OPERATION PHASE

Table 14-- ESMP for Biodiversity Management during the construction Phase

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
Impact on Flora	-No Large impact on existing flora and vegetation.	<p><b>1:</b> Avoidance of impacts should be prioritized; it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.</p>	2,400,000	KETRACO Civil Engineer & Environmental Safeguards Team
		<p><b>2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;</p>		
		<p><b>3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;</p>		

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>4:</b> There should be no deviation from the access road position without prior discussions with the authorities;</p> <p><b>5:</b> Firewood collection by the project's employees should be strictly forbidden.</p> <p><b>6:</b> Rehabilitation of temporary construction sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;</p> <p><b>7:</b> Materials (e.g., pylons and cables) and equipment should not be delivered to the site prematurely, as this could result in need for laydown or storage areas and additional areas being cleared or affected unnecessarily; and</p> <p><b>8:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>Impact on Fauna</b>	<p>~ Disturbance due to noise, vibrations and vehicle presence.</p> <p>~ Direct strike with the transmission line and pylons (bird collision) and by electrocution</p> <p>~ Change of avian flight patterns for some species.</p>	<p><b>1:</b> All areas disturbed by maintenance activities shall be landscaped and rehabilitated;</p> <p><b>2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p>	1,200,000	KETRACO Civil Engineer & Environmental Safeguards Team
<b>Impact on Avifauna</b>	<p>~ Direct strike with the transmission line and pylons (bird collision) and by electrocution</p> <p>~ Change of avian flight patterns for some species</p>	<p><b>1:</b> In the event of receiving confirmation of regular bird strikes along the transmission line, high-visibility markers should be installed to make the lines more visible to birds, to reduce the risk of collision;</p> <p><b>2:</b> Where feasible and safe, provide artificial bird-safe perches and nesting platforms placed at a safe distance from the energised parts of transmission infrastructure</p> <p><b>3:</b> Cross-arms, insulators and other parts of the power lines can be constructed such that there is no space for birds to perch where they can come into contact with energised wires</p>	4,250,000	KETRACO Civil Engineer & Environmental Safeguards Team

PHASE/ IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>4:</b> Undertake regular (at least annual) monitoring of the transmission line for evidence of birds nesting on the pylons. In the event of nesting, anti-perch and nest devices will be installed to discourage birds from regularly visiting these structures. These will be replaced when necessary;</p> <p><b>5:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p>	2,700,000	KETRACO Environmental Safeguards Team

#### 4.3 DECOMMISSIONING PHASE

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>Impact on Flora and Vegetation</b>	Loss of biodiversity.	<b>1:</b> Avoidance of impacts should be prioritized; it is strongly recommended to closely/re-route follow the main road along these transmission-line segments. Where impact avoidance is not possible, existing indigenous vegetation must be kept intact, where possible. Vegetation will be removed only as absolutely necessary.	1,100,000	Contractor Civil Engineer & Environmental Team Implementation role)
	Fragmentation of habitat.	<b>2:</b> Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and organic waste and debris from clearing;		
		<b>3:</b> Alien invasive vegetation should be removed immediately and disposed of properly, at a licensed waste disposal facility as necessary;		



IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<p><b>4:</b> There should be no deviation from the access road position without prior discussions with the authorities;</p> <p><b>5:</b> Firewood collection by the project's employees should be strictly forbidden.</p> <p><b>6:</b> Rehabilitation of temporary decommissioning sites and pioneer camps (if needed) should be done as swiftly as possible and always with suitable native grasses and other plants – construction of new camps is unlikely to happen;</p> <p><b>7:</b> Whenever possible, all damaged areas shall be reinstated and rehabilitated upon completion of the contract to as near pre-construction conditions as possible</p>		

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
<b>Impact on Fauna</b>	-Disturbance due to noise, vibrations and vehicle presence.	<p><b>1:</b> All areas disturbed by decommissioning activities shall be landscaped and rehabilitated;</p> <p><b>2:</b> Vegetation that does not grow high enough to cause interference with the overhead power lines, or cause a fire hazard, should not be trimmed or cut unless it is growing in the road access area</p> <p><b>3:</b> Speed of project vehicles should be controlled at a maximum limit of 40 km/h to minimise roadkill</p> <p><b>4:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>5:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during any routine maintenance of the project's infrastructure.</p> <p><b>6:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct).</p>	650,000	<p>Contractor Civil Engineer &amp; Environmental Team Implementation role)</p> <p>KETRACO Civil Engineer &amp; Environmental Safeguards Team</p> <p>(Supervisory and monitoring role)</p>
<b>Impact on Avifauna</b>	-Disturbance due to noise, vibrations and vehicle presence.	<p><b>1:</b> No hunting by Project personnel is to be tolerated under any circumstances (this measure should be a part of worker codes of conduct)</p> <p><b>2:</b> All animal dens in close proximity to the work areas must be marked as no-go areas.</p>	320,000	Contractor Civil Engineer & Environmental Team Implementation role)

IMPACT TYPE	POTENTIAL IMPACT	MITIGATION MEASURES	COST	RESPONSIBILITY
		<b>3:</b> Guidance shall be given to all staff that they are not allowed to harm any animals during decommissioning.		KETRACO Civil Engineer & Environmental Safeguards Team  (Supervisory and monitoring role)

## 5 RESPONSIBILITY FOR IMPLEMENTATION OF THE BMP AND ESMP

The Contractor's Health, Safety, Environment and Social (HSES) division under the supervision of the KETRACO's Project Implementation Team (PIT) and Environmental Safeguards team, will manage the implementation of the Project's biodiversity management practices and will take primary ownership for ensuring compliance with this Plan. Adherence to the recommendations contained within the Plan will be mandatory, as will compliance with relevant laws and regulations. All contractors and their sub-contractors undertaking activities for the contractor will be required to comply with the protocols contained in this Plan.

### 5.1 ROLES AND RESPONSIBILITIES

Relevant roles and responsibilities have been developed for the implementation of this BMP. These are outlined in Table 15 below:

Table 15-Roles and responsibilities in the implementation of the BMP

Role	Responsibilities
KETRACO Environmental Safeguards team	<ul style="list-style-type: none"><li>Bears overall responsibility for the implementation of this BMP. KETRACO shall provide supervision and monitoring of the contractor during the ESMP and BMP's implementation within the project life cycle.</li></ul>
Operations Manager	<ul style="list-style-type: none"><li>Approve sufficient resources for the implementation of this plan</li></ul>
The Contractor's Environment and Community Manager	<ul style="list-style-type: none"><li>Approve sufficient resources for the implementation of this plan</li><li>Assist with external reporting requirements as well as subsequent revisions of this plan.</li></ul>
The contractor's Environment & Community Coordinators	<ul style="list-style-type: none"><li>Facilitate the external reporting requirements outlined in this plan;</li><li>Undertaken training as required to communicate the requirements of this plan to all relevant personnel and contractors;</li></ul>
The Contractor's Technical Services Manager	<ul style="list-style-type: none"><li>Allow sufficient time and resources in the mine planning process to salvage ecological resources from areas to be disturbed;</li></ul>
The Contractor's Environment & Community Officers	<ul style="list-style-type: none"><li>Coordinate the day-to-day implementation of this BMP, including ecological management activities;</li><li>Authorise clearing activities in accordance with the BMP;</li><li>Coordinate the completion of the monitoring programs outlined in this BMP;</li><li>Assist with external reporting requirements, as well as subsequent revisions of this BMP</li></ul>
All personnel and contractors	<ul style="list-style-type: none"><li>Undertake all activities in accordance with the requirements of this plan</li></ul>

## **5.2 TRAINING REQUIREMENTS**

The Contractor(s) shall implement a training programme to ensure that the workforce (including management, all other employees and workers, other contractors, and sub-contractors) are aware, committed, and competent to manage and operate in the workplace in accordance with relevant policies and standards.

Environmental Awareness Training- To ensure ESMP compliance and to include management actions for protecting biodiversity, ecosystems, ecosystem services, and environment in general.

## **5.3 TIMELINES AND REPORTING**

The implementation of the BMP is expected to be continuous throughout the project period. The frequency of monitoring should be frequent with annual compliance audits to identify risks and gaps. Monitoring reports will be undertaken on a quarterly basis throughout the project cycle.





## **ASSESSING BIRDS AT RISK OF COLLISION, ELECTROCUTION, OR DISPLACEMENT**

**FOR**

### **APPROXIMATELY 95KM KABARNET-RUMURUTI 132KV DOUBLE CIRCUIT TRANSMISSION LINE TRAVERSING LAIKIPIA AND BARINGO COUNTIES**

**Addressing Issue 2:** Provide mitigation measures for the prevention of collision and electrocution of birds highlighting the endangered endemic and threatened flora and fauna within Kinyo, Ol Arabel and Lariak forests.

**October 2022**



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## **1. OVERVIEW**

The Government of Kenya (GoK), through the Kenya Electricity Transmission Company (KETRACO), intends to construct a 132 KV overhead transmission line between two substations, one in Kabarnet and the other in Rumuruti.

If not designed safely such a high voltage transmission line and the distribution lines associated with it that connect to the substations, can have devastating impacts on birds, especially large soaring birds such as vultures, eagles, pelicans, storks, cranes, ducks and geese. These birds are at a potential risk of collision, obstruction or electrocution by the line. Small birds are also at risk of displacement especially from clearing of the wayleave.

Consequently, KETRACO tasked an expert in ornithology to conduct surveys along the line and address some of the issues raised by NEMA. A survey was conducted from 13 to 17 September 2022.

A total of five critical habitats were identified along the line. These were;

1. Kinyo Forest,
2. River Perkerra bridge,
3. Stretch between Lake Baringo and Lake Bogoria,
4. Arabal dryland thicket and
5. Lariak Forest.

## **2. FIELD METHODS**

A rapid sample of birds in these critical habitats was attained using two methods, Vantage point surveys and Point Count on Line transects.

### **2.1 Vantage Point Observations for Target Species**

A Vantage Point (VP) survey is designed to quantify the level of flight activity and its distribution over some given survey area. Vantage Point surveys were used to assess birds along the grid transmission line. These surveys comprise of a series of watches from a fixed location to quantify the flight activity of birds within the observed section of the transmission line. The birds of interest here were large or medium sized and are at risk of colliding, being obstructed or electrocuted by the transmission line. They are referred to as target species elsewhere in the report.

## **2.2. Point Counts (PCs) on Line transects for non-target species**

Point Counts were used to estimate the distribution and density of passerines that are likely to be displaced by clearing of the wayleave to pave way for the transmission line. The PCs were performed along line transects marked regularly along the transmission line. All birds seen or heard within a radius of 50 m will be recorded at each census station located after every 200 m along the 2000 m straight line transects.

## **2.3 Total counts**

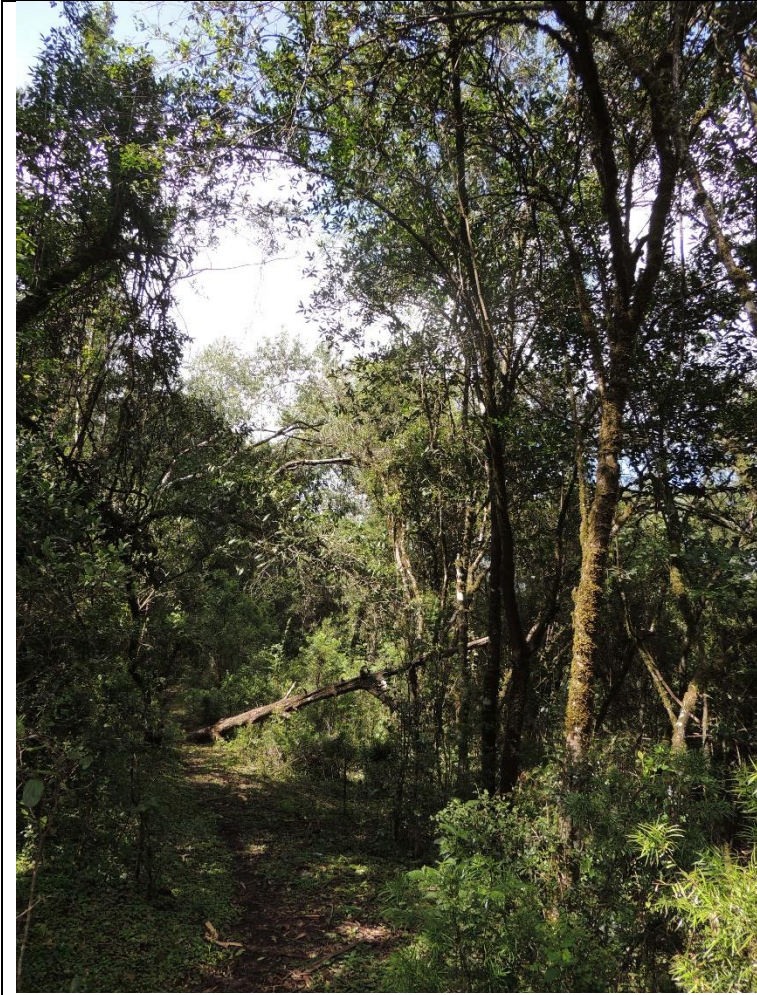
Total counts rely on the ability to see the birds being counted using binoculars or telescopes. This method was used to count congregatory waterbirds at the section where the line crosses between Lake Baringo and Lake Bogoria.

## **3. FINDINGS**

The critical habitats were visited and point counts and vantage point surveys conducted. Below is a summary of the findings.

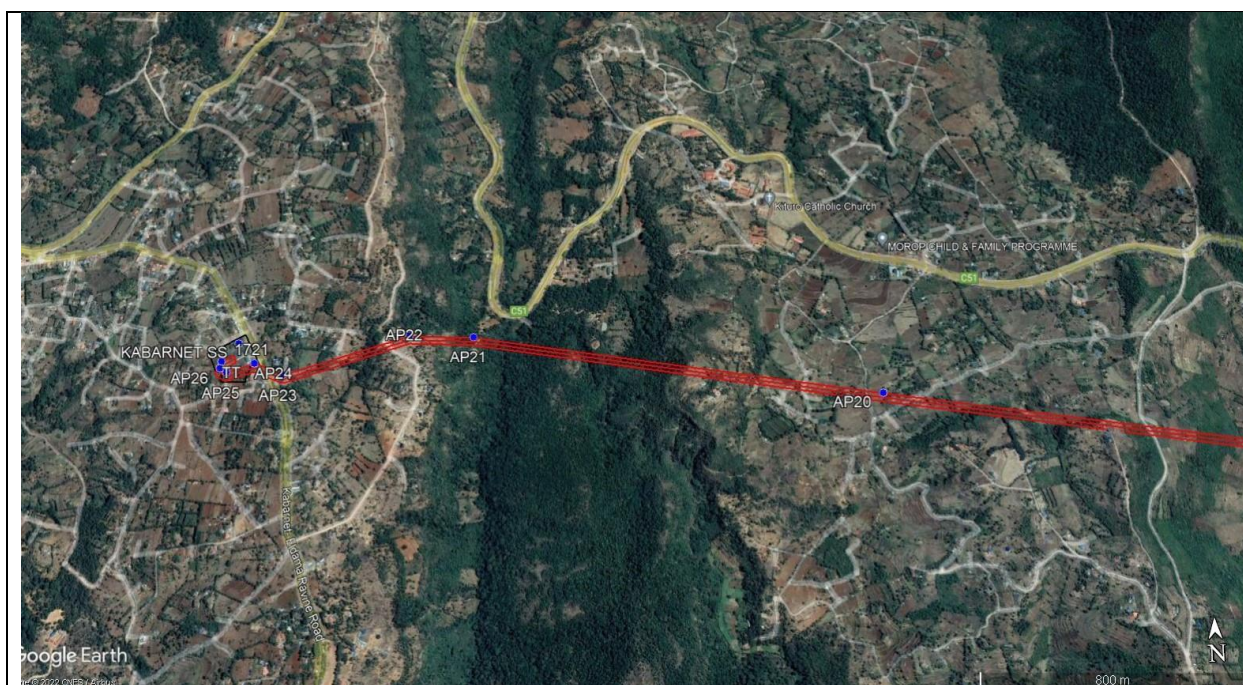
### **3.1 Kinyo Forest**

This is highland forest at an altitude of about 2000 m above sea level (Fig. 1). The forest patch is on the western outskirts of Kabarnet town and is under the custody of both the Kenya Forest Service (KFS) and the Kenya Wildlife Service (KWS).



**Fig. 1:** Footpath through Kinyo Forest.

The transmission line cuts through the forest at the section shown in Figure 2 below.



**Fig.2:** Section of Kinyo Forest traversed by the transmission line.

The transmission line cuts through the forest for a distance of about 1 kilometer, from AP 22 to AP 20 south of the Kabarnet – Marigat road.

At the Vantage point, three target species of birds of prey that could potentially collide with the power line or suffer electrocution were recorded. These were; Augur Buzzard *Buteo augur*, African Goshawk *Accipiter tachiro* and Brown Snake Eagle *Circaetus cinereus*. Other target species were; Black and White Casqued Hornbill *Bycanistes subcylindricus* and Crowned Hornbill *Lophoceros alboterminatus*. None of these target species is classified by the IUCN as threatened.

Bird species that are likely to be displaced by the clearing of the wayleave (non-target) species are listed below in Table 1.

**Table 1:** Non-target species at Kinyo Forest wayleave.

	Common Name	Scientific Name	IUCN Status
1.	Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>	Least Concern
2.	African Dusky Flycatcher	<i>Muscicapa adusta</i>	Least Concern
3.	Tropical Boubou	<i>Laniarius aethiopicus</i>	Least Concern

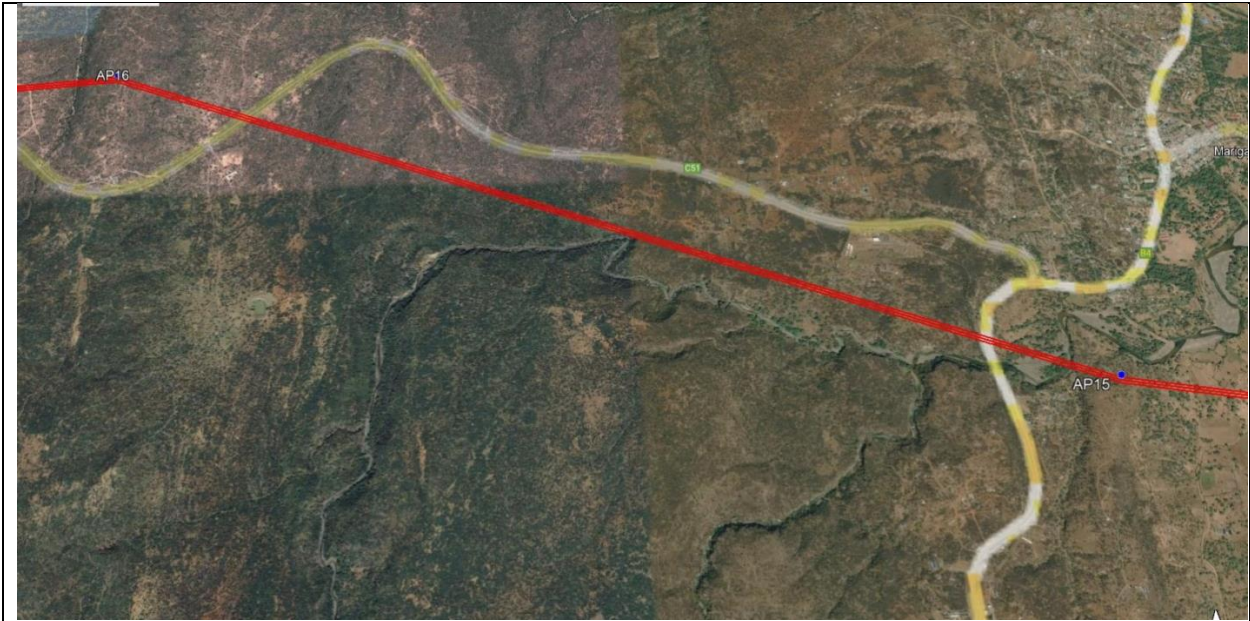


4.	Black Saw wing	<i>Psalidoprocne pristoptera</i>	Least Concern
5.	Grey-backed Camaroptera	<i>Camaroptera brachyura</i>	Least Concern
6.	Crowned Hornbill	<i>Lophoceros alboterminatus</i>	Least Concern
7.	Ross's Turaco	<i>Tauraco rossae</i>	Least Concern
8.	Black and White Casqued Hornbill	<i>Bycanistes subcylindricus</i>	Least Concern
9.	Tambourine Dove	<i>Turtur tympanistria</i>	Least Concern
10.	Hadada Ibis	<i>Bostrychia hagedash</i>	Least Concern
11.	African Goshawk	<i>(Accipiter tachiro</i>	Least Concern
12.	Narina's Trogon	<i>Apaloderma narina</i>	Least Concern
13.	White-starred Forest Robin	<i>Pogonocichla stellata</i>	Least Concern
14.	Olive Pigeon	<i>Columba arquatrix</i>	Least Concern
15.	Grey Cuckooshrike	<i>Cebilepyris caesius</i>	Least Concern
16.	Cinnamon-chested Beeeater	<i>Merops oreobates</i>	Least Concern

**Conclusion:** None of the species recorded is classified as threatened by the IUCN. Most of the species found in this forest patch are common and widespread in Kenya. However, there is a potentially risk of some target species colliding with the conductors, especially the OPGW. At immediate risk are the flocking Black and White Casqued Hornbills that migrate from one forest fragment to the other. Therefore, marker balls, flappers and diverters should be installed between AP 22 and AP 20.

### 3.2 River Perkerra Bridge

This critical habitat is in the low dry acacia woodlands near Marigat town. The transmission line crosses river Perkerra near bridge along Marigat – Lake Bogoria road (Fig. 3).



**Fig.3:** Transmission line crossing river Perkerra

At the bridge are tall rocky cliffs about 50 – 60 m high as shown in Figure 4 below.



**Fig.4:** Rocky cliffs at Perkerra bridge



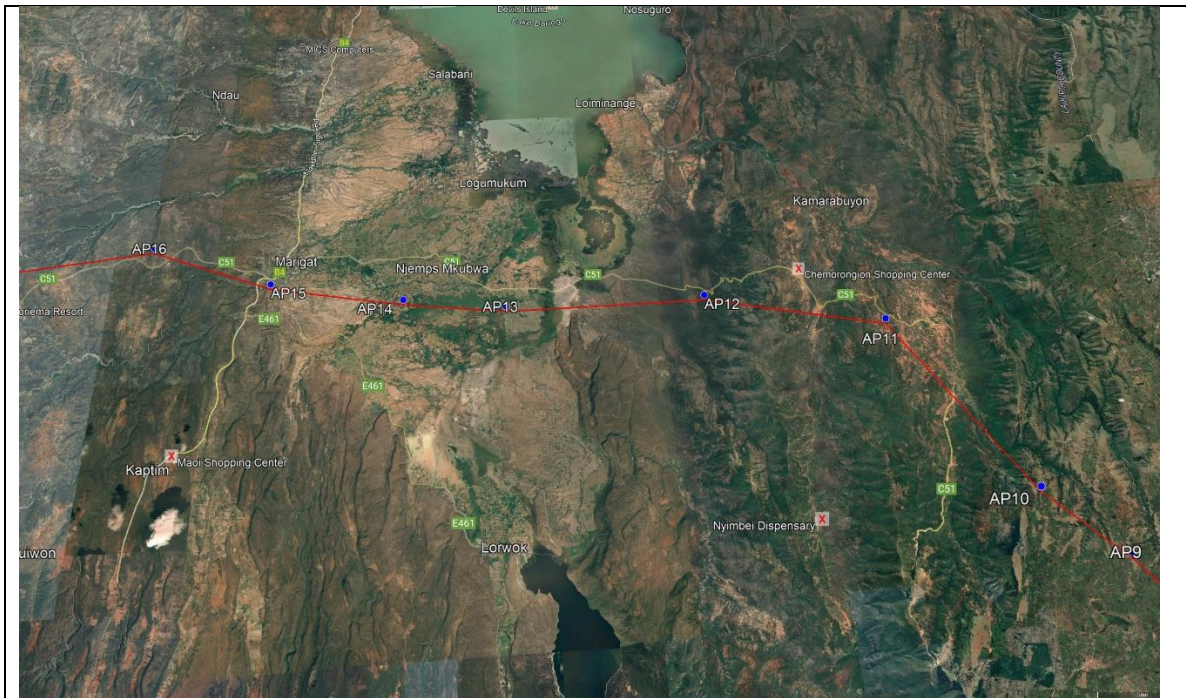


**Fig. 5:** Rock Kestrel resting on the cliffs near river Perkerra bridge south of Marigat town

**Conclusion:** These cliffs are important roosting sites for falcons, kestrels and perhaps eagles, some of which might occasionally breed on them (see Fig. 5). In addition, other soaring birds such as vultures, pelicans, ducks and geese might fly along the river in search of water and food, more so during the dry season. Marker balls are recommended between AP 16 and AP 15.

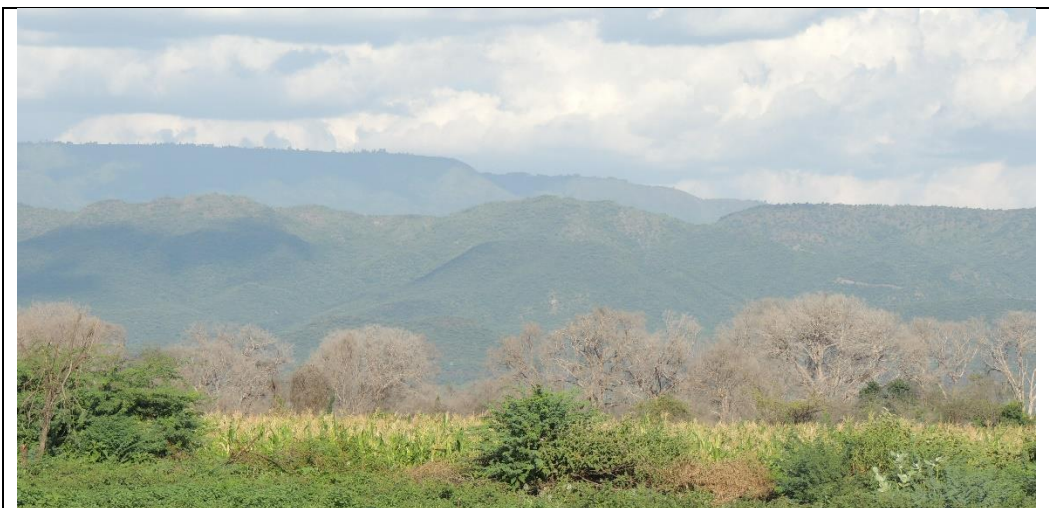
### **3.3 Stretch between Lake Baringo and Lake Bogoria**

This is the most sensitive critical habitat this transmission line will traverse (Fig. 6). The reason being that both Lakes Baringo and Bogoria harbor large numbers of waterbirds. Even though, the physical and chemical properties of the water in the two lakes differ, with Baringo being slightly alkaline and Bogoria completely alkaline, there is a substantial movement of waterbirds between the two lakes. The birds that are likely to migrate through the corridor where the line crosses. Some of the large birds at risk include; the African Fish Eagles, those that feed on the lakeshore such as herons, egrets, harriers and geese.



**Fig.6:** Stretch between Lake Baringo and Lake Bogoria

The ridge line on the eastern edge of the two lakes provide important updraft that can provide orographic lift to large soaring birds migrating along the East African Rift flyway (Fig.7). Some of the birds that migrate through this flyway include flamingoes, pelicans, ducks, geese and cranes.



**Fig. 7:** The ridge on the eastern edge of Lakes Baringo and Bogoria is ideal source of updraft important for large soaring birds.

A total count near Lake 94 recorded the birds shown in Table 2 below.

**Table 2:** Waterbirds at Lake 94.

Common Name	Scientific Name	Number	IUCN Status
Cattle Egret	<i>Bubulcus ibis</i>	26	Least Concern
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	25	Least Concern
Grey-crowned Crane	<i>Balaerica regulorum</i>	1	Endangered
African Marsh Harrier	<i>Circus ranivorus</i>	1	Least Concern
Sacred Ibis	<i>Threskiornis aethiopicus</i>	1	Least Concern
Great White Egret	<i>Ardea alba</i>	1	Least Concern
African Spoonbill	<i>Platalea alba</i>	5	Least Concern
Hadada Ibis	<i>Bostrychia hagedash</i>	2	Least Concern
Black-headed Heron	<i>Ardea melanocephala</i>	1	Least Concern

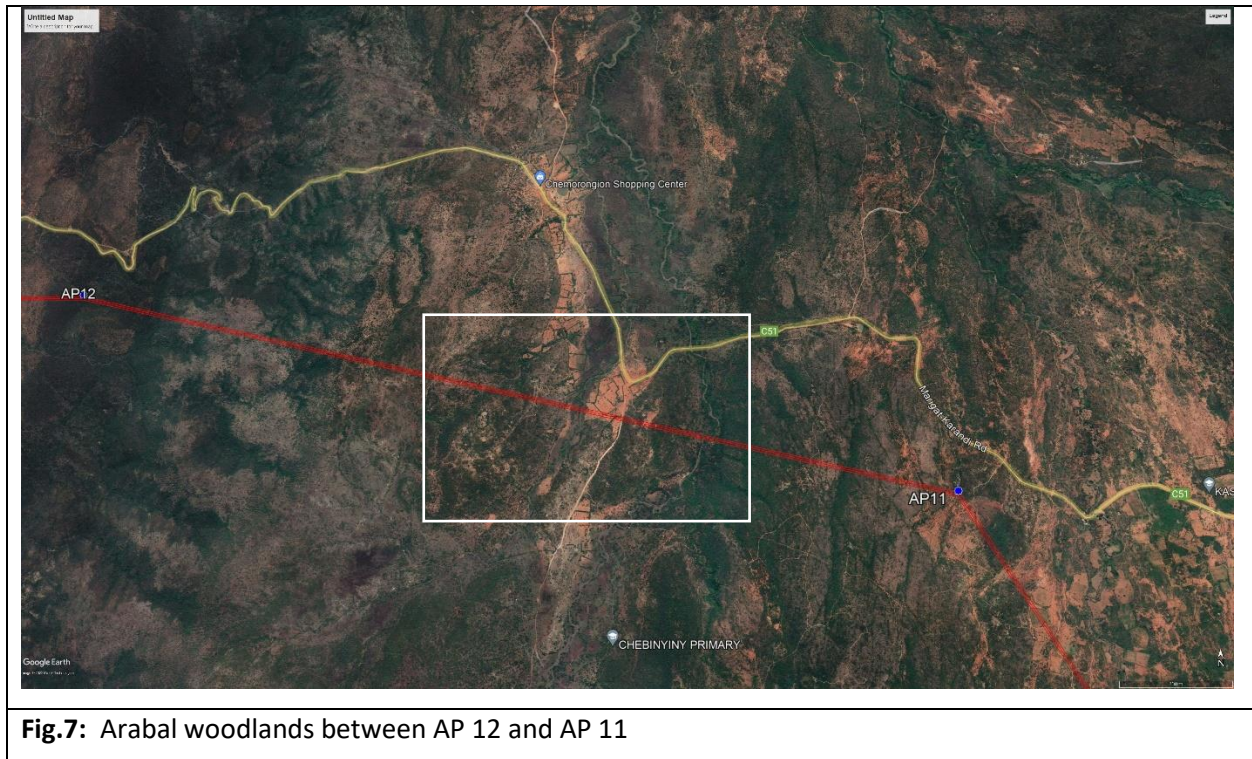
**Conclusion:** Grey Crowned Crane, recorded during the total count is classified by the IUCN as Endangered. The Near Threatened Lesser Flamingos with their stronghold at Lake Bogoria are likely to cross through that stretch while migrating north to Lake Turkana and eventually into Ethiopia. Therefore, the stretch between AP 15 and AP 11;

- should be made as visible to birds as possible. The conductors should be fitted with marker balls, diverters and flappers,
- the conductors can run on Guyed cross-rope suspension towers or
- can be installed underground.

### 3.4 Arabal

Arabal is a dry woodland interspersed with dry river beds, farms and homesteads as shown in Figure 7 below. The nearest shopping center, Chemorongoin, is located on the Marigat - Karandi road. It is important that **Arabal** is not confused with **OI Arabel forest** mentioned in the NEMA letter. OI Arabel forest fragment is situated up the escarpment towards Rumuruti and the transmission line does not pass through it.





Between AP 12 and AP 11, the transmission line cuts through this dry woodland and a dry river valley with continuous ridges on both sides (Fig.8). These ridges provide a good cushion of air over which large soaring birds can gain lift during migration.



**Fig.8:** Arabal woodland as seen from a Vantage point west of AP 11

During the survey, no target species was observed within from the Vantage point observations. However, some of the non-target species recorded here are shown in Table 3 below.

**Table 3:** Non target species recorded near the wayleave at Arabal.

	Common Name	Scientific Name	IUCN Status
1.	White-bellied Go-away Bird	<i>Criniferoides leucogaster</i>	Least Concern
2.	White-browed Sparrow Weaver	<i>Plocepasser mahali</i>	Least Concern
3.	Ring-necked Dove	<i>Streptopelia capicola</i>	Least Concern
4.	African Mourning Dove	<i>Streptopelia decipiens</i>	Least Concern
5.	D'Arnaud's Barbet	<i>Trachyphonus darnaudii</i>	Least Concern
6.	Amethyst Sunbird	<i>Chalcomitra amethystina</i>	Least Concern
7.	Slate-colored Boubou	<i>Laniarius funebris</i>	Least Concern

8.	Red-rumped Swallow	<i>Cecropis daurica</i>	Least Concern
9.	Lesser Masked Weaver	<i>Ploceus intermedius</i>	Least Concern
10.	Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>	Least Concern
11.	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>	Least Concern
12.	Chestnut Weaver	<i>Ploceus rubiginosus</i>	Least Concern
13.	African Grey Hornbill	<i>Lophoceros nasutus</i>	Least Concern
14.	Spotted Palm Thrush	<i>Cichladusa guttat</i>	Least Concern
15.	Common Drongo	<i>Dicrurus adsimilis</i>	Least Concern
16.	Brown-crowned Tchagra	<i>Tchagra australis</i>	Least Concern
17.	Common Bulbul	<i>Pycnonotus barbatus</i>	Least Concern
18.	Laughing Dove	<i>Spilopelia senegalensis</i>	Least Concern
19.	Greater Honeyguide	<i>Indicator</i>	Least Concern
20.	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>	Least Concern
21.	Von Der Decken's Hornbill	<i>Tockus deckeni</i>	Least Concern
22.	Blue-naped Mousebird	<i>Urocolius macrourus</i>	Least Concern
23.	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>	Least Concern
24.	Yellow-breasted Apalis	<i>Apalis flavida</i>	Least Concern
25.	Bronze Sunbird	<i>Nectarinia kilimensis</i>	Least Concern

**Conclusion:** The somewhat continuous ridge on both sides of the river valley is an ideal source of updraft important for migratory soaring birds. An informal interview with one of the locals revealed that Lesser Flamingos occasionally migrate through the corridor. These birds are likely to originate south from Lakes Magadi, Nakuru or Elmenteita heading north to Lake Turkana. The birds are at a potential risk of colliding with the transmission line, especially in bad weather when they have to fly low.

None of the small, non-target species is endemic or threatened. They are widespread. The negative impact of clearing the wayleave for construction will be insignificant on their populations.

### 3.5 Lariak Forest

Lariak forest fragment forms the north eastern tip of the Marmanet, Ol Arabel, Lariak forest complex. These mosaic of forest fragments, including Rumuruti forest were initially interconnected but have since been separated by budgeoning human settlements, farmlands and infrastructure.





**Fig. 9:** Lariak forest

At the Vantage point two target species were seen; African Harrier Hawk and Crowned Eagle. The Crowned Eagle is classified as Near Threatened.

The non-target species recorded by walking along the proposed wayleave are shown in the Table 4 below.

**Table 4:** Non-target species recorded near the wayleave in Lariak Forest.

	Common Name	Scientific Name	IUCN Status
1.	Ruppell's Robinchat	<i>Cossypha semirufa</i>	Least Concern
2.	Grey-backed Camaroptera	<i>Camaroptera brachyura</i>	Least Concern
3.	Red-eyed Dove	<i>Streptopelia semitorquata</i>	Least Concern
4.	Collared Sunbird	<i>Hedydipna collaris</i>	Least Concern
5.	Ring-necked Dove	<i>Streptopelia capicola</i>	Least Concern
6.	Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>	Least Concern
7.	Sacred Ibis	<i>Threskiornis aethiopicus</i>	Least Concern
8.	Hartlaub's Turaco	<i>Tauraco hartalaubi</i>	Least Concern
9.	Red-headed Weaver	<i>Anaplectes rubriceps</i>	Least Concern
10.	Common Bulbul	<i>Pycnonotus barbatus</i>	Least Concern



11.	White-eyed Slaty Flycatcher	<i>Melaenornis fischeri</i>	Least Concern
12.	Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>	Least Concern
13.	Tropical Boubou	<i>Laniarius aethiopicus</i>	Least Concern
14.	Grey Apalis	<i>Apalis cinerea</i>	Least Concern
15.	Dusky Turtle Dove	<i>Streptopelia lugens</i>	Least Concern
16.	Black-throated Wattle eye	<i>Platysteira peltata</i>	Least Concern
17.	Brown Woodland Warbler	<i>Phylloscopus umbrovirens</i>	Least Concern
18.	Golden-breasted Bunting	<i>Emberiza flaviventris</i>	Least Concern
19.	Pale Flycatcher	<i>Melaenornis pallidus</i>	Least Concern
20.	Cape Robinchat	<i>Cossypha caffra</i>	Least Concern

**Conclusion:** The forest fragment is home to the Near Threatened Crowned Eagle and clearly an important roosting and stop-over site for both resident and migratory birds. It is possible that it acts as a refuge for Critically endangered Hooded and White-backed Vultures during the dry season. Therefore, the impact of the transmission line should be kept to the bare minimum by adjusting the line to;

- cut across the forest at the narrowest section (red arrow in Fig. 9)
- go underground at the narrowest section or,
- follow the already existing road from Karandi to Rumuruti.

#### 4. PROPOSED GENERAL MITIGATION OR MANAGEMENT MEASURES

##### 4.1 Mitigation measures

Below are proposed mitigation or management measures for large soaring birds that are potentially at risk of obstruction, collision or electrocution from the construction, operation and decommissioning of the transmission line and the associated substations.

The birds at risk include storks, ducks, geese, pelicans, eagles and vultures.

##### 4.1.1 The Construction phase

During the construction phase, the following measures are highly recommended;

1. Marker balls, flappers and diverters should be installed between AP 22 and AP 20; AP 16 and AP 15; AP 15 and AP 11; and AP 5 and AP 4.
2. Perform simple nest searches within the proposed wayleave prior to clearance of any vegetation. If active nests are spotted, whenever possible, clearance of the vegetation should be delayed until breeding is complete and the chicks have successfully fledged.
3. If a nest of a target species is found on the wayleave, the breeding pair must be left undisturbed until they complete breeding.
4. Implement a card logging system where field workers including surveyors, construction workers and drivers report large birds they see in the field.
5. Engage the local communities and raise awareness to promote environmentally friendly approaches to waste disposal and management especially in Marigat and Karandi towns. This will minimize large congregations of Marabou Storks and Vultures, for example.
6. During construction, access roads, site offices and associated infrastructure should avoid thicker areas of bush and scrub habitat as this will reduce the impact on habitat loss and construction related disturbance on the majority of these assemblages of birds. Some bird assemblages are seasonal.

#### **4.1.2 The Operational Phase**

Working closely with the local community and other relevant stakeholders, implement an integrated operational bird management plan that should include the following;

1. Engage in gainful employment for local communities as Scouts with the task of raising awareness on the dangers of disposing animal carcass along the transmission line. The key aim is to avoid attracting target species near the line.
2. Engage an expert in ornithology, preferably from Nairobi Museum to train the Scouts in identifying and recording incidents of collision, bird strike or injury.

#### **4.1.3 The Decommissioning phase**

In the event that the transmission line is deemed redundant and must be replaced by new infrastructure, then restore and if possible rehabilitate the highlighted critical habitats along the way leave to their original state. This will facilitate the site to become suitable for foraging, roosting and breeding for birds. However, it is important to note that, the areas neighboring the wayleave are under pressure from other threats such as expanding human settlements, towns and agriculture.

## 4.2 Monitoring Measures

Below are measures that will lower the risk of mortality or morbidity of birds during the operational and decommissioning phase.

### 4.2.1 Operational Phase

#### Post-construction monitoring and nest searches

Post-construction monitoring will follow the same methods used during the Pre-construction phase, that is; Vantage Point surveys and Point Counts on Line Transects. The surveys can be conducted twice (2) every year for the first three (3) years of operation. The fundamental aim here is to continue documenting the presence of target species at the substation and at the critical habitats and record cases of collision and electrocution.

If the post-construction monitoring identifies fatalities of target species, then this will trigger a **population estimate** and **breeding study** for this species that will be conducted within the area where the dead birds were found. This study will determine if additional mitigation measures are required. If the species population and the number of breeding pairs is shrinking, then the project will effect specific 'supplemental feeding sites' as a measure to protect the species, especially vultures and eagles. These supplemental feeding sites are meant to boost the species reproductive success and will be considered as compensation for the birds that are likely to be lost every year. During the feeding exercise, the Scouts will also count these birds at their roosts and record their breeding activity.

#### Carcass Searches and disposal

The main aim of carcass searches will be to estimate the mortality rates of Vultures along selected sections of the transmission line. Scouts will conduct annual carcass searches, for a minimum of three (3) years. These searches will be conducted bi-annually along these sections. The data will then be used to isolate high risk areas as identified through the number of dead birds collected under the transmission line.

### 4.1.3 Decommissioning phase

No specific bird monitoring is required for the decommissioning phase.

## **5. CONCLUSION**

From the survey undertaken, it was noted that no birds listed under IUCN list of endangered were spotted. Most of the birds spotted were of least concern. Thus, if the proposed mitigation and monitoring measures are implemented, the project is achievable and sustainable.



## **ANALYSIS OF PROJECT ALTERNATIVES**

**FOR**

### **APPROXIMATELY 95KM KABARNET-RUMURUTI 132KV DOUBLE CIRCUIT TRANSMISSION LINE TRAVERSING LAIKIPIA AND BARINGO COUNTIES**

**Addressing Issue 4:** Justification for the transmission line traversing Lariak Forest and use of overhead pylons instead of underground cables.

**October 2022**

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# 1 INTRODUCTION

This document addresses issue No 4 raised by National Environment Management Authority (NEMA) during the review of the proposed Kabarnet-Rumuruti 132kv double circuit transmission Line traversing Laikipia and Baringo counties.

## 1.1 ALTERNATIVE TRANSMISSION LINE ROUTE

The analysis of alternatives route involved the evaluation of certain sensitivities associated with the various options. Table 1 below summarizes the sensitivity criteria used for the alternative analysis. Each sensitivity aspect was assigned a score and the score was used as a basis for comparison between options.

Table 1-Environmental and Social sensitivity criteria

Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
High	4	Dense permanent Housing (larger populations) or areas highly significant for livelihoods which are not available elsewhere.	Substantial or highly Significant infrastructure present (e.g., school, hospital, medical centre etc.).	Area is essential for principal livelihoods.	Presence of large number/highly sensitive intangible / living cultural heritage sites. e.g., graves or cemeteries or religious buildings.	Landscapes that: feature concentrations of biological diversity Including endemic species, and rare, threatened or endangered species, that	Major changes affecting a substantial part of the view, continuously visible for a long duration, or obstructing a	A high implementation cost factor due to a substantial increase in associated construction materials. This is due to factors such as unsuitable terrain,	Severe health effects for a large portion of the community



Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
						are significant at global, regional or national levels; and Feature ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of naturally occurring species in natural patterns of	substantial part or important elements of view. Contrast may dominate the view and be the major focus of viewer attention	transmission length changes with the aim of avoiding environmentally and socially sensitive areas etc	

Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
						distribution and abundance; and Feature rare, threatened, or endangered ecosystems, habitats refuges.			
Medium	3	Small-medium groups of houses, priority areas used frequently for livelihoods, or businesses potentially requiring economic	Some infrastructure present with some alternatives available.	Area is significant for principal livelihoods.	Individual grave sites.	Landscape features that Include ecosystems and ecosystem mosaics that are significant at global, regional, or national levels,	Clearly perceptible changes in views at intermediate distances, resulting in a either a distinct new element in a significant part of	A moderate implementation cost factor due to a perceptible increase in associated construction materials. This is due to factors such as unsuitable terrain,	Moderate Health effects for a larger portion of the community and severe health effects for a small portion of

Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
		Resettlement.				and that contain viable populations of naturally occurring species in natural patterns of distribution and abundance.	the view, or a more wide ranging, less concentrated change across a wider area. Contrasts may attract attention but should not dominate the view of the casual observer.	transmission length changes with the aim of avoiding environmentally and socially sensitive areas etc	the community
Low	2	Individual houses or Small communities,	Some infrastructure Present although	Area is used for livelihoods.	Intangible cultural heritage sites known to be used, e.g.,	Ecologically important areas that do not form part of recognized	Minor changes in views, at long distances or	A low implementation cost factor due to a negligible increase in	Non-permanent Health effects for a

Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
		Non-priority areas used for livelihoods.	Typically accessed at Alternatives sites.		views or landscapes.	protected areas	visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view. Contrasts may be seen but should not attract the attention of the casual observer.	associated construction materials. This is due to factors such as unsuitable terrain, transmission length changes with the aim of avoiding environmentally and socially sensitive areas	Larger portion of The community and moderate health effects for a small portion of the community
Negligible	1	No significant human land use for	No significant areas used to collect resources or	Area only occasionally used for	No significant Culturally sensitive areas.	Other areas not considered sensitive.	Change which is Barely visible, at a	No significant changes on the project	Non-permanent Health effects for

Category	Score	Physical and Economic Displacement	Community Infrastructure and Resources	Socio-Economics and Income-Generating / Subsistence Livelihoods	Socio-Cultural Characteristics and Intangible/ Living Cultural Heritage	Environmental Sensitivity	Aesthetic	Project implementation Cost	Community Health & Safety
		livelihoods / housing.	House infrastructure.	Livelihood activities.			very long distances, or visible for a very short duration, perhaps at an oblique angle, or which blends with the existing Acceptable contrasts are primarily natural ecological changes.	implementation cost factor	small portion of the community.

Comparison of the transmission line routing is provided as per Table 2 below:

**Table 2-Preferred Route**

Topic	Option 1: Transmission Line in accordance with KETRACO's Coordinates – Preferred route		Option 2. Transmission line Route in accordance with ESIA Team Analysis (Avoiding the Forests)	
	Analysis	Scoring	Analysis	Scoring
<b>Environmental Sensitivity</b>	This option would include the construction of the transmission line which will cross inside/into Lariak Forest (1.8km) long and which is considered sensitive. Due to the traversing of the route transmission line into the Lariak Forest the potential impacts on flora and fauna can be tentatively considered as high. Potential noise and air quality sensitive receptors are also high.	<b>3</b>	This option would include the construction of the transmission line avoiding Lariak Forest which is a sensitive ecosystem.	<b>1</b>
<b>Physical and Economic Displacement</b>	No significant human land use for livelihoods/housing as the line is optimized to avoid settlements	<b>1</b>	No significant human land use for livelihoods/housing as the line is optimized to avoid settlements.	<b>1</b>
<b>Community Infrastructure and Resources</b>	No significant areas used to collect resources	<b>1</b>	No significant areas used to collect resources.	<b>1</b>
<b>Socio-Economic and Income Generating Livelihoods</b>	Project route and areas along the 2 Counties used for livelihood activities.	<b>1</b>	Project route and areas along the 3 Counties used for livelihood activities.	<b>1</b>
<b>Socio-Cultural Characteristics and/Living Cultural Heritage</b>	As per the ESIA baseline, no culturally- sensitive areas.	<b>1</b>	As per the ESIA baseline, no culturally- sensitive areas.	<b>1</b>
<b>Aesthetics</b>	There are no other overhead transmission lines in the area, hence moderate impacts.	<b>2</b>	There are no other overhead transmission lines in the area, hence moderate impacts.	<b>2</b>
<b>Community Health and Safety</b>	Overhead transmission structures are clearly marked and have security mitigation measures to prevent harm to the	<b>1</b>	Same as Option 1.	<b>1</b>

	community, both during construction and operation phases. The line snapping and causing injury is a potential risk (although considered to be low). The line hardware used on the overhead transmission line is rated or designed higher than the conductor ultimate tensile strength and the conductor is only pulled to 20% of its ultimate tensile strength. Therefore, the likelihood of a transmission line snapping is possible but unlikely. Specifically, during operation, due to the transmission servitude being maintained, this risk is not material.			
<b>Construction cost</b>	A 1.7km section of the proposed kabarnet-Rumuruti TL will traverse through the Lariak forest. This stretch will traverse the southern end of the forest. Further, a 1 km section of the proposed kabarnet-Rumuruti TL will traverse through the Kinyo forest. These cumulatively have a minimal impact in relation to the overall project cost.. Thus, a low scoring factor.	<b>1</b>	Rerouting this line to avoid the forests will lead to an 11 km outbound stretch around the Lariak forest, a 3 km outbound stretch around the Kinyo forest. Cumulatively, this lengthening of the transmission line will significantly increases the overall project cost as well a pose other technical challenges due to unsuitable terrain. Thus, a high scoring factor	<b>4</b>
<b>Total Score</b>		<b>11</b>		<b>12</b>



### **Preferred Transmission Line Route A:**

In proposing the above line route, consideration was given to social, environmental, technical, and financial implications. The transmission line will generally follow open ground with minimum settlement to avoid areas of dense settlement and where impacts on environment and local people e.g., from loss of farmland or grazing land are minimal. The proposed route of the Kabarnet-Rumuruti transmission line will traverse ecologically sensitive areas such as Lariak and Kinyo forests. This proposed line routing was done in consideration of technical viability and cost-effectiveness by avoiding as much as possible excessively steep areas such as hills' escarpments and areas with high population. The following statements summarize the lengths traversed within the forests and the alternative outbound line options around the respective forests:

1. Lariak Forest is traversed by approx. **1.7km** while the outbound option would be **11km**.
2. Kinyo Forest is traversed by approx. **1km** while the outbound option would be **3km** with challenges of finding the route due to closeness to Tugen hills.

Therefore, there would be no added benefit of rerouting the route as all important parameters were considered in mapping the current route. However, the project proposes concrete mitigation measures to address the impacts on the forest which will be implemented in consultation with KFS.

### **Alternative Transmission Line Route B: Avoid Forest**

This ESIA is proposing an alternative route (Route B) which would primarily avoid the transmission line crossing into Lariak Forest as shown in Figure 1 below. This option would thereby ensure that the adverse impacts associated with clearing the vegetation in Lariak Forest is avoided. This option was deemed unfavourable due to the additional implementation cost associated with increase in length of the transmission line to orient the line around and outside the Lariak forest

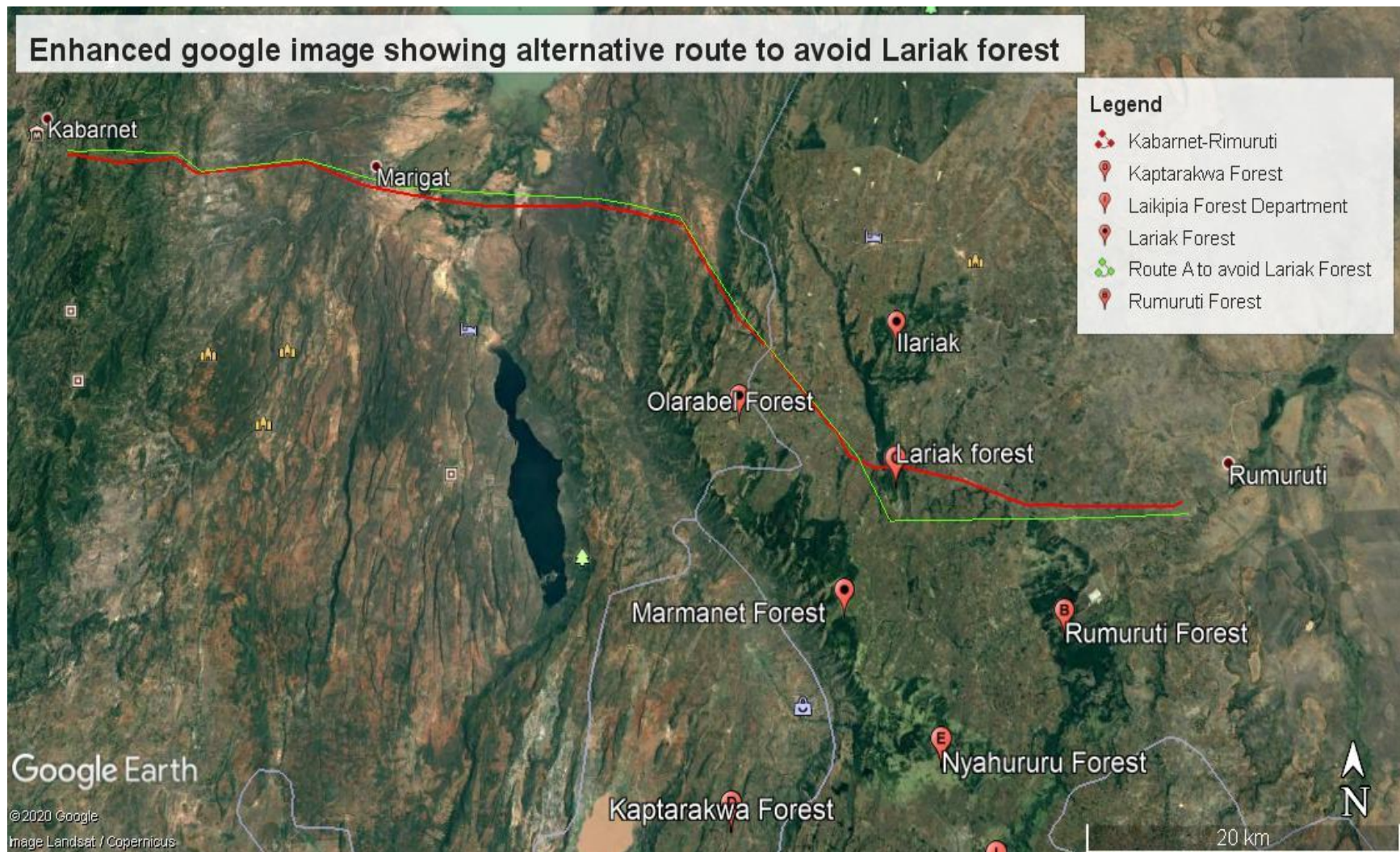


Figure 1-Alternative Line routes

## **1.2 THE PROPOSED DEVELOPMENT OPTION**

The existing network in Rumuruti and Kabarnet area is characterized by overloaded 33kV feeders which lead to numerous outages and subsequent loss of supply to customers. There is also expected load growth in Rumuruti for new industrial activities (meat processing facility). Kabarnet suffers poor voltage profiles and load shedding due to the long 33KV lines that currently supply the area. Even with the completion of Lessos – Kabarnet. The proposed Kabarnet -Rumuruti transmission line will thus:

1. Increase system reliability by enabling supply of hydro power from the hydros in Mt. Kenya to the Western Kenya region which has limited generation sources.
2. Improve the overall voltage profile and minimizing load shedding.

### **Evacuation/ Transmission options**

#### **Single/ Double Circuit Overhead Powerline**

The use of single/ double circuit overhead power lines to transmit electricity is considered the most appropriate technology and has been designed over many years for the existing environmental conditions and terrain as specified by KETRACO Specifications and best international practice. Based on all current technologies available, single/Double circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

- More cost-effective installation costs
- Less environmental damage during installation minimal area is disturbed during construction and operation (maintenance)
- More effective and cheaper maintenance costs over the lifetime of the power line

#### **Underground Cabling**

Underground cabling of high voltage power lines over long distances is not considered a feasible or environmentally practicable alternative for the following reasons:

- Underground cabling will incur significantly higher installation and maintenance costs
- It is more difficult and takes longer to isolate and repair faults on underground cables.
- There is increased potential for faulting at the transition point from underground cable to overhead power line.
- Underground cables require a larger area to be disturbed during construction and maintenance operations and hence have a bigger environmental disturbance footprint.
- Underground cabling requires the disturbance of a greater area when it comes to agriculture and other compatible land uses as the entire right of way becomes available for use as opposed to just the area around the towers.

Overhead power lines have been determined to be the most feasible option for the Kabarnet-Rumuruti 132kV line for the following reasons:

- Underground cabling will incur significantly higher installation and maintenance costs given the length of the power line;
- Overhead lines are far quicker and easier to repair should faults occur; and
- Relative to overhead lines, underground cables require a larger area to be disturbed during construction and maintenance operations.