

**UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESMENT STUDY REPORT FOR
THE PROPOSED 81KM,132KV NAROK-BOMET DOUBLE CIRCUIT TRANSMISSION LINE
IN NAROK AND BOMET COUNTIES**



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CERTIFICATION

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Assignment: To carry out an update of the Environmental & Social Impact Assessment Study report of the Proposed 81Km, Narok- Bomet 132kV double Circuit Transmission Line

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LIST OF ABBREVIATIONS

ADC	Agricultural Development Corporation
BOD	Biological Oxygen Demand
BS	British Standard
CBD	Convention on Biological Diversity
CC	County commissioner
CDF	Constituency Development Fund
CO ₂	Carbon dioxide
CSR	Corporate Social Responsibility
DCC	Deputy county commissioner
EA	Environmental Audit
ECDF	Economic Development Cooperation Fund
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMCA	Environmental Management and Coordination Act, 1999
EMP	Environment Management Plan
ERC	Energy Regulatory Commission
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender Based Violence
GHGs	Green House Gases
GoK	Government of Kenya
Ha	Hectare
HEP	Hydro Electric Power
HOD	Head of Department
HVF	Heavy Vehicle Fuel
IDO	Industrial Diesel Oil
IEIA	Integrated Environmental Impact Assessment
KCAA	Kenya Civil Aviation Authority
KCC	Kenya Cooperative Creameries
KenGen	Kenya Electricity Generating Company
KeRRA	Kenya Rural Roads Authority
KETRACO	Kenya Electricity Transmission Company
KMD	Kenya Meteorological Department
KPC	Kenya Pipeline Company
KPLC	Kenya Power & Lighting Company
KTNIP	Kenya Transmission Network Improvement Projects
kV	Kilo Volt
KW	Kilo Watt
KWS	Kenya Wildlife Service
L.R	Land Registration
LBDA	Lake Basin Development Authority
MOA	Ministry of Agriculture
MoALF	Ministry of Agriculture, Livestock and Fisheries
MSDS	Material Safety Data Sheet
MVA	Mega Volt Amps
NCBP	National Cereals and Produce Board
NEMA	National Environment Management Authority
NGOs	Non – Governmental Organizations
NFPA	National Fire Protection Association

NLC	National Land Commission
NOx	Oxides of Nitrogen
OSHA	Occupational Health and Safety Act
PDS	Project Development Services
PIT	Projects implementation Team
PM	Particulate Matter
PPE	Personal Protective Equipment
SEA	Sexual Exploitation and Abuse
SEM	Sustainable Environmental Management
SH	Sexual Harassment
SHE	Safety Health and Environment
Sox	Oxides of Sulphur
STD	Sexually Transmitted Diseases
UETCL	Uganda Electricity Transmission Company Limited
WRMA	Water Resources Management Authority

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EXECUTIVE SUMMARY

Introduction

The country's long-term development blueprint, Vision 2030 aims at transforming Kenya into a globally competitive newly industrialized middle-income and prosperous country. The Second Medium Plan 2013-2017 identifies energy as one of the enablers for transformation into "a newly-industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment". Efficient, accessible, and reliable infrastructure is identified as an enabler for achieving sustainable economic growth, development, and poverty reduction by lowering the cost of doing business and improving the country's global competitiveness.

The energy sector plays a critical role in the socio-economic development of a country. Kenya is committed to universal access to modern forms of energy by year 2030, as articulated in the Vision 2030 (the Vision). Energy is identified as a critical enabler of this Vision. Kenya has dramatically increased electricity access over the last few years, from 2.3 million connections in 2013 to 8.2 million by the end of April 2021 thereby achieving electricity access rate of over 75%. However, there's need for equitable distribution to all areas within Kenya. To attain this universal coverage alongside providing reliable and affordable power, the government is implementing various projects all over the country.

Overview of the Proposed Project

Project Background

The Government of Kenya through its implementing agency; Kenya Electricity Transmission Company (KETRACO) plans to construct and commission 81km, 132kV double circuit transmission line linking Narok 132/33kV and Bomet 132/33kV substations.

Bomet 132/33kV substation is currently supplied from Sotik on the Kegati- Chemosit line. The newly completed Narok 132/33kV substation is to be supplied from Olkaria I substation by a 132kV line that is currently under construction by KETRACO. At present, power from the Olkaria geothermal generating plants flows to the Western region of the country through the Olkaria I- Naivasha single-circuit 132kV line with a capacity of 150MVA and onwards on double-circuit Naivasha-Lanet-Lessos 132kV lines with a capacity of 166MVA. Western region has a maximum demand of 391MW which cannot be met by the generation in the region (Sundu, Sangoro, Muhoroni GTs and Turkwell) supplemented by imports from Uganda Electricity Transmission Company (UETC).

The National Treasury on behalf of KETRACO Commenced the process of seeking financing for the Narok-Bomet transmission line project under Kenya Transmission Network improvement Project (KTRNIP) that also includes two other transmission lines i.e. the Malindi-Kilifi 220kv and Kabarnet-Rumuruti, 132kV the project was conceived in 2009. The scope had been given to Kenya Power and lighting company who did feasibility studies, ESIA and RAP in 2018. In 2021 the scope was transferred to KETRACO which therefore necessitated the need to firm up the line route and update the previous studies and implement the project under funding from the African Development Bank and Korea Exim Bank.

Kenya's legal framework stipulates that all new projects require an Environmental and Social Impact Assessment (ESIA) this is anchored in the Environment Management and Coordination Act (EMCA) Cap 387. ESIA study is meant to be carried out at the project planning phase to ensure that environmental issues are taken into consideration at the project planning stage and adequately addressed during project implementation: construction, operations, and decommissioning stages, therefore KETRACO involved the in-house expertise to undertake the ESIA update study.

Project objectives

The overall objective is to construct a new 81km 132kV double circuit transmission line from Narok to Bomet. Specific objectives include:

1. To stabilize power supply in Narok and Bomet counties by forming a ring and providing alternative supply
2. To improve quality of supply and reliability to the western regions of the country by providing an alternative route for evacuation of power from Olkaria geothermal plants.
3. Designing and constructing of a 132kV double circuit transmission line in compliance with electric generation regulatory authorities (ERC, Ministry of energy)
4. Ensure sustainability of the project by complying with national laws especially those applicable to environment and social safeguards.

Project Description

The project shall involve construction of an approximately 81km long 132 kV Double Circuit transmission line from the existing Narok 132/33kv Substation to Bomet 132/33 kV substation. The line will be constructed in self-supporting Lattice steel towers and ACSR-175 mm² "Lynx" conductor with a single overhead OPGW shield wire.

The scope of work for the Narok-Bomet 132Kv transmission line will cover design, testing, manufacture, supply, shipping, transport from docks to stores, delivery to site, unloading, check survey and all associated profile plotting, support pegging, provision of access facilities and route clearing, transportation to site, installation of foundations and all associated civil works, erection of supports, installation of insulators, conductors, and all associated fittings.

The proposed transmission line is 81km starting from Narok substation and terminates at Bomet 132/33kV substation. The line will start from Narok Ilmashariani area and run straight on the Narok North Subcounty for some of the distance before crossing to Narok South before Ololunga and run for about 8kms before crossing to Narok West at Olereut area where it then crosses to Bomet County at Mara river to Bomet East, Kapkimolwa location, Koibeiyon sublocation and it crosses the valleys, ridges, hills and rivers as it crosses to Bomet central and partly Chepolungu in Cheboin and Kyogong locations before termination in Itembe location in Bomet Central subcounty and get to Bomet 132kV substation at sachangwan area.

The proposed Narok-Bomet 132kV powerline will be designed and constructed according to KETRACO transmission's Standard Specifications for overhead lines of up to 132kV double circuit. KETRACO's engineers and surveyors will be responsible for the specific power-line structure designs and placement of towers after the Power-line route survey.

KETRACO has confirmed the final transmission line tower specifications as they relate to the structure and stay arrangement and foundation details, which be a self-supporting 205 (A, B, C, D) type steel lattice transmission line towers will be utilized for the transmission line. The towers will be approximately 30m in height and servitude/wayleave width of 30m will be required for the transmission line. The powerline will have a Delta phase configuration. "Kingbird" ACSR (greased) phase conductors and St 7/3.35mm earth wires will be used. Silicon composite (132kV) insulators will also be used for the line and the tower foundations will comprise reinforced concrete piles. Traditional concrete foundations will also be required.

Most of the construction activity during project implementation will involve the erection of the transmission line. The line will use self-supported steel lattice towers with concrete foundations as commonly used in Kenya by KETRACO.

Project Justification

The proposed project seeks to establish a more reliable power supply with improved voltage profiles via the establishment of a line linking the Olkaria geothermal generation plants to the south rift and western region transmission network. This will greatly improve supply quality and reliability to the said regions of the country as it will provide an alternative route for evacuation of power from Olkaria geothermal plants. The project is justifiable in that it will stabilize power supply, improve on transmission line security hence cushioning against losses occasioned by power failures and blackouts.

The proposed Narok-Bomet transmission powerline will also provide an additional supply of electricity to the Narok/ Bomet/ Sotik/Kericho areas. Many households in this area currently do not have electricity and are reliant upon kerosene and candles for lighting purposes. A dedicated, additional supply of electricity will enable many previously un-serviced households to receive electricity. If the status quo remains, the ability to supply new customers will 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. This will consequently have a significant positive impact on existing and proposed new developments in the area, including tourism and agriculture. The rationale for the project is driven by the imperative to dramatically improve reliability of electricity supply to underpin economic activity and to sustain electrification.

Study Methodology

The approach chosen in undertaking this study was careful to consider EMCA, 1999, requirements and the the Environmental Impact Assessment and Audit Regulations, 2003 as well as the AfDB Environment and social safeguards policies. It involved largely an understanding of the project background, the preliminary designs, and the implementation plan. The approach and methodology applied during the study enabled collection of both primary and secondary data. Qualitative and quantitative methods of data collection were employed. Secondary data was obtained through literature reviews while primary data was obtained through physical observations, photography, interviews, and stakeholders' consultation.

The initial stage of this assessment was project screening. Screening of the project sought to ascertain whether this project falls within a category that requires ESIA prior to commencement. Other considerations made during this stage included a preliminary assessment of the environmental sensitivity of the areas along the proposed transmission line route through assessment of project maps and walking along the preliminary routes. This screening indicated that the proposed power transmission line is among the listed projects under Schedule 2 of EMCA, 1999 thus requires a Comprehensive Project ESIA study, while under AfDB categorization, it's a Category 1 investment Project – likely to induce significant and/or irreversible adverse environmental and/or social impacts, or to significantly affected environmental and/or social components that AfDB considers sensitive.

Project scoping was the next stage which was done to delineate project issues that required detailed analysis. This step involved collection of primary and secondary data through field visits and literature review respectively. Some of the methods used included:

- Desk study/literature review
- Socio economic and cultural assessment
- Public Consultations

Baseline information / description of project area environment

Location, Position and Size

Narok County is situated in the southern part of the Great Rift Valley with a total area size of 17,921.2Km². Narok lies between latitudes 0° 50' and 1° 50' South and longitude 35° 28' and 36° 25' East. The county borders the Republic of Tanzania and six other counties: Bomet, Nyamira, Kisii, Nakuru, Migori & Kajiado.

Bomet County lies between latitudes 0° 29' and 1° 03' South and between longitudes 35° 05' and 35° 35' East. It is bordered by four Counties, namely: Kericho to the North, Nyamira to the West, Narok to the South and Nakuru to the North-East. The County covers an area of 2037.4Km². The proposed route starts at Narok 132kV substation at (Eastings-825015, Northings-987461), plot no. Ilmasharian 329 where the T-off point is proposed. The proposed TL will run for 81 km and terminate at existing Bomet Substation terminal point ((Eastings 754037, northings 9914031) at the Bomet 132kV substation at sachagwan area.

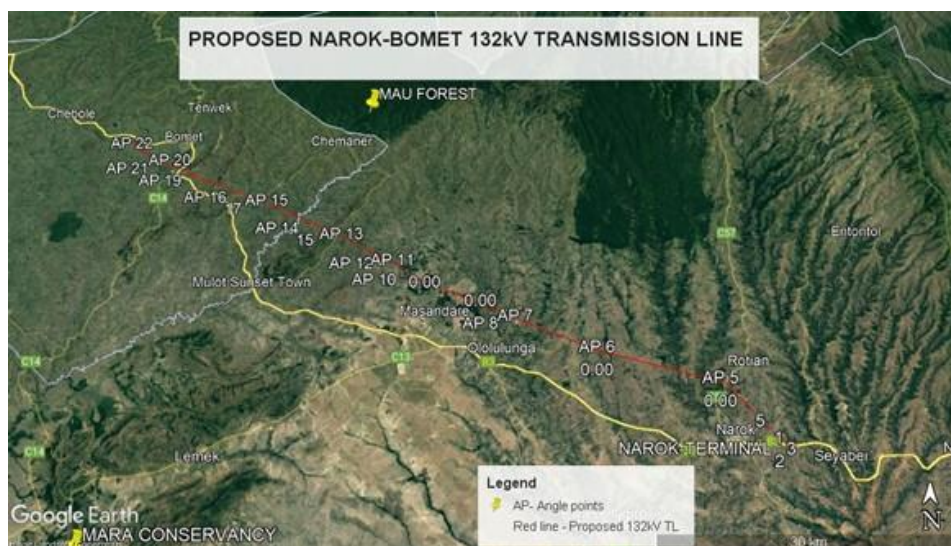
The 81Km 132kV transmission line traverses through several sub-locations mainly; Ilmasharian, Olopito, Olorroito, Kotolian, Nkobon, Ololunga, Nkareta, Melelo, Ilmptiook, Kobeiyon, Kiptulwa, Lebekwet, Emitiot, Cheboin, Kyongong, Kabisoge and Itembe. The locations and sub-locations are administrative units of the National Government.

Physical, Biological, topographical, and Key environmental and social features the proposed Route

The proposed transmission route is characterized by both gentle slopes and relative flat landscapes in Narok side and hilly undulating landscapes in Bomet side. The route traverses over several streams and dry valleys that form the drainage system of the area.

The ecological conditions of the proposed route are influenced by the soil type, altitude, vegetation, rainfall pattern and human activities. The route has varying Soil types that includes sandy loam, clay loam and loamy.

The Narok Bomet 132Kv line avoids the Key ecosystems namely the Maasai Mara and the Mau Forest. The proposed transmission line in Narok County is approximately 50km off the edge of the Maasai Mara reserve in the south thus minimal risk to protected wildlife To the North the line doesn't traverse the Mau Forest and its approximately 30Km off. The common fauna species along the transmission line in Narok side are terrestrial baboons is small private forests, rabbits and quelia birds which feed on the maize and wheat farms. In Bomet side there is no documented endangered fauna species along the proposed transmission line corridor



Alignment of the proposed Narok – Bomet 132kV transmission line

The vegetation on the proposed route includes grass lands and shrubs, indigenous and exotic trees, and agricultural crops. Some of the indigenous tree species and their uses includes: Osokonoi (*Warbugia ugandensis*)-

tooth brush, medicinal, Oleleshwa (timber, perfume), olkilinyei –(*Rhoicissus tridentate*)- timber, slaughtering, olpalagilagi(timber, cultural/ occasions), oreteti(medicinal), olkokola(medicinal), olmorogi (*Dovyalis abyssinica*)-medicinal), olmisigiyo (*Rhus natalensis*), *acacia trees, croton, baobab, cactus etc.* Exotic species includes *gravelia robusta, eucalyptus and wattle bark.*

A large part of the area where the line passes is gently sloppy. This Bomet section is characterized by undulating topography that gives way to flatter terrain in the South. The area around 132kV substation that is Itembe location is generally flat followed by sloppy area of Kabisoge towards Kyogong secondary school. Kyogong area is also characterized by small hills which are currently used for harvesting sand and hardcore. Ilmotiook area is also hilly, but the area is covered with small shrubs and vegetation which has not been disturbed hence also acts as soil erosion barriers.

Agriculture:

The Narok section of the line mainly practice large scale farming of Wheat and maize. They also keep large herds of cattle & other livestock mainly which can adapt to dry seasons e.g. the Sahiwall cattle breed. While from NB 11 NB 18, The land size per household is small, most of the land is used for crop and livestock production in small scale as compared NB1 to NB 10 while the remaining land is utilized for construction of homesteads.

In Bomet county, majority of the farmers practice small scale agriculture. within the area of transverse practice mixed farming with coffee, maize, wheat farming, and dairy taking the lead. Milk, Wheat, and maize are the highest source of income. Climate smart agriculture has been greatly adopted to adapt and mitigate on the adverse impacts of climate change

Land tenure and land holding along Narok-Bomet 132kV Powerline

The mean land holding size for Narok County is 16.2 Hectares. In the county, there are alternative land uses which are open to landowners, namely agricultural, livestock and wildlife production. The most prevalent land-use in the county is mixed farming units, with portions of the farm allocated to tree crops, cash crops and vegetables, while fallow land is used to graze livestock. Most of the land tenure along the proposed route is free hold tenure system. Some of the lands in Narok site are also under ranching but the land titles are still freehold hence it will not be difficult to acquire the wayleaves for the transmission line.

A total of 600 acres on the entire TL will be acquired for transmission line wayleave and a total of 254 structures affected (KETRACO NB TL RAP Survey 2021). All PAPs whose land will be acquired will be compensated adequately through KETRACO's land compensation process.

Institutional, Legal and Regulatory Framework

Administrative framework for the proposed project

The Project will be an Investment Finance operation processed under AfDB. The Republic of Kenya will be the Borrower, and the Ministry of Energy and Petroleum (MoEP) will be the Executing Agency and beneficiary of the proposed loan. KETRACO will serve as the implementing agency.

Kenya Electricity Transmission Company- KETRACO

KETRACO was incorporated in 2008 through an Act of parliament to plan, design, construct, operate and maintain high voltage electricity transmission lines in Kenya. Since its establishment KETRACO has sought to resource itself and build the institutional capacity required to carry out its mandate. 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 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 to facilitate power exchange and develop electricity trade in the region
5. Reduce transmission losses that currently cost the country heavily every year and Reduce the cost of electricity to the consumer by absorbing the capital cost of transmission infrastructure

KETRACO has established a dedicated Project Implementation Team (PIT) to implement the Project. 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 /Contractor will prepare the technical specification and draft bid documents for transmission lines and substations.

Project Institutional Capacity and responsibility

	Project activity	Responsibility
1	Project inception- Site, route identification	KETRACO Strategy PDS Department
2	Mapping and surveying	KETRACO Surveyors and Consultants
3	Land acquisition	Wayleave acquisition, Legal, NLC
4	Preliminary designs	KETRACO & Contractor Design Engineers
5	Environmental screening	KETRACO ESS SHE Department
6	ESIAs, RAPS and VMGPs	KETRACO Environment & Social Safeguards
7	Detailed Designs	KETRACO Design Engineers, Consultants
8	Wayleave acquisition	KETRACO Wayleave acquisition department
9	Bidding	KETRACO Procurement and Finance department
10	Construction	KETRACO Project Development, Environment and social safeguards
11	Operation and Maintenance	KETRACO Operation and Maintenance
12	Decommissioning	KETRACO Operation Maintenance Environment & Social Safeguards

The 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.

Legislative Framework

Kenya has over 77 statutes which relate to environmental concerns. Most of these statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health, soil erosion, air quality etc. Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licenses and sectorial laws.

There was however a need for stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management and Coordination Act in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

Laws of particular concern to this project are:

1. The Constitution of Kenya, 2010:
2. Regulations under EMCA
 - Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101
 - Environmental Management and Coordination (Water Quality) Regulation 2006
 - Environmental Management and Coordination (Waste Management) Regulation 2006
 - Environmental Management and Coordination, (Conservation of Biological Diversity) (BD) Regulations 2006
 - Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations 2006
 - 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
3. Public Health Act (Cap. 242)
4. County Government Act, 2012
5. Water Act, 2002
6. Energy Act of 2006
7. Climate change Act, No 11 2016
8. Physical and Land use planning Act, 2019
9. County Governments Act, No 17, 2012
10. National Gender and Equality Act, 2011
11. Security Laws (Amendment Act), 2014
14. The Standards Act Cap 496
15. Penal Code Act (Cap.63)
16. The Wildlife Conservation and Management Act, 2013
17. The Lakes and Rivers Act Chapter 409 Laws of Kenya:
18. The Forestry Services Act, 2005
19. Occupational Safety and Health Act, 2007
20. Work Injury and Benefits Act, 2007
21. The Radiation Protection Act (cap 243), 2014
22. The Traffic Act Chapter 295 Laws of Kenya
23. The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)
24. The Agriculture Act, Cap 318 of 1980 (revised 1986)
25. National Museums and Heritage Act, 2006
26. Land in the Kenyan Constitution 2010
27. The Land Act 2012
28. The land and Environment Court Act 2011
29. The National Land Commission Act 2012
30. The Civil Aviation Act Cap 394
31. Sexual Offences Act, 2006
32. Children's Act 2012
33. Counter Trafficking in persons Act 2010
34. International Environmental Guidelines
35. Environmental Conventions and Treaties
36. The African Development Bank Environmental and social Assessment Procedures (ESAP)
37. Korea Eximbank EDCF Safeguard Policy HIV and AIDS Prevention and Control Act, 2011
38. Labour relations Act, 2012

12. Protection of Indigenous and Cultural Expression Act, 2016
13. Prevention, Protection, and assistance of internally displaced persons and affected communities Act, 2012.
39. Employment Act, Cap 226

Public Participation and Stakeholder engagement

Public participation is an essential and legislative requirement for environmental authorization. The ESIA PI team undertook the stakeholder consultation (SC) for the proposed project in accordance with the requirements for a Study stipulated in the EMCA, 1999, 2015 and EIA/EA Regulations 2003.

Stakeholder engagement began early in the planning phases of the project. The implementing agency KETRACO wrote a letter to Bomet and Narok county governments informing them about the project. Previous stakeholder consultations were undertaken during the month of 26th February 2018 to 23rd March 2018 by KPLC. Subsequently an update of the previous studies was done from 2nd to 21st December 2021 by KETRACO Projects Implementation Team (PIT). During this time project information in terms of (design, route, positive impacts, negative impacts) were discussed with various stakeholders. The stakeholders gave their views in to the project. Stakeholder engagement and consultations were undertaken to fully inform the communities about the proposed project. The objectives were aimed to:

- Establish a participatory process for identifying potential impacts and benefits of the project.
- Accord the locals in a fair and culturally appropriate way, a chance to be engaged and determine how they wish to be involved throughout the project phase.
- Solicit the support of the communities from the proposed project area.
- Determine the nature of the local power structure and document the procedures for the entry and access into the community.
- Obtain accurate and detailed data on local livelihoods, customs, and historical traditions for information to project partner agencies and agents.
- Determine through careful consultation with the community members the preferred mechanisms for information provision and consultations and representatives in decision making.

To ensure adequate public participation in ESIA, 159 questionnaires were administered to the proposed project route neighbours. The information gathered was subsequently synthesized and incorporated into the ESIA Study Report

Previously in February and March 2018, KPLC Conducted a total of 9 Key informants' meetings, and 20 Community public sensitization meetings in all locations in the proposed route. In December 2021, KETRACO did an update of study after the route firming exercise and conducted a total of 8 key informant meetings and 6 community sensitization meetings focusing on the final proposed route. Meetings were held within the following sub locations; Ilmasharian, Olopito, Olorroito, Kotolian, Nkoban, Ololunga, Nkareta, Melelo, Ilmotiok, Kobeiyon, Kiptulwa, Kongotik, Emitiot, Cheboin, Kyongong, Kabisoge and Itembe. Public consultations were conducted through public Sensitization barazas and through pre-designed questionnaires and interviews with neighbors along the proposed route of the transmission line (project area).

The proponent in consultation with the team of experts informed the neighbors as well as the relevant authorities two weeks before consultations began. Due to the different categories of the stakeholders, the ESIA team opted to employ various methods in engaging them. The methods included face to face discussions, focused group consultation as well as public meetings.

Since the project area falls under the jurisdictions of two counties the ESIA team visited the Narok and Bomet County governors' offices as well as county commissioners to discuss the project and get their views on the project. Additionally, a project brief was also given to them for better understanding of the project and for record purposes. The project received support both from the county and national government who added that it will be of great importance to ensure that the public is widely consulted, and awareness created coupled with appropriate compensation for those to be affected by the proposed project.

The ESIA PIT also visited the key line ministries and discussed the project including seeking key issues of concern for better project implementation. The following officers were consulted; Bomet /Narok water and sewerage company, National Environment Management Authority, Kenya Forestry Service officers, Ministry of lands and urban planning officers, Ministry of Youth and Ministry of Agriculture

Public consultations through barazas/public meetings were held within the locations & sub locations where the proposed line will pass. These meetings were organized through the office of the various chiefs and held within convenient venues within reach of the local community members. During the meetings the ESIA team explained the project in terms of route of the line, positive impacts, negative impacts, mitigation measures of the negative impacts and open forums for discussion. The message was also communicated in Kiswahili and using the local dialect i.e Maasai and Kalenjin to ensure the information was well understood.

Sensitization Meeting attendee's summary -2021

Location Name	Date	Venue	Participants	Total Attendees		
				Male	Female	Total
Lower Melili	15/12/2021	Nchoe Farm in Olopito	PAPs Local Administration KETRACO PIT	13	4	17
Ololunga	15/12/2021	Hon.Nkoreita Farm-Naropil	PAPs Local Administration KETRACO PIT	7	1	8
Endonyio-Ngiro	16/12/2021	Olosiyoi Dispensary	PAPs Local Administration KETRACO PIT	17	2	19
Nkareta	17/12/2021	Nkareta community resource center	PAPs Local Administration KETRACO PIT	6	1	7
Ilmotyok	18/12/2021	Chebolet Farm,Aganga Village	PAPs Local Administration KETRACO PIT	31	9	40
Ilmotyok	18/12/2021	James Bett Farm,Oletepesi	PAPs Local Administration KETRACO PIT	17	4	21
Total						112

Sensitization meetings attendee's summary-2018

Location Name	Date	Venue	Participants	Total Attendees		
				Male	Female	Total
Ilmashariani	2/3/2018	Ilmashariani Chiefs office,Narok	PAPs Local Administration KPLC PIT	5	3	8

Location Name	Date	Venue	Participants	Total Attendees		
Kyogong	6/3/2018	Sanchora Shopping Center	PAPs Local Administration KPLC PIT	14	2	16
Itembe	7/3/2018	St.Peters Catholic Church,Kapkw en	PAPs Local Administration KPLC PIT	11	5	16
Nkareta	7/3/2018	Nkareta Olamutai barrier	PAPs Local Administration KPLC PIT	16	4	20
Kabsioge	8/3/2018	Kapsioge Primary School	PAPs Local Administration KPLC PIT	10	4	14
Olopito	9/3/2018	Olopito Village	PAPs Local Administration KPLC PIT	16	3	19
Kapkimolwa	13/3/2018	Koiben shopping center	PAPs Local Administration KPLC PIT	17	3	20
Oloroito	13/3/2018	Oloroito Village	PAPs Local Administration KPLC PIT	17	2	19
Ilmotyok	14/3/2018	Jamboruto Village	PAPs Local Administration KPLC PIT	15	8	23
Ololunga	14/3/2018	Ololunga Royal Church	PAPs Local Administration KPLC PIT	13	4	17
Kapkimolwa	15/3/2018	Kiptulwa shopping center	PAPs Local Administration KPLC PIT	11	3	14
Nkoban	15/3/2018	Kotolian Center	PAPs Local Administration KPLC PIT	13	5	18
Kombu	16/3/2018	Lebekwet Shopping C	PAPs Local Administration KPLC PIT	12	7	19
Ololunga	21/3/2018	Melelo Village	PAPs Local Administration KPLC PIT	17	4	21
Melelo	22/3/2018	Chebkwet Village	PAPs Local Administration KPLC PIT	21	6	27

Location Name	Date	Venue	Participants	Total Attendees		
Ilmotyok	23/3/2018	Olereut shopping center	PAPs Local Administration KPLC PIT	14	4	18
Total						289

Below is a summary of key issues discussed in 2018 and 2021 respectively.

Summary of issues discussed in sensitization meetings in 2018

Concern/Negative Impact	Suggested mitigation
Destruction of trees, crops, and houses	The community was informed that PAPs would grow more trees especially at the periphery of their plots and in tandem to meeting the Ministry of Agriculture policy of ensuring 10% tree cover for each given parcel of land. Just compensation for destroyed trees, crops, and houses (property) would be done
Electrocution and vandalism	The proponent would ensure the transmission line and Pylons were maintained in a good state of repair, with frequent monitoring and necessary corrective measures. It was agreed that no settlement or growing of trees within the Right of Way. Vandals were warned and the public encouraged in ensuring community policing.
Noise and dust:	It was agreed that the Proponent would sprinkle water where and when necessary to minimize dust pollution, and construction to be done during the day and to observe NEMA Noise regulations.
Soil Erosion	It was agreed that soil erosion that may arise during construction would need to be controlled. Vegetation disturbance will be avoided as much as possible as the contractor will use the access roads provided by the proponent.
Consultation and informing the affected persons	Further consultations/ meetings with specific Project affected persons will be carried out to brief the community on the next plan of action alongside taking census and other data to prepare a Resettlement Action Plan to guide compensation. This would be done through the office of the chief
Valuation of houses, trees and property	The proponent will undertake valuation of property as per the proponent's RPF. Trees will be valued using ministry of agriculture rates based on species and size.
Displacement of people Social impacts	<ul style="list-style-type: none"> The proponent will conduct social impact assessment prior to implementation of the project the proponent will upon completion of RAP study compensate PAPs in fair and timely manner.

	<ul style="list-style-type: none"> • KETRACO shall hold capacity building sessions with PAPs in order to further guide them on responsible use of the compensation package.
Loss of Livelihoods	The proponent informed the community was informed that compensation to destroyed property would be done to the affected people
Misuse of compensation proceeds	Those to be affected were cautioned about misuse of compensation money and were encouraged to use the money appropriately. More education on this would be done by the proponent.
The wayleave will render some arable land unproductive thus reducing food security	The Proponent will compensate land acquired as a wayleave and educate PAPs on environmentally sound land reclamation practices
Increased accidents especially during construction phase	<ul style="list-style-type: none"> • The proponent and the contractor will continually sensitize workers and the public on occupational health and safety • The contractor shall place warning signs appropriately, visible, and legible to the locals. • The Proponent to develop and implement a traffic management plan
Restricted choice of enterprises particularly commercial trees and domestic agro forestry	The proponent in conjunction with KFS to promote planting of shorter species of trees and other value chains
Electromagnetic effects of energized Transmission line	All possible EMF radiations from operation of substation and TL will be managed in accordance with OSHA, 2007
Obstruction of development and projects privately operated	The proponent to conduct proper and adequate compensation of any developments and displaced people and their daily activities
<ul style="list-style-type: none"> • Spread of communicable diseases such as HIV/AIDS 	<ul style="list-style-type: none"> • The Proponent in collaboration with chief/ village head men to educate the residents – hold Barraza’s • Contractor to mount HIV/AIDS education programs to workers • Contractor to provide condoms to employees
None employment of local people	<ul style="list-style-type: none"> • Contractor to give priority to locals in access to casual jobs • Contractor to work together with chiefs to to ensure fairness and equity
Restriction of tree planting within the power line wayleave corridor	Planting of trees outside the wayleave corridor is encouraged as a safety measure
The project is dangerous because of its high voltage	Proponent to educate the community on the project to reassure the community and dispel the fears
May lead to electrocution of people and animals	<ul style="list-style-type: none"> • The PAPs to report any incident which occur along the line • The proponent will sensitize the PAPs regarding need to avoid construction of structures below the line
Social impacts-breakdown of families due to misunderstanding	Civil education to be done by the proponent especially to the affected people

Land disputes because of misunderstanding on the money	<ul style="list-style-type: none"> • Sensitization on step-by-step compensation process to be done by the proponent • PAPs are encouraged to cooperate with the KPLC team
Fire out brakes in case the high voltage lines brakes	<ul style="list-style-type: none"> • Avoid tree planting within the wayleave corridor • Regular tree maintenance by KPLC maintenance team

Summary of concerns raised with suggested mitigation in 2021 meetings

Concern/Negative Impact	Suggested mitigation
Vegetation loss along the wayleave corridor will be massive	<ul style="list-style-type: none"> • Compensatory tree planting outside the wayleave • Have programmes of tree planting within the community by the proponent equivalent to area of wayleave • The proponent to encourage PAPs to plant cover plants such as grass to further reap other benefits such as erosion control
Disruption of habitats	Contractor to minimize clearance as much as possible especially in protected ecosystems like community forests
Displacement of persons	The proponent will develop a Resettlement Action Plan (RAP) to guide compensation and resettlement
Relocation of native residents from their homes	<ul style="list-style-type: none"> • The proponent to roll out civil education to the affected/displaced PAPs • The proponent to encourage resettlement within the land if land sizes allow
Rain reduction, due to cutting of many trees along wayleave	The proponent will sensitize PAPs to plant trees outside wayleave
Land degradation and forest destruction Accidents and injuries during and after construction	<ul style="list-style-type: none"> • Planting of ground cover grass by the proponent on excavated foundations • The proponent to compensate PAPs on agricultural damage • Proponent to Sensitize to community on safety procedures
Family conflicts in case of disagreements	Prior sensitization on the community by the proponent's environmental and social safeguards team.
Teenage pregnancies	<ul style="list-style-type: none"> • Counselling affected communities by the proponent • Sensitization on reproductive health and social interaction with project workers by the proponent and contractor
Effect on wildlife leading to loss of tourism	<ul style="list-style-type: none"> • The proponent to sensitize PAPs and encourage them to avoid settling in wildlife dispersal areas. • The proponent shall develop and implement strict code against consumption of game meat by workers
Increased Accidents	<ul style="list-style-type: none"> • The Proponent/contractor to develop and implement traffic code • The contractor shall regularly service and maintain construction vehicles, plant, and machinery
Poor reception of telecoms infrastructure	the proponent to conduct awareness in order to dispel this fear
Relocation of schools potentially disrupting learning	The proponent shall route the transmission line to avoid schools and other social amenities such as hospitals, markets, churches, among others

Rain reduction, due to cutting of many trees a along wayleave	The Proponent to encourage community to plant trees in their farms
Noise during construction	the proponent/contractor shall provide strict daytime (6 a.m. to 6 p.m.) work schedules.
Dust during construction	Contractor to regularly suppress dust through water sprinkling
If the parcel is too small, the landowner will be disadvantaged	<ul style="list-style-type: none"> • The Government through the proponent will favorably compensate all affected persons • The proponent will consider land sizes vis-a-avis total on trace in computing the compensation package.
Electrocution	<ul style="list-style-type: none"> • Anti-climbing devices will be mounted on towers by the contractor • Substations will be fenced, guarded round the clock and access allowed only to authorized persons
Late payment of compensation	The proponent to ensure fair, just and timely compensation in accordance with laid down statutes

Enumeration of Impacts by the Proposed Transmission Line

Project Potential Impacts and Mitigation Measures

Both positive and negative impacts that are associated with the proposed 132kV transmission power line during the construction phase, operation phase and decommissioning phase were identified. The following positive and negative impacts are associated with the proposed project.

Positive Impacts

The following are positive impacts associated with the proposed construction of Narok-Bomet 132 kV transmission line from Narok to Bomet Counties:

- Creation of employment opportunities
- Direct income from Supply of Building Materials
- Boosting of the informal sector
- Gains in the Local and National Economy
- Improved accessibility from better roads
- Compatibility with existing and proposed land uses
- Improved unity and social integration
- Climate change mitigation through provision of electrical energy instead of wood fuel
- Skills learning and exchange of knowledge
- Local Benefits and Opportunities for Electricity Supply in support of the Vision 2030 of the Government of Kenya.
- Reliable supply of electrical energy.
- Improvement in security because of lighting.
- Improvement in social infrastructures.
- Benefits to Education sector through Improved Learning
- Acceleration of the investment process in the region.

Negative Impacts

Against the background of the above positive impacts, there will be negative impacts emanating from the construction and subsequent operation activities of the proposed project. The impacts will adequately be evaluated, and mitigation measures provided.

The negative impacts include the following:

1. Soils and Geology

- Soil erosion impact from vegetation clearance
- Increased erosion potential and sedimentation
- Contamination of soil
- Weakening of the geological stability

There is a likelihood of localized soil erosion during the civil works which entail compacting, earth excavations and moving works. However, these impacts will be largely localized to the project area and will only occur during the construction phase.

2. Impacts on Flora and Fauna

- Impact on vegetation
- Impact on natural habitats

3. Air quality

- Decreased air quality due to dust emission
- Fugitive emissions
- Air pollution from incidences

Dust and fugitive emissions will be generated during construction. This will affect construction staff as well as the neighbors. The impact will be direct, temporary, and minor.

4. Pollution from Waste generation

solid and liquid waste generation

5. Impacts on Water Quality and Water Resources

- Decreased water quality due to soil contamination and soil erosion

6. Noise and vibration

- Deterioration in ambient noise quality

The proposed civil works and operation of the facility will bring about an increase in cumulative noise levels. Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers during day time. Considering the existing background noise level, the operations activity during daytime is not expected to seriously affect the noise level in areas adjacent to the project site.

7. Visual intrusion and aesthetic impacts

- Impact on the visual landscape
- Impact on natural environmental aesthetic

The proposed project will change the natural appearance of the project area landscape.

8. Land take

- Right of Way
- Way-Weave

- Land-take for construction purposes
- Perceived loss of Economic Value of Land

9. Fire Hazards

Construction activities, accidents as well as behavioral activities such as smoking and cooking on site by construction workers might result into wildfires.

10. Impacts on archaeological, Cultural and Historic sites

Along area of traverse, especially during construction phase, there is likelihood of tampering with sacred cultural sites or areas of archeological importance. Thus, relevant stakeholders must be consulted and assessment thoroughly done before groundbreaking.

11. Impacts of construction material sourcing (e.g. quarrying)

- Defacing of the landscape due to material extraction

12. Traffic congestion / Road Wear/Tear

- Transportation and Traffic Safety
- Increased Traffic hindering movement/Access
- Accidents because of increased traffic
- Damage to roads and transport infrastructure

During the construction phase, heavy vehicles moving in and out of the project site are likely to increase traffic along the main road near the project site and could cause congestion. Deliveries of transformer oil by road during project operation will also increase the amount of traffic flow in the project area.

13. Occupational Health and safety Impacts

- Live power lines
- Working at height on poles and structures
- Community health and safety
 - Electrocution
 - Electromagnetic interference
 - Noise and ozone
 - Tower vandalism

There will be potential risk of occupational hazards that could lead to occupational accidents and during construction and operation of the project. Adverse impacts on the workers' health and safety is likely to occur especially through workers' interaction with the equipment and machines during construction and operation of the substation. Accidents, injuries, and diseases are likely to occur during project construction and operations and this could potentially harm the health of the employees.

14. Air navigation safety

The proposed location of traverse is from Narok town and Bomet town which are county headquarters. There are few airstrips in Masai mara reserve and a proposed airstrip in Narok county. The towers must not be located where there are low flying aircraft or along flightpaths

15. Health and Safety Impacts

There is a likelihood exposure to hazards and negative impacts eg trips and falls of workers especially during construction and operational phase. assessment and controls are outlined explicitly in chapter six

16. Hazardous materials

The proposed transmission line project will need many types and forms of raw material some of which are hazardous in nature and classification. proper strict controls will be needed to eliminate or minimize the hazard effect to negligible levels

17. Impacts on Public Health

- HIV/ AIDS
- Electric and magnetic fields
- Communicable disease
- COVID 19

18. Social- Economic Impacts

- Physical Displacement of People
- Loss of livelihoods
- Restriction on land use

21 Sexual exploitation and Abuse (SEA)

High risk /Category 1 projects with a large influx of workers may increase the demand for sex work—even increase the risk for trafficking of women for the purposes of sex work—or the risk of forced early marriage in a community where marriage to an employed man is seen as the best livelihood strategy for an adolescent girl.

22. Sexual harassment (SH)

Sexual harassment is a form of Gender based violence. SH occurs between personnel/staff and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The workers interaction during project implementation, company, subcontractor, or employees may experience unwelcome sexual advances or requests for sexual favors or acts of a sexual nature that are offensive and humiliating among the same company's employees.

23. Child Labour

In remote Locations where the poverty index is high, there is a likelihood of using cheap labour from underage children in project related activities. Child Labour is prohibited under Children's Act and ILO.

24. Capacity Building

Lack of adequate information to the stakeholders especially the contractor employees, construction workers, community and stakeholders might lead to unforeseen incidents.

Environmental and Social Management 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 programmes developed for their observation and action. When developing the monitoring programme 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 below:

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
PHASE 1: PRE-CONSTRUCTION PHASE						
Land Take/Loss of Land and Land use rights	<ul style="list-style-type: none"> •Preparation of a resettlement action plan to guide compensation, relocation, and resettlement •Community sensitization by KETRACO on alternative land uses of wayleaves, and design themes to reduce the effect of land take by the transmission line project. •KETRACO to follow way-leave rules and provide 30-day notice prior to way-leave maintenance works. Sufficient notice post compensation to be accorded to those who require rebuilding their dwelling units and relocate. •KETRACO will be required to enter an agreement/arrangement with land owners on alternative afforestation/reforestation •Compensation against loss and damage to crops when land will be temporarily acquired for construction purposes •Compensation for land 	Prior to project commencement	KETRACO	<ul style="list-style-type: none"> •Prepared RAP •No. of community sensitization meetings •No of PAPs compensated •Notice period given to PAPs 	<ul style="list-style-type: none"> •Prepared and Disclosed RAP •Minutes of Community/PAPs meetings •Compensation records 	RAP Budget (given below)
Physical Displacement of PAPs	Conduct a Resettlement Action Plan (RAP) along the transmission line	3 months before project construction	KETRACO	•No. of RAP reports completed	•Approved RAP Report	3,200,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> •RAP Implementation through •Compensation of PAPs and giving a disturbance allowance •will be carried out in compliance with the Kenyan legislation, and AFDB safeguard standards Physically or economically displaced people will be offered an option between either cash or a full compensation or replacement of residential houses and affected structures <ul style="list-style-type: none"> •The project will make every effort to sensitize the affected on wise use of the compensation package. 	3 months before project construction	KETRACO	<ul style="list-style-type: none"> •No. of persons compensated and resettled before construction •No of structures compensated and replaced •Sensitization On the use of cash compensation 	<ul style="list-style-type: none"> •Compensation Records •Replaced structures •Sensitization records 	666,000,000
Occupational Health and safety impacts	<ul style="list-style-type: none"> •Health, Safety and Environmental training of KETRACO Supervisory Staff and Contractors •Training of Site management staff on ESMP 	•Prior to project implementation	KETRACO	•No of KETRACO and contractor staff trained and number of trainings held	•Training records (reports, minutes, attendance lists)	150,000
Low knowledge level on high energy transmission infrastructure	Sensitization of the Public-on-public occupational health and safety	Prior to construction	CONTRACTOR	• Number of members of the public and sensitized	• Meeting minutes • Attendance records	200,000
Sub total						669,700,000
PHASE 2: CONSTRUCTION PHASE						

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Increased Air quality (Air pollution and dust generation)	<ul style="list-style-type: none"> • All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction • The Contractor to protect stockpiles of friable material subject to wind-throw by wetting, or with a barrier, vegetation, or windscreen. • Cover loads of friable material during transportation. • Restrict speed on loose surface roads during dry or dusty conditions. • Suppress dust during dry periods by use of water sprays. • Maintain equipment and machinery in good running condition – no vehicles to be used that generate excessive black smoke; • A maintenance plan for the construction machinery and vehicles shall be prepared and implemented to prevent excessive emissions. • Burning of woody debris & construction waste to be prohibited within the wayleave • The Contractor to ensure that all equipment used, and all facilities erected on site are designed and operated to control the emission of 	Throughout Construction phase	Contractor	<ul style="list-style-type: none"> • No of Trainings for staff • Frequency of air quality tests done as per schedule • Number of respiratory disease cases • Vehicles Maintained in good condition • No of Speed limits signage • No of • No. of Maintenance plan for the construction machinery and vehicles prepared 	<ul style="list-style-type: none"> • Air quality PM measurement reports • Medical reports of workers and PAPs • Quarterly ESMP Reports • Vehicles and machines maintenance records • Training records (reports, minutes, attendance lists) • Photos of traffic signage • Maintenance plan for the construction machinery and vehicles 	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>smoke, dust, fumes and any other air impurity into the atmosphere.</p> <ul style="list-style-type: none"> • Use of personnel protective equipment (PPE) • Keep stockpiles and exposed soils compacted and re-vegetate as soon as possible. • Regular air quality tests 					
Solid waste generation	<ul style="list-style-type: none"> • The wrappings and packaging materials should be reused or recycled where applicable • The contractor should prepare and adhere to the site waste management plan • No burning of solid waste on site • Provision of waste skips and bins for various types of wastes on site • Any service/Repair of vehicles to be done offsite in approved garages or service stations • Construction wastes to be managed in accordance with standards. • Application of 3R Principle in waste management • Contractor on site MUST have a NEMA licensed waste handler to always collect any waste residue and dispose effectively • Separation of waste to be effected 	During Construction	Contractor	<ul style="list-style-type: none"> • Amount in tonnes of waste generated • Nema licensed solid waste handler hired • Prepared site waste management plan • No. of Waste skips and bins for various types 	<ul style="list-style-type: none"> • Waste consignment notes 	100,000
					<ul style="list-style-type: none"> • NEMA Waste license for approved waste handlers/contract for the waste handler • Waste tracking documents • Documents for final waste disposal site 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Impacts on water quality and water resources	<ul style="list-style-type: none"> • Unchanneled flow of water at the site during construction will be controlled to avoid soil erosion • Storage areas that contain hazardous substances should be bunded with an approved impermeable liner • Care will be taken during concrete pouring activities to ensure there is no pollution of surface • Siting of towers away from drainage lines and floodways can also minimize interference to natural drainage systems. Siting of towers away from drainage lines and floodways can also minimize interference to natural drainage systems • Siting of towers away from drainage lines and floodwayst to minimize interference to natural drainage systems • Limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass • Train work crews in safe handling of petro-chemicals. • Follow WRA regulations 	Construction	Contractor	<ul style="list-style-type: none"> • Quantity in m3 of water used daily • No of awareness sensitization/t rainings on water management • Location OF towers • Location of vehicle servicing yards • Location of storage areas for hazardous substances 	<ul style="list-style-type: none"> • water meter usage reports • Training attendance records • Water quality reports • Vehicle servicing records 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Noise & vibration	<ul style="list-style-type: none"> 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. Landowners along the routes to be notified about the construction schedule & activities, including blasting, should it be required. Construction techniques and machinery selection to minimize noise and vibration. Noise generating activities that take place near residential or sensitive institutional receptors will be restricted to between 0800 and 5pmhrs, which is defined as 'daytime' in the Kenyan noise regulations Contractor is prohibited causing excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of 	Construction	Contractor	<ul style="list-style-type: none"> Number of noise level tests done Number of machines and equipment producing noise No of silencers or enclosures for noise generating machines Notices for landowners on construction activities Type of PPEs issued for noise protection Construction timing 	<ul style="list-style-type: none"> Noise measurement reports Visual Noise Hazard warning signages in specified locations PPEs issuance register NEMA Noise license Notices for the public 	300,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>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.</p> <ul style="list-style-type: none"> • Provision of protective devices like earmuffs/earplugs to workers, who are continuously exposed to high levels of noise during construction activities. 					
Visual & aesthetic impacts	<ul style="list-style-type: none"> • Extensive public consultation during the planning of power line and power line right-of-way locations. • Maximize straight-line runs to reduce the need for angle towers. • Locate new towers adjacent to already existing high-impact visual features, such as forests where possible • Where possible, locate the new line adjacent to existing power lines • Siting power lines, and designing substations, with due consideration to landscape views and important environmental and community features. • Location of high-voltage transmission lines in less populated areas, where possible 	Construction Phase	KETRACO/Contractor	<ul style="list-style-type: none"> • Number of towers erected per location • Location of powerlines, sub stations etc 	<ul style="list-style-type: none"> • Rehabilitation program plan • Photos of location of towers, sub stations etc. 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> Existing tracks will be used for construction and maintenance operations as much as possible 					
Land Take	<ul style="list-style-type: none"> Route selection to avoid existing settlements and minimize disturbance. KETRACO to follow Land Act 2012 Laws of Kenya and Land Acquisition Act; Community sensitization on alternative land uses Compensation of the affected people at current Market rate for land and other loss assets Prior to wayleave acquisition free and informed consent should be sought Consultation with PAP should continue throughout project phases KETRACO will identify all potential Project Affected Persons (PAPs) & develop a Resettlement Action Plan (RAP) to address economic losses, physical resettlement & loss of land or land rights. The RAP should be framed in consultation with the PAP Appropriate ongoing consultation with local communities throughout Project construction as well as 	Preconstruction, construction, and operation phases	KETRACO	<ul style="list-style-type: none"> Prepare RAP No Of PAPs compensated 	<ul style="list-style-type: none"> Signed minutes of discussion on community sensitization on project impacts and controls Approved RAP 	RAP budget

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	informing workers on local cultural sensitivities and health matters					
Fire Hazards	<ul style="list-style-type: none"> • The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process. • Monitoring ROW vegetation according to fire risks • The Contractor shall prepare a fire prevention and fire emergency plan as a part of the Environmental Plan to be submitted to KETRACO • The Contractor shall provide adequate firefighting appliances at specified localities on the worksite to meet any emergency resulting from ignition of a fire. • No burning of any litter/ cleared vegetation on site • Avoid Careless handling of cigarette butts • Sensitizing community of fire hazards and prevention • Training of Staff and personnel on fire fighting • Monitoring right-of-way vegetation according to fire risk 	Construction	Contractor	<ul style="list-style-type: none"> • Conducting Fire audit • fire prevention and fire emergency plan • adequate firefighting appliances 	<ul style="list-style-type: none"> • Fire clearance certificate by contractor • Purchase records for fire fighting equipment 	600,000
		Construction	KETRACO	<ul style="list-style-type: none"> • No of training and sensitization sessions (community/ workers) on fire • No of participants attending fire safety training • Personnel training and community sensitization • Fire Safety plan developed 	<ul style="list-style-type: none"> • Fire safety policy in place • Fire warden/marshall certificates • Roll call register for fire drills • Quarterly ESMP Reports highlighting status • Fire fighting equipment inspection records 	600,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Removing blowdown and other high-hazard fuel accumulations. • Time thinning, slashing, and other maintenance activities to avoid forest fire seasons; 				<ul style="list-style-type: none"> • Sensitisation/training records 	
Impacts on Traffic (Traffic congestion)	<ul style="list-style-type: none"> • Contractor to prepare and implement a Traffic Management Plan. • KETRACO and contractor will choose traffic routes to reduce the impact in the neighborhood avoiding, as far as practical any sensitive areas • The contractor will ensure due regard of drivers to traffic regulations and always insist that courtesy be shown to other road users • Where traffic is anticipated, the contractor in close consultation with KETRACO should ensure they notify KERRA • Effecting of traffic routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood. • Choice of routes depending on delivery and dispatch to reduce the 	Construction	Contractor	<ul style="list-style-type: none"> • Prepared Traffic Management Plan. • Public notifications of planned traffic • Hiring OF a road safety coordinator • Reinstated roads/property 	<ul style="list-style-type: none"> • Records indicating date time and delays caused by traffic • Recorded complains by local road users • a road safety coordinator contract 	800,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>congestion impact in the neighborhood</p> <ul style="list-style-type: none"> • Employment of a road safety coordinator to oversee implementation of the traffic controls • Regular maintenance of delivery and dispatch trucks. • Wherever possible, use should be made of the existing roads and existing tracks during construction. If damage occurs to roads or properties, it should be repaired when the work is finished. • Personnel driving construction vehicles will be required to adhere to speed limits and all other applicable road rules in order to ensure vehicle and pedestrian safety. • All vehicles to be in good working order, particularly as there are many pedestrians and animals in the area; and • A safe sight distance will be always maintained by cutting grass or other vegetation on either side of the access road/s to the substation site 					
Impacts on Archaeological,	<ul style="list-style-type: none"> • Diversion of the Right of Way for the proposed transmission line, to 	Construction	Contractor	<ul style="list-style-type: none"> • Preparation of chance find 	<ul style="list-style-type: none"> • NMK Manual of critical areas of 	200,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
cultural and historic sites	<p>minimize the impacts of these sites if they are present.</p> <ul style="list-style-type: none"> • Selective tower placement to span archaeological site if any • Contractor to follow procedures for chance find and protection of Archaeological sites and contact the National Museums of Kenya (NMK). • Avoid siting transmission line towers on cultural property (Graves, shrines etc) consult with local community. • If avoidance is not possible prepare a management plan to ensure least damage to cultural, archaeological sites. 			<p>and protection of Archaeological sites</p> <ul style="list-style-type: none"> • Sensitization trainings on chance find • Location of transmission line towers 	<p>archeological importance</p> <ul style="list-style-type: none"> • Chance find procedure training attendance sheets • Route firming reports showing location of archeological resources 	
Construction Material Sourcing	<ul style="list-style-type: none"> • Ensure accurate budgeting to ensure only Necessary material is ordered • Proper storage to ensure minimal loss • Strip & store topsoil separate from subsoil for major tower site excavations. • Rehabilitation of exposed sites as soon as practicable • Source Raw Materials from NEMA approved sites • Use recycled and recyclable materials where possible 	Construction phase	Contractor	<ul style="list-style-type: none"> • Quantity in tonnes of materials abstracted • Amounts of recycled materials 	<ul style="list-style-type: none"> • NEMA Licence for sand or quarry stone harvesting 	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Impacts on flora & Fauna-Loss of Vegetation/terrestrial habitats	<ul style="list-style-type: none"> • Mark out areas for clearance and use manual method of clearance • Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the way leave • Prevent colonization by invasive species • Vegetation removal will be kept to a minimum during construction of the substation and powerline / vegetation should be cleared only as and when required. • Care will be taken to remove topsoil and then subsoil and to stockpile these separately to be replaced at a later stage in order to facilitate revegetation. • The amount of time vegetation is covered by stockpiled material should be minimized. • Temporary access routes to construction areas will be kept to a minimum. • Re-vegetation using indigenous species and rehabilitation of areas temporarily cleared during construction should occur. 	Construction Phase	KETRACO	<ul style="list-style-type: none"> • Migration of fauna species • Invasive species • No of trees cleared for construction works • No of trees planted as part of re-forestation 	<ul style="list-style-type: none"> • Crops and trees data • Monitoring records • Reafforestation programs records 	5,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none">• Alien vegetation should be removed from site on completion of construction;• Construction personnel should be properly trained to use equipment, particularly in terms of the dangers associated with the operation of heavy plant machinery; and• Following completion or partial completion of construction					

<p>Occupational Health & Safety -workers</p>	<ul style="list-style-type: none"> • Staff Training and regular equipment service and testing • Only trained & certified workers to install, maintain or repair electrical equipment. • 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 • Testing structures for integrity prior to undertaking work. • Use of signs, barriers and education/ public outreach to prevent public contact with potentially dangerous equipment. • Community policing to be encouraged to reduce vandalism of towers • Ensure provision and proper use of Personal Protective Equipment (e.g. Safety harness, helmet, dust masks, etc) • Follow safe work procedures • Maintain a fully stocked and accessible first aid kit under trained first aider • Observe OSHA 2007 regulations 	<p>Construction,</p>	<p>contractor KETRACO</p>	<ul style="list-style-type: none"> • Induction sessions with employees • Community sensitization trainings on EHS • PPE provision • No of fully stocked first aid kits • Install hazard signage and warnings • Prepared Safe Work procedures and manuals • A Response and Evacuation Plan developed • Contracted qualified health and safety advisor • health and safety committee in place 	<ul style="list-style-type: none"> • Appointed SHE Expert on site • Training records • DOSH Workplace register on site • Induction records for workers • Inspection & Maintenance records • Visible Hazard communication signages • Safe Work procedures and manuals available • A Response and Evacuation Plan • Contract for the qualified health and safety advisor • health and safety committee • copy of wiba 	<p>12,000,000</p>
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	<ul style="list-style-type: none"> • Ensure there is no encroachment on the transmission line wayleave • A Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees • The contractor should contract a qualified health and safety advisor to conduct training and monitoring of construction works; • The contractor must ensure establishment of a health and safety committee for the project as per the Health and Safety Committee Rules 2004 of the OSHA, 2007 Act. • Provide for WIBA 			<ul style="list-style-type: none"> • WIBA policy in place 		
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Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Impacts on Public Health	<ul style="list-style-type: none"> • Reduce Perceived EMF impacts during design • The proposed line will be constructed to safe standards to ensure the height and way leave trace protects the public from any adverse effects of electric power and electromagnetic frequencies. • A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. • The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. • KETRACO policy of keeping the residence away from the way-leave will also minimize exposure of the general public to EMFs. • On HIV/AIDS, The contractor should install bill boards written in English, Kiswahili and local language to warn and educate the public on HIV/AIDS along active construction sites. 	Construction	KETRACO & Contractor	<ul style="list-style-type: none"> • EMF Testing before commissioning • No. of Contraceptive dispensers • Awareness training • HIV aids awareness sign posts • Prepare COVID-19 Preparedness management plan • Provision of hand sanitizing facility or handwashing soap and water • Temperature checks on site access • Community Grievance Mechanism. 	<ul style="list-style-type: none"> • EMF Test reports • Training register on COVID 19 • Weekly temperature logs • PPEs issuance records • Training attendance sheets • No. of COVID prevention and control signages on site • Copies of the Developed Traffic Management plan, Response and Evacuation Plan, community Health and Safety Management Plan (CHSMP), Emergency Response Plans (ERPs) • Signage on HIV AIDS 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Develop and communicate to all employees (skilled, semi-skilled and 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. • Sensitize all workers (skilled, semi-skilled and unskilled) on COVID-19 risk mitigation measures with sufficient information to keep them and local community safe. • Establish prevention and mitigation measures against COVID-19 and arrangements for dealing with suspected and confirmed COVID-19 cases. The measures should include but not limited to; <ul style="list-style-type: none"> • Infection control plans, • Ensuring social distancing of not less 1.5 meters between employees in all directions, • Hygiene promotion through suitable hand sanitizing facility or handwashing soap and water • Strict and proper use of face masks throughout all working hours and public places. 			<ul style="list-style-type: none"> • Developed Traffic Management • Signage on HIV AIDS • A Response and Evacuation Plan • Community Health and Safety Management Plan (CHSMP) • An Emergency Response Plans (ERPs) 		

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • 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. • 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 • As part of the C-ESMP, contractor to develop and monitor implementation of a Community Health and Safety Management Plan (CHSMP) which will include the following measures: <ul style="list-style-type: none"> ○ Keep construction site cordoned off from the public and employ full time security guard. Signs are put up around work fronts and construction sites advising people of the risks associated with trespass. Ensure that work sites are fenced and 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>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.</p> <ul style="list-style-type: none"> ▪ Adequate collection and storage of waste on site and safe transport to the disposal sites and disposal methods at designated area shall be provided in addition cover for refuse containers so that waste does not become source of diseases. ▪ Contractor will provide access to 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>health care for those injured by its activities.</p> <ul style="list-style-type: none"> ▪ Provision of protective condoms in worker’s sanitation facilities. ▪ Provision of Voluntary Counselling and Testing (VCT) services <ul style="list-style-type: none"> • 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 on symptoms of communicable diseases of concern and STDs. • Ensure all the COVID-19 protocols by the Ministry of Health are adhered to including social distancing, use of masks, hand washing, 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>and use of sanitizers and vaccination of workers</p> <ul style="list-style-type: none"> • Proponent 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. • Proponent will implement a Community Grievance Mechanism. • Proponent 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. Institute a compensation mechanism for animals knocked by contractor or sub-contractor/supplier vehicles 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> An Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals to be prepared to deal with any emerging issues e.g., accidents involving the community. 					
Impacts on soils and geology	<ul style="list-style-type: none"> During the foundation excavations, it is recommended that excavated material is stockpiled a sufficient distance from the excavation; Material to be backfilled will be compacted to limit the possibilities of erosion; Backfilling of foundations should occur as quickly as possible; and Unchanneled flow of water at the site during construction should be controlled to avoid soil erosion. The contractor will ensure recovery of exposed soils with grass and other ground cover as soon as possible. The project should ensure monitoring of areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled. 	Construction phase	Contractor KETRACO	<ul style="list-style-type: none"> Total surface area of excavated ground Number of blasted tower locations 	<ul style="list-style-type: none"> Geotechnical reports Blasting licence with their signed risk assessment ESMP implementation reports during construction phase 	3,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> •The contractor should ensure that construction related impacts like erosion and cut slope destabilizing should be addressed through landscaping and grassing, carting away and proper disposal of construction materials in the various site works. •The contractor should ensure that recommended compaction of spoil areas is undertaken and effective drainage of spoil sites in order to avoid land instability in form of soil subsidence, slip and mass movement.; •The contractor should ensure landscaping of the completed site. 					
Influx of people-Social vices e.g Theft and Vandalism	<ul style="list-style-type: none"> •Adopt and implement a Grievances Redress Mechanism to receive and address complaints from PAPs and host community. •Minimize overcrowding at the construction site to prevent double handling of materials and equipment. •Provision of proper management of materials by allocation to specific persons involved. •Advanced tracking of on-site construction machinery which 	Construction & Operational Phase	KETRACO	<ul style="list-style-type: none"> • Grievances Redress Mechanism set up • Number of reported cases of vandalism • Community Liaison Officers (CLOs) hired 	<ul style="list-style-type: none"> • Security project status reports • Quarterly ESMP Reports • Community Liaison Officers (CLOs) contracts 	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>facilitate an improvement in the safety performance job site layout and prevent theft</p> <ul style="list-style-type: none"> •Optimize the utilization of construction equipment. •Proponent to engage local persons as Wayleave Officers to work with the contractor, in order to ensure the project is implemented smoothly •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. •Liaise with law enforcement in the project area to ensure theft and vandalism perpetrators are held to account. 					
Gender-Based Violence (GBV)-Sexual Exploitation and Abuse (SEA) /Workplace Sexual Harassment (SH)	<ul style="list-style-type: none"> •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 	Construction phase	Contractor	<ul style="list-style-type: none"> • Number of trainings for workers and sensitization meetings for community • Developed GBV-SEA/SH 	<ul style="list-style-type: none"> • Employee code of Conduct signed by all employees • Training records on GBV • Community sensitization meeting minutes 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>presence on site as well as within the project area, and to include sanctions for non-compliance (e.g., termination)</p> <ul style="list-style-type: none"> •Ensure mandatory trainings regarding GBV -SEA/SH to be provided to all project workers including temporary and casual workers. •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 •Adopt and implement a grievance redress mechanism (GRM) and referral mechanism to address all emerging complaints related to Sexual Exploitation and Abuse (SEA) / Sexual Harassment (SH). •Implement the GBV-SEA/SH Management Plan Ensure establishment and Implementation of a GBV-SEA/SH Action Plan by the 			<p>Management Plan</p> <ul style="list-style-type: none"> • No of workers who have signed CoCs • Established survivor centered GRM • No of GBV cases reported and how addressed • Separated men and women latrines on site • Signage prohibiting SEA/GBV 	<ul style="list-style-type: none"> • GRM records 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	contractor which should reflect the unique dimensions of COVID-19.					
Hazardous Materials (Fuel, Oil & chemical storage on site)	<ul style="list-style-type: none"> • 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. • 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. • The contractor shall place on-site tools and equipment, such as generators, compressors on compact impermeable sheeting to prevent oil spills/leaks from causing subsurface contamination. • 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; • The Contractor shall ensure that fueling and repairs are carried out by 	Construction	Contractor	<ul style="list-style-type: none"> • Type and Number of activities /processes involving hazardous materials • Set up procedures of dealing with spills and leaks • No of workers inducted and safety trained on spills handling • 	<ul style="list-style-type: none"> • Have licenced fuel handlers • MSDS Records • NEMA licenced hazardous waste handler • Destruction certificate for any disposed hazardous waste • Spill containment kits • Training records 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>trained personnel familiar with spill containment and clean-up procedures and in Garages and licensed petrol stations</p> <ul style="list-style-type: none"> • The Contractor shall ensure that all the employees working onsite are trained on good housekeeping practices 					
Community Health and Safety	<ul style="list-style-type: none"> • Adherence to OSHA 2007 Act and its subsidiary legislations to ensure that health and safety of immediate neighbors and the public is not threatened. • The Contractor to ensure that construction work is undertaken in manner not likely pose risks to community health and safety. • The contractor should use barricading tape to prevent members of public from accessing excavated tower foundations and work sites during construction • 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 • The contractor should conduct public awareness on safety 	Construction	ESS Officer-KETRACO and EHS Officer-contractor	<ul style="list-style-type: none"> • Number of community PAPs sensitized • Barricade excavations and warning signage • Security personnel on sites • HIV AIDS awareness training and no of participants 	<ul style="list-style-type: none"> • Community sensitization meeting minutes records • Hazard signages on all tower • Barricades and signage purchase records 	2,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>requirements within construction sites</p> <ul style="list-style-type: none"> • HIV & AIDS education and awareness • Provide adequate security where necessary for the public and staff • Public awareness of the public health issues identified. • Provision of condoms for staff • Distribution of HIV & AIDS awareness materials in collaboration NACC • Condone working sights and ensure controlled access 					
Avifauna Impacts	<ul style="list-style-type: none"> • Identify locations as far away as possible from any significant bird breeding or staging areas • Consider migratory bird routes when planning the route of the proposed transmission line • Locate the proposed transmission line adjacent to prevailing natural obstacles such as trees or cliffs to prevent them from perching on the line • Sensitive areas such as the streams, rivers and grasslands should be avoided during the construction phase where possible to limit the impact on 	Operation	KETRACO	<ul style="list-style-type: none"> • Number of Bird mortality cases 	<ul style="list-style-type: none"> • Reported documented of bird mortality cases • Avifauna Monitoring reports 	800,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>avifauna. If these areas are accessed,</p> <ul style="list-style-type: none"> • particular care should be taken to limit impacts; and • assess the electrocution threat posed to avifauna from the new tower structures 					
Impacts on Aviation	<ul style="list-style-type: none"> • Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers • Consider aircraft flight route when locating the proposed transmission line • Proponent must get approval from KCCA by issue of an approval certificate 	Construction	KETRACO	<ul style="list-style-type: none"> • Type of air safety signals on towers • Flight path zones record • No.of towers with signals 	<ul style="list-style-type: none"> • Approved record and data sheets of LED Aviation lights • Testing records of functionality of aviation lights on towers • KCCA Approval on transmission line route 	1,500,000
Child Labour/Exploitation	<ul style="list-style-type: none"> • No employment for anyone under the age of 18 • All persons seeking employment (contractor, subcontractor) should be required to provide a national identity card. • The client and contractor will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. 	Construction	KETRACO Contractor	<ul style="list-style-type: none"> • No.of workers and casual laborer's n site • No.of workers trained on Labour and welfare 	<ul style="list-style-type: none"> • Records of employee age or DOB. • Copies of I.Ds of workers to verify age • Training manuals • Training attendance list 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Implement a labour management plan –to promote fair and equitable labour practices during the COVID 19 pandemic including the project cycle for the fair treatment, protection of workers’ rights, non-discrimination, and equal opportunity of workers • Implement a local recruitment plan - to create opportunities for local employment and to adopt a fair and consistent approach to the recruitment, assessment, and selection of local employees during the COVID 19 pandemic including the project cycle. • Adopt and implement a Grievances Redress Mechanism to receive and address grievances from host community during the COVID 19 pandemic including the project cycle. 					
Sexual harassment (SH)	<ul style="list-style-type: none"> • Ensure clear human resources policy against sexual harassment that is aligned with national law. • Integrate provisions related to sexual harassment in the employee code of conduct and have the Code of Conduct signed by all employees. A key element of the CoC is the sanctions that may be applied if an 	Construction	KETRACO Contractor	<ul style="list-style-type: none"> • No.of workers trained and sensitized • No.of reported SH Cases to authorities during 	<ul style="list-style-type: none"> • Training records- attendance list and certificates • OB register records of ay SH Cases • Incident reports if any 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>employee is confirmed as a SEA/SH perpetrator</p> <ul style="list-style-type: none"> • Have a robust complaints and grievance handling system. Ensure appointment of human resources personnel to manage reports of sexual harassment according to policy • The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse • The contractor will implement provisions that ensure that gender-based violence at the community level is not triggered by the Project, including: <ul style="list-style-type: none"> ✓ Effective and on-going community engagement and consultation, particularly with women and girls. ✓ Review of specific project components that are known to heighten GBV risk at the community level, e.g., compensation schemes; 			project implementation	<ul style="list-style-type: none"> • Visual signs displayed on site to inform and warn on SH 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>employment schemes for women; etc.</p> <ul style="list-style-type: none"> • Have separate, safe and easily accessible facilities for women and men working on the site. Locker rooms and/or latrines should be in separate areas, well-lit and include the ability to be locked from the inside. • Visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where SEA/SH is prohibited. • As appropriate, ensure public spaces around the project grounds are well-lit. • Enhance security on site with guards and CCTV Cameras • Train all Teams in Sexual Harassment prohibition at work 					
Sub-total						36,400,000
PHASE 3: OPERATION PHASE						
Avifauna impacts/Bird Mortalities	<ul style="list-style-type: none"> • Undertake wire marking/reflective balls to alert birds to the presence of power line. • Build raptors platforms on top of pylons for roosting and nesting 	Operation Phase	KETRACO	<ul style="list-style-type: none"> • Number of recordable bird electrocution & collision cases 	<ul style="list-style-type: none"> • KWS Bird mortality reports along wayleave 	2,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Dress existing and proposed transmission lines with conspicuous bird warning devices, where necessary, such as areas where bird migratory routes cannot be avoided 				<ul style="list-style-type: none"> • Quarterly monitoring Reports • KWS bird migratory route maps 	
Impacts on Aviation	<ul style="list-style-type: none"> • Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers • Dress existing and proposed transmission lines with conspicuous aviation warning devices, where necessary, such as areas where aircraft flight path cannot be avoided 	Operation Phase	KETRACO	<ul style="list-style-type: none"> • Near misses/ aircraft incidents and accidents 	<ul style="list-style-type: none"> • KCCA Approved clearance 	3,000,000
Health and Safety impacts during operation. Electrocutation from powerlines Workers exposure to EMF	<ul style="list-style-type: none"> • A maintenance system to ensure physical integrity of structures is maintained • Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines; • Ensuring that live-wire work is conducted by trained workers should not approach an exposed 	Operation and maintenance phase	KETRACO	<ul style="list-style-type: none"> • Number of injury incidences during maintenance • Number of EMF regular tests 	<ul style="list-style-type: none"> • Incident reports • EMF test reports • Monitoring and maintenance records and Reports 	2,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>energized or conductive part even if properly</p> <ul style="list-style-type: none"> • Ensure vegetation along wayleave id below 12ft in height • Electric utility workers have a higher exposure to EMF than the general public due to working in proximity to electric power lines. Occupational EMF exposure should be prevented or minimized through the preparation and implementation of the EMF safety program including the following components: <ul style="list-style-type: none"> • Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities • Training of workers in identification of occupational EMF levels and hazards • Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>compared to those acceptable for public exposure, limiting access to properly trained workers. Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the institute of Electrical and Electronics Engineers (IEEE).</p>					
Community health and safety-Perceived EMFs	<ul style="list-style-type: none"> • If EMF levels are expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines. Examples of these techniques include: <ul style="list-style-type: none"> ○ Shielding with specific metal alloys ○ Burying transmission lines ○ Increasing height of transmission towers 	Operation	KETRACO	<ul style="list-style-type: none"> • Community complaints • No Of regular EMF tests undertaken 	<ul style="list-style-type: none"> • EMF test reports • Complaints and grievances reports • Medical reports on identified cases 	300,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	Modifications to size, spacing, and configuration of conductors					
		• Sub – total				7,800,000
DECOMISIONING PHASE						
Demolition waste	<ul style="list-style-type: none"> 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 Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary landfilling 	Decommissioning	CONTRACTOR	• Weight in tonnes	• Waste carriers' license	1,500,000
Noise	<ul style="list-style-type: none"> 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 	Decommissioning	KETRACO CONTRACTOR	<ul style="list-style-type: none"> Duration of the noise exposure Number of noise complains 	<ul style="list-style-type: none"> Noise meter records NEMA Licence 	600,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>concrete mixtures, compressors, etc.</p> <ul style="list-style-type: none"> Landowners along the routes to be notified about the construction schedule & activities, including blasting, should it be required 					
Vegetation disturbance	<ul style="list-style-type: none"> Implement an appropriate re-vegetation programme to restore the site to its original status(selected critical locations eg AP5) Consider use of indigenous plant species in re-vegetation Trees should be planted at suitable locations to interrupt sight lines (screen planting), between the adjacent residential area and the development 	Decommissioning	Contractor	<ul style="list-style-type: none"> Area of cleared vegetation 	<ul style="list-style-type: none"> Crop Damage Report Compensation matrix Monitoring report for greening program 	5,000,000
Buried/ underground infrastructure including cables from third parties, water pipes, sewer systems	<ul style="list-style-type: none"> Contractor should conduct extensive ground investigations where pylons will be sited to ensure that no damage is caused on buried/ underground infrastructure. The contractor will be liable for damages and associated costs for any of the infrastructure he may tamper with during implementation and installation of the proposed Narok – Bomet line. 	Decommissioning	KETRACO CONTRACTOR	<ul style="list-style-type: none"> Number and types of buried services 	<ul style="list-style-type: none"> County infrastructure plans Demolition works approval 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Water Pollution	<ul style="list-style-type: none"> 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 No waste to be disposed in water body. KETRACO to supervise all activities 	Decommissioning	CONTRACTOR	<ul style="list-style-type: none"> Change in water quality in specified areas Water borne diseases No of mortalities of aquatic species 	<ul style="list-style-type: none"> Effluent discharge License NEMA licenses for transporter Water quality reports Medical reports 	1,500,000
Fire Hazard	Electrocutation and fire by line snapping Transmission tower/pylon collapse Flooding and fire hazards of substation and transmission line <ul style="list-style-type: none"> 	Decommissioning	CONTRACTOR	<ul style="list-style-type: none"> Availability of fire warden 	<ul style="list-style-type: none"> Fire clearance report Fire equipment register 	500,000
Sub-total						10,100,000

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. Flora and Fauna
5. Aviation
6. Community health issues and spread of communicable diseases such as HIV/AIDS, Covid-19
7. Occupational health and safety
8. Gender based violence (GBV); Sexual exploitation and Abuse (SEA)/ Sexual harassment (SH) and gender equality issues

Conclusions and Recommendations

The ESIA study has established that the proposed transmission line and substations are a worthwhile investment. The project will contribute significantly to the power stability, provide reliability, enhance security of supply to the existing demand hubs in Narok and Bomet counties and country at large which by extension will spur economic development; expand transmission capacity necessary to enhance electrification initiatives and reduce technical losses in areas currently served by long medium voltage lines.

The ESIA study estimated that a total of 242.90 Ha or 600.219 Acres will be affected by the right of way for the proposed transmission line. Parcels of land traversed by the proposed RoW range in various sizes of largely private land. From the RAP update exercise carried out in December 2021, it is estimated that an approximate 256 structures will be affected. The displacements will occur throughout the ROW with significant impact on structures likely to be experienced in the densely populated Melelo, Ilmotiok and the entire of the section in Bome County. Further, some physical cultural resources especially some trees with medicinal and economic significance were observed. The highlighted social -cultural and economic issues underpins the need for a comprehensive resettlement action plan (RAP) that would ensure compensation and livelihood restorations for projected affected persons.

The proposed line traverses natural forested areas (especially the Narok section) and riverine habitats notably the Mara and Nyongores river riverine ecosystems. Crossing across these ecosystems may result in loss of vegetation and associated habitats. The ESIA study recommends ninety degrees crossing (wherever possible) to minimize the impact of vegetation clearance. It is further recommended that KETRACO in collaboration with other agencies such as the Kenya Forest Service rolls out afforestation programmes in the project areas to offset vegetation/tree loss.

It's worth to note that the proposed project is especially designed to veer off and avoid the the Maasai Mara National Reserve and the Mau Forest. The line is closest to the the Mau Forest at AP15 (11.69km) to the North East. It is closest to the Maasai Mara National Reserve at AP13 (46.33km) to the Southwest. In addition, the proposed transmission route avoids densely populated areas, towns, and market centers and follows existing roads as closely as possible. These design measures minimize negative environmental, social and economic impacts.

The ESIA study has established detailed environmental and social management plan (ESMP); and an environmental and social monitoring plan (ESMmP); including standalone management plans for various aspects with mitigation measures for the anticipated impacts. The ESIA has recommended the need to ensure stakeholder engagement and grievances management is undertaken post ESIA (applicable to the pre-construction, construction, operations, and decommissioning phases). This ESIA also recommends that the proponent disseminates the correct information on KETRACO's CSR policy and the cap for trees and crops allowed under the RoW guided by the RPF provisions to PAPs in consecutive stakeholder engagement sessions e.g., during the disclosure of the RAP and ESIA.

An approximate budget to implement the RAP, ESMP and ESMmP has been calculated at **Ksh 775,763,000.00**.

Some of the management plans to be implemented alongside the ESMP and ESMmp are as follows;

- Atmospheric Emissions Management Plan
- Hazardous Substances Management Plan
- Spill Prevention and Countermeasures Management Plan
- Fire Risk Management Plan
- Noise Management Plan
- Surface Water Management Plan
- Waste Management Plan
- Biodiversity Management Plan
- Occupational Health and Safety Management Plan
- Emergency Preparedness and Response Management Plan
- Labour Management Plan
- Labour influx management plan
- Local Recruitment Plan
- Associated Facilities Management Plan
- GBV-SEA/SH action management plan
- Stakeholder Engagement Plan
- Grievance Redress Mechanism
- CSR plan.
- Resettlement Action Plan
- Livelihood Restoration Plan
- Gender mainstreaming plan
- Chance Finds Procedure
- Resource Efficiency and Pollution Prevention and Control Plan
- External Communication Mechanism on Environmental Issues
- Community Health and Safety Plan

The cost 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 Environmental safeguards team, in collaboration with stakeholders such as KFS, KEFRI and Community Forest Associations, will oversee and monitor the tree planting/ reforestation activities within the project affected areas.

The budget overview of implementing the RAP, ESMP & ESMmp has been summarized below:

RAP, ESMP & ESMmp Implementation estimate costs

Item	Cost
<i>RAP costs</i>	669,200,000.00
<i>Environmental and social management costs</i>	51,500,000.00
<i>Environmental and social monitoring costs</i>	6,500,000.00
<i>Costs to be included in contractor's Boq</i>	27,200,000.00

<i>Costs that should be part of routine or periodic maintenance</i>	6,250,000.00
Total	755,650,000.00
Training/institutional costs 2% of total cost	15,113,000.00
Grand total	775,763,000.00

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 ESMnP.

KETRACO 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.

The contractor will be availed this ESIA and ESMP and required to develop and submit to the client a detailed C-ESMP for approval prior to the start of any construction works. Further, the Contractor will be required to have environmental, Health and social/liason persons charged with primary responsibility of monitoring the implementation of the C-ESMP.

CHAPTER 1. INTRODUCTION AND PROJECT BRIEF

1.1 Introduction

The country's long-term development blueprint, Vision 2030 aims at transforming Kenya into a globally competitive newly industrialized middle-income and prosperous country. The Second Medium Plan 2013-2017 identifies energy as one of the enablers for transformation into "a newly-industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment". Efficient, accessible, and reliable infrastructure is identified as an enabler for achieving sustainable economic growth, development, and poverty reduction, by lowering the cost of doing business and improving the country's global competitiveness.

The energy sector plays a critical role in the socio-economic development of a country. Kenya is committed to universal access to modern forms of energy by year 2030, as articulated in the Vision 2030 (GoK, 2007). Energy is identified as a critical enabler of this Vision. Kenya has also experienced an impressive expansion of access to electricity. According to the recent Multi-Tier Framework Energy Access Survey Report (2020), the country now has the highest electricity access rate in East Africa with the total access standing at 75% both from grid and off-grid solutions. Despite the progress, there is still a gap and room for equitable distribution across Kenya. Responding to this challenge, in December 2018 the government launched the Kenya National Electrification Strategy (KNES) – a roadmap for achieving universal access to electricity by the year 2022. The strategy includes commissioning and completing previously launched donor funded projects

To attain this universal coverage alongside providing reliable and affordable power, the government is implementing various projects all over the country and this includes the Narok-Bomet 132kV transmission line. The National Treasury on behalf of the Kenya Electricity Transmission Company Limited (KETRACO) commenced the process of seeking financing for the Narok-Bomet transmission line project under Kenya Transmission Network improvement Project (KTRNIP) that also includes two other transmission lines including Kabarnet – Rumuruti 132kV and Malindi – Weru – Kilifi 132kV. The project was conceived in 2009. The scope had been given to the Kenya Power who did feasibility studies, ESIA and RAP in 2018. In 2021 the scope was transferred to KETRACO which therefore necessitated the need to firm up the line route and update the previous studies.

Kenya's legal framework stipulates that all new projects require an Environmental and Social Impact Assessment (ESIA) this is anchored in the Environment Management and Coordination Act (EMCA) Cap 387. ESIA study is meant to be carried out at the project planning phase to ensure that environmental issues are taken into consideration at the project planning stage and adequately addressed during project implementation: construction, operations, and decommissioning stages. Therefore, KETRACO involved in-house expertise to undertake the ESIA update study.

1.2 Background Information

The Government of Kenya through its implementing agency; Kenya Electricity Transmission company Limited (KETRACO) plans to construct and commission a 81km 132kV double circuit transmission line linking Narok 132/33kV and Bomet 132/33kV substations.

Bomet 132/33kV substation is currently supplied from Sotik on the Kegati- Chemosit line. The newly completed Narok 132/33kV substation is to be supplied from Olkaria I substation by a 132kV line that is currently under construction. At present, power from the Olkaria geothermal generating plants flows to the Western region of the country through the Olkaria I- Naivasha single-circuit 132kV line with a capacity of 150MVA and onwards on double-circuit Naivasha-Lanet-Lessos 132kV lines with a capacity of 166MVA. Western region has a maximum demand of 391MW which cannot be met by the generation in the region (Sondeu, Sangoro, Muhoroni GTs and Turkwell) supplemented by imports from Uganda Electricity Transmission Company Limited (UETCL).

Load shedding is usually instituted in the western region whenever there is poor system voltages, a trip of the Naivasha-Lanet line on overload or outage of any of the generation plants in the region resulting in loss of revenue for the economy at large. There are also increased transmission losses when the power is evacuated through the 220kV Okaria II-Nairobi North-Dandora lines and 132kV Dandora-Juja Rd-Naivasha-Lanet-Lessos lines route especially in case of an outage on the Olkaria I-Naivasha line.

1.3 Project Justification

The proposed project seeks to establish a more reliable power supply with improved voltage profiles via the establishment of a line linking the Okaria geothermal generation plants to the south rift and western region transmission network. This will greatly improve supply quality and reliability to the said regions of the country as it will provide an alternative route for evacuation of power from Olkaria geothermal plants. The project is justifiable in that it will stabilize power supply, improve on transmission line security hence cushioning against losses occasioned by power failures and blackouts.

Further, the existing Bomet 33kV electrification network is highly constrained in terms of capacity and is therefore unable to supply additional electrification load growth in the Narok, Bomet and Sotik areas. It is therefore imperative for KETRACO to establish a new 132kV network of powerlines on the western region circuit specifically on the south rift to strengthen the existing electrification network and cater for the projected electrification load in the future. In addition, the development of the Narok- Bomet 132kV Transmission line is part of the larger Bomet and Narok counties electrification project in which KETRACO has proposed constructing substations to form a closed circuit (ring) of lines on the different areas. As such, the development, and the construction of the new Narok-Bomet 132kV powerline is imperative in enabling KETRACO to establish the required closed-circuit system of powerlines.

The proposed Narok-Bomet transmission powerline will also provide an additional supply of electricity to the Narok/ Bomet/ Sotik/Kericho areas. Many households in this area currently do not have electricity and are reliant upon candles, woodfuel and kerosene lamps for lighting & cooking purposes as indicated in Table 1-1

Table 1-1: Percentage access to Energy in Bomet and Narok Counties

County	Electricity	Paraffin	Gas (LPG)	Biogas	Firewood	Charcoal	Solar
Narok	0.5	1.0	8.2	0.5	71.7	17.7	0.4
Bomet	0.3	0.8	5.9	0.2	88.4	4.1	0.2

Source: KNBS, 2019 (National Census Report)

A dedicated, additional supply of electricity will enable many previously un-serviced households to receive electricity thus reducing pressure on and overreliance on woodfuel - which has adverse impacts to the environment and health of local population. If the status quo remains, the ability to supply new customers will 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. This will consequently have a significant negative impact on existing and proposed new developments in the area, including tourism and agriculture.

The direct beneficiaries of the project output will be economic actors and the population connected to the national power grid. The Fast-growing counties of Narok and Bomet will have stable and reliable power since they are a strategic location where power flow can be evacuated from 2 alternatives, that is, supply from the

Jinja – Lessos 132kV network and the current alternative from Olkaria geothermal power. This power is also sustainable and reliable since its generated from green energy sources of Geothermal in Olkaria.

1.4 Objectives of the Project

The overall objective of the project is to construct a new 132kV double circuit transmission line from Narok to Bomet.

Specific objectives

1. To improve quality of supply and reliability to the western regions of the country by providing an alternative route for evacuation of power from Olkaria geothermal plants.
2. Designing and constructing of a 132kV double circuit transmission line in compliance with electric generation regulatory authorities (ERC, Ministry of energy)
3. Ensure sustainability of the project by complying with national laws especially those touching on environment

1.5 Project Sustainability

High Voltage transmission lines have a tremendous size advantage and lower total electrical losses for high-capacity transmission plus several technological advantages compared to solutions based on standard conductors. This leads to a minimized environmental impact and enables an overall more sustainable transmission of electric energy. The access of remote renewable energy (RE) sources with high-capacity transmission is rendered possible with superior efficiency. That not only translates into further reducing CO₂ emissions in a global energy mix.

According to the Environmental Management and Coordination Act 1999 (EMCA), a proponent of any project specified in the Second Schedule – more so high-risk projects such as high voltage transmission lines shall undertake a full Environmental & Social Impact Assessment (ESIA) Study and submit report to the Authority a Comprehensive project report (CPR) prior to being issued with any license by the Authority. In compliance with this legal requirement, the proposed transmission line is expected to be implemented in an environmentally and socially sustainable manner. The proposed project will also conform to all donor Safeguards particularly African Development Bank (AfDB) Operational safeguard 1 on Environmental and social Assessment. Been classified as a Category 1 investment Project – likely to induce significant and/or irreversible adverse environmental and/or social impacts, or to significantly affected environmental and/or social components that AfDB considers sensitive, the project does require and ESIA.

Consequently, the implementing agency (KETRACO) has engaged the services of environmental experts registered by NEMA to conduct an Environmental and Social Impact Assessment (ESIA) study for the proposed project prior to its construction. This ESIA report has been conducted as per the Environmental Management and Coordination Act 1999, and the Environmental Impact Assessment and Audit Regulations, 2003) among other legal requirements.

1.6 Objectives and Scope of the ESIA Study

1.6.1 Objectives of the study

The main objective of this ESIA study was to examine both positive and negative effects of the proposed 132kV double circuit transmission line on the people, their property, and the environment. The study also identified measures to mitigate the negative impacts and enhance positive impacts, hence ensuring sustainable projects.

Specific objectives of the study included the following:

- Present the proposed project design,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,

- Identify key areas for environmental, social, health and safety concerns as well as the anticipated impacts associated with the proposed project implementation and commissioning,
- Undertake public consultations with the potentially affected people and other interested parties
- Establish a comprehensive environmental and social management plan covering the construction, operation, and decommissioning phases of the project,
- Preparation of a comprehensive Project Report in accordance with the local environmental legislation and submission to NEMA for further instructions and/or approval.

1.6.2 Scope of the ESIA study

The assessment was undertaken in full compliance with the Environmental Management and Coordination Act 1999, and the Environmental Impact Assessment and Audit Regulations, 2003 (and 2019 Amendment). In addition, appropriate sectoral legal provisions relevant to such projects have also been referred to for the necessary considerations during the construction, commissioning, operation and decommissioning of the proposed transmission line.

The ESIA scope largely covered the following areas:

- **Baseline Conditions:**

Environmental setting (climate, topography, geology, hydrology, ecology, water resources sensitive areas, baseline noise levels, air quality and soil quality analysis.

- **Socio-economic activities in the surrounding areas**

Land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.

- **Infrastructural issues**

Roads, water supplies, drainage systems, electricity distribution system, etc.

- **Legal and policy framework:**

- Focusing on the relevant national environmental laws, regulations and by-laws and other laws and policies focusing on allied activities relative to the proposed project.
- The financier/donor policies on environment and social safeguards

- **Stakeholder engagement**

Focusing on identification, categorization, and engagement through various forums such as Barazas

- **Analysis of project alternatives**

Consideration of project alternatives including technology, do nothing alternative and routing options

- **Identification and assessment of potential impacts**

Identification and analysis of impacts during design, construction, operation, and commissioning phases of the project

- **Environmental and Social Management Plan (ESMP) preparation of ESMP for design, construction, operation, and commissioning phases of the project**

1.6.3 Terms of Reference (ToR) for the ESIA Process

The Project Implementation Team Experts were assigned the task of carrying out Environmental and Social Impact Assessment of the proposed Narok-Bomet transmission line. The scope covered various activities related to; project planning activities, construction works of the proposed development which included all works of civil, mechanical, electrical, or other nature necessary to construct, commission and decommissioning of the transmission project. The output of this work is a comprehensive Environmental and Social Impact Assessment Study Report which will aid NEMA in deciding on the project. The report is also in compliance to Environmental and Social Safeguard Policies of the proponent's development partners, that is the African Development Bank (AfDB).

The ESIA experts conducted the study guided by the following terms of reference:

- Establish the suitability of the proposed location to construct the 132kV transmission line.
- Provide a concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- Provide a description of the technology, procedures, and processes to be used, in the implementation of the project.
- Description of materials to be used in the construction and implementation of the project, the products, by-products, and waste to be generated by the project.
- Description of the potentially affected environment/social economic and cultural setting of the project area.
- Description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term, and long-term effects anticipated.
- Analysis of alternatives including project site, design and technologies.
- Development of an Environmental Management Plan proposing the measures for eliminating, minimizing, or mitigating adverse impacts on the environment, including the cost, timeframe, and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities during project construction, operation, and decommissioning.
- Propose measures to prevent health hazards and to ensure safety in the working environment for the employees and the neighboring community.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
- An economic and social analysis of the project.

1.7 ESIA Approach and Methodology

The approach chosen in undertaking this study was careful to consider EMCA, 1999, 2015, 2019 requirements as well as the Environmental Impact Assessment and Audit Regulations, 2003 and 2019. It involved largely an understanding of the project background, the preliminary designs, and the implementation plan. The approach and methodology applied during the study enabled collection of both primary and secondary data. Qualitative and quantitative methods of data collection were employed. Secondary data was obtained through literature reviews while primary data was obtained through physical observations, photography, interviews, and stakeholders' consultation.

The initial stage of this assessment was project screening. Screening of the project sought to ascertain whether this project falls within a category that requires ESIA prior to commencement. Other considerations made during this stage included a preliminary assessment of the environmental sensitivity of the areas along the proposed transmission line route through assessment of project maps and walking along the preliminary routes. This screening indicated that the proposed power transmission line is among the high risk listed projects under Schedule 2 of EMCA, 1999 and AfDB Category 1 projects thus requires an ESIA study.

Project scoping was the next stage which was done to delineate project issues that required detailed analysis. This step involved collection of primary and secondary data through field visits and literature review respectively.

1.7.1 Desk study/literature review

A critical literature review of secondary data was done to establish the following:

- Relevant legislations and institutional framework governing the proposed project
- Licenses and permits requirements and conditions.

- Baseline information of the project area
- Types of waste likely to be generated.

1.7.2 Socio economic and cultural assessment

A socio-economic assessment was conducted to establish the socio-economic and cultural setting of the project area. This entailed primary data collection using various tools and methods. Interviews, discussions, photography, and observations are some of the methods employed in conducting the assessment with the potentially affected persons. A total of 26 sensitization meetings have been held, that is, 20 in 2018 and 6 in 2021. As this is a linear project, social economic assessment largely involved a census whereby all the Project Affected Persons (PAPs) were interviewed at household level. The data from household interviews was corroborated through key informant interviews. It captured information, particularly: administrative location, household characteristics, sources of livelihood, types of housing and ownership, economic activities, religion, sanitation, education, priorities among others

1.7.3 Public Consultations

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003 requires that all ESIA Studies undertake Public Consultation (PC) as part of the study. The aim of the PC is to ensure that all stakeholders interested in a proposed project such as project beneficiaries and the public in the vicinity of the proposed project be identified and their opinion considered during project planning, design, construction, operation, and decommissioning phases. Stakeholder engagement and consultations were undertaken to fully inform the communities about the proposed project. The objectives were aimed to:

- Establish a participatory process for identifying potential impacts and benefits of the project.
- Accord the locals in a fair and culturally appropriate way, a chance to be engaged and determine how they wish to be involved throughout the project phase.
- Solicit the support of the communities from the proposed project area.
- Determine the nature of the local power structure and document the procedures for the entry and access into the community.
- Obtain accurate and detailed data on local livelihoods, customs, and historical traditions for information to project partner agencies and agents.
- Determine through careful consultation with the community members the preferred mechanisms for information provision and consultations and representatives in decision making.

Public consultations were conducted thorough public barazas organized at appropriate sub location levels along the proposed route. Key stakeholder's views on the project were solicited through interviews and discussions with the heads of various line ministries at the county headquarters. The cumulative meetings held in 2018 were 20 in total with 289 participants (222 male and 67 female) and the update in 2022 involved a total of 6 community meetings with 112 participants (91 male and 21 female) and 8 key stakeholder/Lead Agencies consultations with 22 participants (18male and 4 female).

1.7.4 Environmental and Social Impact Assessment steps

Interactive approach was adopted for the immediate neighborhood in discussing relevant issues including among others:

- Land use aspects,
- Neighborhood issues,
- Project acceptability,
- Social, cultural, and economic aspects,
- Environmental Impacts
 - Physical impacts,

- Biological impacts,
- Legal Compliance.

Key activities undertaken during the study included the following:

- Physical inspections of the proposed project area
- Desktop study of all alternatives
- Literature review of relevant documents
- Stakeholder consultations with the line ministries and project affected persons
- Socio-economic assessment of the project area
- Continuous discussions with the stakeholders and accessing other sources of information on the proposed project details, the site planning and implementation plan,
- Photography, and interviews with people in the immediate neighbourhood. Public participation forms were used to record their opinion regarding the project.
- Evaluation of the activities around the site and the environmental setting of the wider area.
- Report writing and submission.

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

Step 1: Project Screening

Details about baseline conditions and potential environmental and social impacts were collected through desktop study, stakeholder consultations, site visits, photography, and inductive methods

Step 2: Project Scoping

Scoping involves the process of determining the content and extent of the matters which should be covered in the environmental information to be submitted to a competent authority for projects which are subject to EIA. Project scoping was done during feasibility study stage and firming up of the line route. A copy of the route firming report done by KETRACO in 2021 is attached to this report as annex 10.

Step 3: Terms of Reference (ToR)

The terms of Reference were developed guided by EMCA 1999 and The Environmental Impact Assessment/Audit regulations 2003. Any new developments out of character with their surrounding must have an ESIA undertaken; for review, approval, and licensing by NEMA. The ToR for this project was done, duly submitted, and approved by NEMA.

Step 4: Identification of Potential Environmental and Social Impacts

The Potential Environmental impacts were identified, Classified and magnitude determined.

Step 5: Impact Assessment and Consultations

The Environmental and Social Impacts were analysed, assessed, and discussed in detail involving consultations with the Proponent and other stakeholders.

Step 6: Formulation of Mitigation measures

Mitigation measures to ameliorate or minimize the potential Environmental and Socio – economic impacts were formulated for the entire project life.

Step 7: Development of an Environmental & Social Management and Monitoring Plan:

An ESMP for the project life was developed indicating parameters to be monitored, persons responsible, timing and costs involved.

Specific issues covered in the project report include but are not limited to:

- Name of the proponent, address and contact person

- Title of the project
- Objectives and scope of the project
- Nature of the project.
- Location of the proposed project, including the physical area that may be affected by the project's activities.
- Types of activities that will be undertaken during the project construction, operation, and decommissioning phases.
- Design of the project.
- Proposed Project budget.
- Materials to be used, products and by-products, including waste to be generated by the project and the method(s) of their disposal.
- Potential environmental impacts of the project.
- Economic and social impacts to the local community and the nation in general.
- Views of the public/potentially affected people about the project; and
- An Environmental and Social Management Plan (ESMP) for the entire project cycle to include mitigation measures to be taken during and after implementation of the project and an action plan for the prevention and management of foreseeable accidents during the project cycle.
- An Environmental and Social Monitoring Plan (ESMoP)

Therefore, it is critical to note that this ESIA report meets all conditions as stipulated in the Environmental Management and coordination Act (EMCA) Amended 2019, Legal Notice 32.

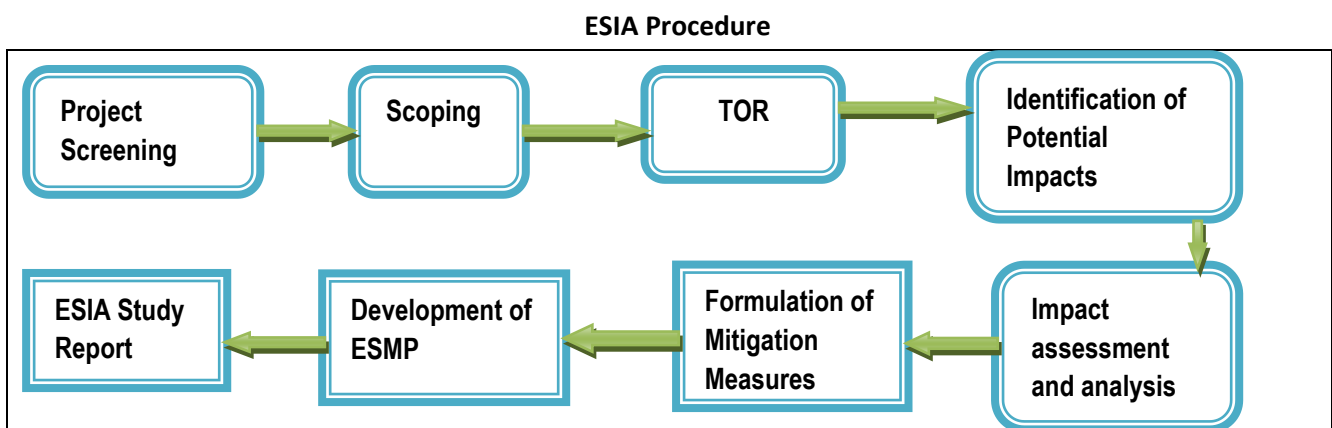


Figure1-1 : Summary of ESIA procedure

1.8 Uncertainty and Difficulties in Compiling Information

Uncertainty arises from a variety of aspects in any development, and for this study report has emanated from the following:

- The changes that may occur in baseline conditions, due to external factors over the lifetime of the project.
- Uncertainty related to Proponent's policy initiatives that might influence the assessment of future baseline and post-development conditions.
- Uncertainty in relation to project planning and implementation as the detailed program and means of construction may be influenced by the choice of Contractor and the detailed design of the development.

The difficulties in compiling the information for this study report have related principally to the above sources of uncertainty. To obviate these difficulties, the Lead Expert has used his experience in electricity transmission

infrastructure wherever possible to gauge and recommend appropriate mitigation measures in this study report.

The study does not also consider how the present global meltdown/ economic recession and donor funding may affect the construction and management of the proposed project.

CHAPTER 2. DESCRIPTION OF PROPOSED DEVELOPMENT PROJECT

2.1 Overview

This chapter provides an overview of the proposed Narok-Bomet 132kV transmission powerline as currently designed. The description borrows largely from documentation and initial ESIA study undertaken by the Kenya Power and Lighting Company (KPLC) in 2018.

2.2 Description of the Proposed Development

The project shall involve construction of an approximately 81km long 132 kV Double Circuit transmission line from the existing Narok 132/33kv Substation to Bomet 132/33 kV substation. The line will be constructed in self-supporting Lattice steel towers and ACSR-175 mm² "Lynx" conductor with a single overhead OPGW shield wire.

The scope of the Transmission line works shall involve.

1. Extension of the existing 132kV bus bar at Narok and Bomet substations to create two lines take off bays, complete with protection, system control and Automation.
2. Construction of 81kms of 132kV double circuit line with OPGW earth wire

The scope of work for the transmission line will cover design, testing, manufacture, supply, shipping, transport from docks to stores, delivery to site, unloading, check survey and all associated profile plotting, support pegging, provision of access facilities and route clearing, transportation to site, installation of foundations and all associated civil works, erection of supports, installation of insulators, conductors, and all associated fittings.

The works shall further include, but not limited to, testing on site and setting to work as set out in the General Conditions of the Contract and prices stated in the schedules or at such other prices or rates as may from time to time be agreed, together with the provision of such spares as directed and training of the Employer's personnel (if specified) to all works associated with the transmission line in accordance with the specification, standards, schedules and accompanying drawings and maps for the transmission line .

The transmission line shall be constructed completely in accordance with the specifications and associated design and general arrangement/outline drawings.

2.3 Scope and Extent of Definite Work

Approximately 81Km of Double circuit three-phase transmission line on lattice steel towers with single 30/7 (Lynx) 175mm² ACSR conductor per phase and single OPGW earth wire from the existing 132 kV substation at Narok to the existing Bomet Substation.

2.4 Location

The proposed transmission line will be in Narok and Bomet counties. The total length of the transmission line in Narok county is 58km while the length in Bomet county is 23 km. Figure 2-1 indicates the project's setting in the national (Kenyan) context.



Figure 2-1: Geographical setting of the proposed Transmission line

The line route runs from the existing Narok 132/33 kV Substation situated within environs of Narok town to the existing Bomet 132/33kV substation within the environs of Bomet town. The line route was largely adopted from the KPLC firmed route, a few changes made to minimise the environmental and social impact. In KETRACO update study, the angle points were increased from 1 to 22 and total distance reduced from 85km initially to 81km. The changes will go a long way in enabling the project to be more environmentally sound and sustainable.

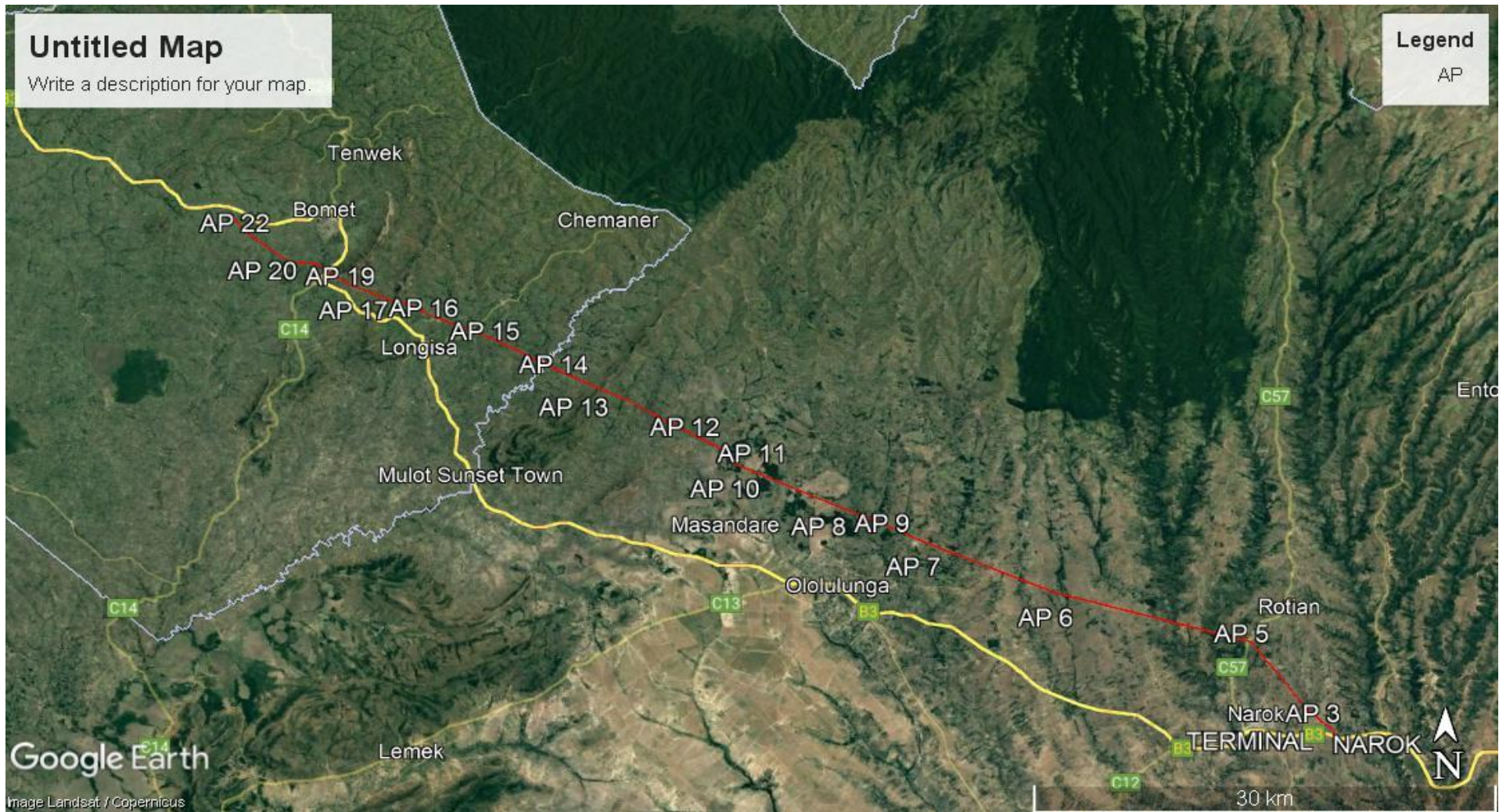


Plate 2-12: A Google earth view of the proposed line route

2.5 The proposed routes of traverse

The proposed transmission line is 81km starting from Narok substation and terminates at Bomet 132/33kV substation. The line will start from Narok Ilmashariani area and run straight on the Narok North Subcounty for some distance before crossing to Narok South before Ololunga. It then runs for about 13kms before crossing to Narok West at Olereut area where it then crosses to Bomet County at Mara River to Bomet East, Kapkimolwa location, Koibeiyon sub location.

The line then runs across valleys, ridges, hills and rivers and crosses to Bomet central and partly Chepalungu in Cheboin and Kyogong locations before termination in Itembe location, Sachangwan area in Bomet Central subcounty. The proposed route was carefully selected to minimize interruption of human settlement, habitat, and social amenities. Associated ground structures will avoid sensitive habitats such as wetlands and riparian land.

In localities where the existing pole based 33kV and 132kV has traversed densely populated human and environmentally fragile ecosystems, adjustment of the proposed 132kV transmission line route was done with an aim of reducing any undesirable interruption.

It should be noted that the KETRACO ESIA team largely adopted the KPLC proposed line route. However, the line route was further reviewed and optimized. Necessary adjustments were made to adapt to the baseline changes that have occurred since 2018, crossings on biophysical parameters such as rivers, wetlands, and forests.

2.6 Detailed Route Description

The proposed line will take off from Narok 132/33kV substation in Ilmashariani Sublocation to pylon 1 which will be approximately 70 meters from the Nairobi – Narok road. The Pylon will be on a farmland currently under Bomarode grass cultivation. A few scattered trees mainly yellow-barked acacia and Osokonoi (*Warburgia ugandensis*) spread across the farm. The soil is alluvial with good drainage and the land is gently sloping to the North. The Contractor will be expected to carry out geotechnical surveys to establish the ground stability in all points pylons will be installed. Damage to vegetation is anticipated and the contractor will be expected to use minimal mechanical labour, implying less vehicles will be expected to be driven to this point.



Plate 2-2: Narok 132kV substation take-off point & Bomet 132Kv substation terminal point

Pylon 1 and Angle Point 1 are on the same parcel of land sharing same topographic, soil and land use characteristics and apart from damage of grass and the four trees that will be lost there are no significant environmental characteristics.

There were no visible waterways along the parcel of land, but soil and geotechnical studies will guide the contractor on the civil requirements for the pylons.

Electrical powerlines of medium and low voltage will be crossed by the 132KV line within this parcel of land and the contractor should follow KETRACO electrical rules and procedures to ensure safety of the employees and the existing powerlines.

Angle Point 2 is approximately 270 meters from Angle Point 1 and the line will mainly traverse farms of wheat and maize and portions of grassland characterized by Sparse trees and bushy woodlands of indigenous trees. The trees likely to be affected are Acacia species, Mutamahiu, Osokonoi, Ceder and other indigenous bushes and herbs.



Plate 2-3: Subsistence farming in Ilmotiok before crossing river Mara

Angle point 2 at the time of the update study was in a farm with settlement, however another angle point was introduced to evade settlements. At the time of study, the farm was planted with wheat and the angle is proximal to a rural road roughly 10 meters and on the opposite side a 11kV power line serves immediate neighbors.

The contractor will take precautions applicable when working proximal to a road, and safety signages should be installed and due care taken to ensure he doesn't inconvenience other road users.

The proposed line will then traverse through farmland and grazing grounds before cutting through a wheat farm, a maize farm and then cross Olopito gully which is deep with some indigenous vegetation and some tall trees. The contractor will take precaution not to locate towers close to the gully because of ground instability and risks of fostering soil erosion. Safe stringing of conductors across the gullies will also be factored.

The line will then be routed to Angle point 3 before slighting across Narok – Nakuru road where the proposed routing is over a permanent toilet which will require to be compensated. To the left of the proposed route is a hill with Base Transmission masts and significant vegetation cover. The construction of the line will not affect this physical feature. The routing will progress to the third gully across a maize farm and some trees on the lower side after which the proposed routing will cross over a commercial/residential shop proximal to the gully. The shop and associated structures should be valued, and compensation done for relocation before construction of the line is commenced. The affected structures are iron roofed & walled. The affected plot is small in size and the project may affect three quarters of the total parcel of land. Livelihood restoration has been factored for the affected family.



Plate 2-4: Permanent and mud grass thatched structures to be along the proposed wayleave

The proposed line will then cross a gully with minimal trees. The total number of affected trees and other vegetation will be tabulated during census before submission for wayleave team to compensate/offset. The line will cross through one parcel of land with a residential premise near the edge of the wayleave trace. The contractor will ensure necessary precautions not to unnecessarily disrupt the concerned neighbor and the topography at that point is rugged with signs of soil erosion and exposed rocky surfaces.



Plate 2-5: Woodland thicket along the wayleave

The gully is a seasonal water way which is deepening and expanding with years and the contractor will take caution not to place pylons close to the gully. The ground is unstable and introducing heavy civil works may promote soil erosion and exacerbate land degradation as well as risking on the stability of the power line. The gully locally referred to as *mukuru* is characterized of thick indigenous trees at the edges. Farms have been done to proximity of the water way.

The contractor will ensure only necessary vegetation is cleared and any disturbed soils should be reinstated. They will also factor transport challenges as well technology required to string the cable across such land formations.



Plate 2-6: Massive soil erosion leading to deepening and widening of the gully at AP 11

The contractor will exercise necessary precautionary matters when crossing the proposed line over existing Low voltage lines and more so be cautious to other road users. The contractor will not construct his materials storage yard near the school. The contractor should respect the culture of the Maasai community and construction of the power line will not disrupt the learning environment/discipline in the school in any way.

The proposed routing then cuts diagonally across a farm which has dense vegetation on the lower side before crossing Sikintteir river which is permanent. The river proceeds downstream through Narok town into the Maasai Mara. The river is an important resource to the community who use it for sourcing drinking water, watering their livestock and small-scale horticulture.

The contractor should ensure no towers are located proximal to the river and none of his activities including transportation and stringing of conductors cause water contamination.



Plate 2-7: Gully erosion along riverbank(left) and Community dam(silanga) a wetland ecosystem



Plate 2-8: Sikinteirr river which will be traversed by the transmission line.

As the Transmission line crosses Sikinteirr river, it enters Olroito Sublocation where it will be routed over Nturere's land and an entire compound will be affected consisting of a five-roomed main house, a two-roomed kitchen, a chicken house, a pit latrine, cow sheds and compound fencing. Such affected structures shall be valued and compensated before construction of the power line.

Livelihood restoration should also be factored for the affected family.

The line crosses the road and 11 kV line and enters plot 101 where three structures will be affected. The line will then cross through a section of natural thicket through Enkare river. Crossing rivers where there are no bridges will be a challenge especially during peak river times. The contractor should consider what method will be applied to transport materials across such rivers and the challenges that would be experienced during stringing.

Undisrupted power supply should be considered as the contractor strings the conductors across existing low and medium voltage lines.

The contractor will factor constructing temporary elevated safety bridges way up the local distribution lines across which he would pull the conductors of the proposed line both across local network and across road networks. The line would cross through farmland currently planted with wheat and two homesteads would be affected. In one of the compounds numerous exotic trees ranging from Gravelia, Eucalypts, Casuarina and Ornamental trees will be affected. The total number of trees in that compound is approximately 400 and compensation for such trees and structures will be affected.



Plate 2-9: Thick vegetated area the line will traverse before crossing Enkare Narok river



Plate 2-10: Crossing near Olereut Primary school -approximately 80m from the wayleave corridor at AP13

From the river, the line will traverse through a s across farmland as it crosses a road and a 33kV line in Olmutiai shopping Centre through wheat farms. One structure will be affected on the lower side as the line progresses towards ilmotrok road crossing

As the line crosses to Nkareta section, the line was adjusted during the route firming assignments right after angle point 8 placed in natural vegetated area with dwarf shrubs along which it will proceed to affect Turantias homestead and vegetated area with natural trees and thickets, and as it crosses the road the line will be approximately 150m to PMCA Church near Ololunga all-weather road crossing. The routing of the line should be such that public institutions are avoided as much as possible.

The line will proceed in a straight line through to Ololung'a section where the line will cross a 33kV KPLC line and a road and proceed through Ole Koini land, cross river Ewaso (The crossings have been reduced from 3 to one. Adjustments made and angle points increased) then to Ole Kurietas land where a small section of Natural Forest and structures will be affected, then other two homesteads will be affected as the line crosses to Olekeiwa land. A section of very thick natural forest will be affected.



Plate 2-11: Sections of Olekeiwas private forest to be traversed by the Transmission line at AP10

As the contractor clears the private forested area to pave way for the line, caution should be exercised to ensure only the required area for the wayleave trace is cleared. The cut trees will be compensated for and left to the owner for his appropriate use (these processes will be under guidance by KFS private forest procedures). Fire hazards should be considered, and no fires should be lit in the forested area nor anywhere along the route of traverse. Charcoal burning should be discouraged because unattended kilns may break and cause fire to spread to the forest causing drastic damages.

Handling of cigarette butts should be with lots of care to ensure it is completely extinguished before disposing it off. Smoking in dryland is not encourage and ashtrays and designated smoking areas must be marked. The contractor should be aware that he will be liable for any damages or losses occurring due to carelessness or negligence of his workers.

Angle Point 10 is on Ole Keiwa's private land close to his servant quarters after which the line slights to the right across a gully with thick natural vegetation characterized by indigenous trees. The line will cross an 11 KV line and proceed in a straight line up to around Ilubi Chiefs office area.

The line takes a slight angle between AP 10- AP 11 towards southeastern part crossing over Ngito/ Tuiyobei river which has massive gulleys due to erosion. The Angle point was adjusted to ensure the Tower is located on good ground that is less prone to erosion the lower side of Ilubi primary school near chief's office. Adjustments were made to traverse away from the school. The section between AP 11 and Ilubi primary is quite rocky and will require drilling machines during excavation of the foundations. The line then runs across farmlands in chepkutbei/ lolua and Kimugul in Melelo sublocation before crossing over to Olereut and oldepesi villages through a depression within Olmotiok river all in Ilmotiok sublocation. This area is mainly used for Maize and wheat farming as well as grazing of livestock. The line will cross Ngasian stream where it takes another turn southwards at AP13 near Olereut Primary school as it traverse Olereut area. The wayleave corridor was adjusted further to give a clearance of approximately 100m from the school a Crossing Ilmotiok river as it scales up Oletepesi village and crosses the Olmotiok ridge which is also rocky and stony and covered by shrubs (Lelechwet) which are relatively short and scattered coupled with occasional appearance of the flat top acacia.



Plate 2-12 : Access Road TL crossing point (left) & Maize Farming in Aganga Area(right)



Plate 2-13: Masare Hill in Kyogong with rugged landscape in Bomet County



Plate 2-14: Mara River Crossing.at AP17



Plate 2-15: Top of Olmotiok Masare hill in Kyogong- land degradation due to unregulated hardcore and sand mining

The proposed line then descends the Ilmotiok ridge which has a gently sloping gradient with rocky terrain and is inhabited area community with semi-permanent houses (Mostly from the Kipsigis community) and agricultural activities. There is also presence of strong winds in this area and soils are black cotton, very ideal for crop agriculture especially unions

The line crosses Ilmotiok ridge near Kaproret village and descended the gentle slope crossing Oljoro-Olmotiok road towards Aganga secondary passing near Aganga Catholic church located between Aganga Secondary school and Kaproret primary school. At this section the line takes another turn at AP 15 to avoid public facilities (Church and school).

The line then traverses kaproret, Cheboruto, Aganga and Mbalakai Villages all in ilmotiok sublocation, Narok West subcounty in Narok county before crossing Amalo river to Norera village in Koibeyon sublocation, Kapkimolwa location, Bomet East Subcounty, Bomet County, this area is characterized with exotic vegetations with intermittent appearances of indigenous patches as the line descend towards Amalo river the vegetation becomes more of riverine indigenous vegetation which is mainly characterized by stripes indigenous vegetation. It is important to note that the soils in this are mainly sandy/loam with a blend of clay which is mainly referred to as black cotton soils, the soils are mainly erodible hence need to take care during construction to ensure soil erosion is controlled.



Plate 2-16: Unregulated rock and sand mining activities in Kyogong Bomet county

The vicinity of Amalo river is characterized by indigenous riverine ecosystem with rocky patches of about 30metres on either side of the river. From Amalo river the line crosses farmlands and livestock grazing fields. The agricultural farms are dominated by maize, beans, sweet potatoes, Peas, millet, and Bananas. The stretch between Koibeyon and Kiptulwa locations is characterized by acacia Karkii and acacia Tortillas with intermittent occurrence of scattered indigenous trees including Croton species. This section is also dominated by exotic trees mainly blue gum, cypress and grevillea which are used as boundary trees but sometimes as wood lots. The area has undulating topography with intermittent rocks outgrowths as the powerline nears simwaga river.

The proposed line crosses river simwaga which is one of the major sources of drinking water for human and livestock in the area. The river is characterized by indigenous riverine ecosystem and rocky patches which will require the use of compressors during foundation excavation. The line then crosses Longisa - Kemu road as it traverse Kiptulwa sublocation. Individual Structures will be affected, both indigenous and exotic trees will be cut down during construction.

The line will then cross over Kiptulwa-Kongotik road just before Lebekwet shopping centre and traversing streams, farms and homes. At this point the line has been firmed up and angle points increased so that the transmission line doesn't run over the dam "silanga" that is of high ecosystem and community importance. The dam has been silted due to erosion and is mainly covered by papyrus reeds and a few indigenous tree species. The dam is home to several low flying birds e.g. weaver and quelea birds, aquatic and wading birds and African crane which was also noted foraging in the dam's vegetation. The dam is feed by Chepkirib stream river which is also a source of community's drinking water. The dam is mainly used for watering cattle and fetching water for other activities like smearing homes and washing of cloths and bathing. The community dam covers a total of 8acres of land, but the line crosses it at the edge affecting a small area.



Plate 2-17: Vegetation at the Dam site- Community dam in Lekimbo

The proposed line will then traverse homes, structures, farmlands, and crosses Farmers market- Kongotik road near Lekimbo schools as it descends the slopes and valleys crossing a seasonal river at cheboin before scaling up Kyogong hills. Kyogong hills is rocky and the lower side has been affected by artisan quarrying by the community. The hills lack access road hence the contractor may be forced to open an access road of about 200metres hence mitigation of dust pollution is crucial. The TL then descends the hill crossing Narok-Bomet highway near Kaboson junction traversing a coffee farm just after the road and other farms within Tulwetab mosonik village, it crosses a stream and some swampy area before crossing a meandering Nyongores river in two points between tulwetab mosonik village and Chebirir village which has a bigger flooding zone and between Chebirir village and Kaptambuliet village. The two points are prone to flooding hence the need to define the flooding zone which will be about 30-40 metres from the bank of the river.

After Nyongores river the transmission line will traverse farms which are characterized by several indigenous and exotic trees. Some farms have woodlots while other have scattered scrubs and Thickets of indigenous trees and vegetation. The area is mainly dominated by agricultural farms with loose soil type which is erodible.



Plate 2-18: Nyongores river crossing in Bomet County



Plate 2-19: Some of the structures to be affected along the Transmission line route

From the route firming field study, the river crossing on meandering river Nyongores was reduced from 3 crossing to one crossing. The line moves on descent gradient at the eastern outskirts of Bomet town. It then proceeds on a straight trajectory of approximately 6kilometres. The area is densely populated but during route firming and adoption of the final route, settlements were avoided, however there are a few exotic trees and farmland to be traversed. The line continues for another 5 km before taking the last angle at AP 23 prior to finally terminating at the Bomet Substation.

2.6 Route Realignment Sections**2.6.1 Entry to Narok Substation**

The change was made to reduce the sharp turning angle and to terminate the line in a realistic position, considering the future busbar extension.



Figure 2-2: Cyan Line is KPLC Previous line. Red line is KETRACO firming route

2.6.2 Entry to Bomet Substation.

A change was made to terminate the line in a realistic position considering the future busbar extension



Figure 2-3: Adjustments made at Bomet Substation entry-Red line is KETRACO firm route

2.6.3 Crossing Ewaso Ngiro river

The change was made to avoid double crossing of Ewaso Ngiro river and in addition, avoid line running along the river downstream.



Figure 2-4: Ewaso Ngiro river adjustment change-Red line is New KETRACO route

2.6.4 Crossing Lekimo dam

The change was made to avoid flying over Lekimo dam due to construction challenges and environmental concerns.



Figure 2-5: Crossing over Lekimbo community dam realigned

2.6.5 Crossing Nyangores river and Masare hills

The change was made to avoid crossing mining sites at Masare hills at Kyogong and crossing Nyangores river thrice at a span of seven hundred meters.



Figure 2-6: Adjusted points-Red route from Masare hills in Kyogong

2.6.6 Updated Angle Point Coordinates

After route firming exercise and subsequent slight realignment, new coordinates were established to factor in environmental and social considerations as indicated in Table 2-1 below

Table 2-1: New updated angle point coordinates

ANGLEPOINT COORDINATES IN UTM, ARC 1960 ZONE 36.				
POINT	EASTINGS	NORTHINGS	ALTITUDE (m)	COMMENT.
NAROK- TERMINAL	825105	9879461	1961	NAROK 132KV S/STN KM 0.00
AP 1	825244	9879516		ARABLE LAND
AP 2	825262	9879697		WHEAT FARM
AP 3	824439	9880286	1974	KM1.160M
AP 4	823431	9881176	1949	CROSS SGR 70M WIDE CORRIDOR
AP 5	819793	9885634	2022	KM8.215 NAROK-ROTIAN RD
AP 6	807100	9888899	2016	KM21.350
AP 7	798545	9892285	2015	KM30.551 OLOLUNGA.
AP 8	794832	9893946		Re-aligned to river crossing
AP 9	794107	9894163		Re-aligned to river crossing
AP 10	786369	9897441	2054	KM43.772 9 JUSTICE OLE KEIWA)
AP 11	785251	9898566	1996	KM45.379(Re-aligned to avoid gully)
AP 12	783780	9899318		
AP 13	779481	9901623	2019	KM51.846 (OLE REUTI PRI SCH) re-aligned to avoid line running along the road.
AP 14	775320	9903453	1902	KM56.423
AP 15	770887	9905659	1938	KM61.281 KEMBU/SOSIONI (Re-aligned to avoid line running along the road
AP 16	766915	9907190		realigned to avoid water pan
AP 17	765266	9908029		realigned to avoid water pan
AP 18	764641	9908079		realigned to avoid water pan
AP 19	761536	9909290		Re-aligned to avoid crossing river Nyangores thrice and sand mining site at Kyogong

ANGLEPOINT COORDINATES IN UTM, ARC 1960 ZONE 36.				
POINT	EASTINGS	NORTHINGS	ALTITUDE (m)	COMMENT.
AP 20	759377	9910659		Re-aligned to avoid crossing river Nyangores thrice and sand mining site at Kyogong
AP 21	757600	9910825	1913	KM75.563
AP 22	754728	9912824		KM79.054(Re-aligned to avoid running along road)
AP 23	753933	9913815	1925	KM80.421
TT-BOMET	754037	9914031	1933	KM80.639; BOMET 132KV S/STN (re-aligned to the proposed gantry)

2.6.7 Administrative territories to be traversed

As currently designed, the transmission lines will largely pass through Narok and Bomet counties starting at Ilmasharian T-off in Narok North subcounty. In Narok North subcounty, the proposed double circuit line traverses four different four sublocations starting at Olmasharian, Olopito, Ololoito and Ngareta before crossing over to Narok South near ololunga area where it traverses huge parcels of land at Kolieta, Nkoban, Oleshapani, Ololunga and Melelo sublocations.

The 132kV transmission Line will be constructed from the existing Narok 132/33k substation situated along Mai Mahiu-Narok Road in Narok town. Ilmasharian location, Narok North Sub County, Narok County. The 132kV proposed transmission line cut across private parcels of land that are in different administrative sub locations/ locations in the Narok County. The proposed line traverses out of Narok town on the northern side (right hand side of Mai Mahiu-Bomet Road). The administrative Sub locations where the line traverses on Narok side are Ilmasharian, Olopito, Olorroito, Nkareta; Nkoban, Kotolian, Oloshapani, Ololulung'a and Melelo. These sub locations are in Narok North and Narok South Sub Counties.

The design of the transmission line is generally on a straight route, but minimal angle points have been introduced informed by certain factors like social amenities, public facilities, terrain, and settlement among other considerations. The proposed route starts at Narok 132kV substation at (*Eastings-825015, Northings-987461*), plot no. Ilmasharian 329 where the T-off point is proposed. It traverses through Ilmasharian and Olopito sub locations towards the Northwest on a straight line for 3.1 kilometres where the second angle point is proposed at (*Eastings-825262, Northings-98767*), before the line crosses the Narok-Nakuru road just before the telecommunication boosters.



Plate 2-20: Take off point at Narok Substation

The line takes a slight turn to the left and traverses through Olorroito and Nkareta sub locations on a straight line towards the west for another 13.1 kilometers where another angle point (*Eastings-807100, Northings-9888615*). The proposed line is on the south side of Olorroitto primary school.



Plate 2-21: Traverse between Ilmashariani and Olopito

The proposed line takes a slight turn to the left and traverses Nkoban, kotelian, Olshapani and Ololulung'a sub locations towards the west on a straight line for about 9 kilometers where another angle point at (*Eastings-807100, Northings-988899*), proposed at Ololulung'a area. The line is on the northern side of Kotolian primary school and traverse between the school and the telecommunication booster at Kotolian centre. The line is on the northern side of Ololulung'a market/ town where new two angle points have been introduced to completely avoid the shopping center. The line takes a slight angle to the left and traverse Ololung'a and melelo sub locations towards the west on a straight line for about 8 Kilometers where another angle point at (*Eastings-786369, Northings-9897441*).



Plate 2-22: Livestock Farming and maize farming between Ap5 and Ap 6

The line crosses to Bomet county at Amalo river in Aganga Village which feeds into Mara river. The line descends from hills at Ilmotiok sublocation where it takes a turn at angle point AP14 (Eastings 775320, Northings 9903453) near Aganga catholic church to cross the river and traverse farms in Koibeyon sublocation before heading to Kiptulwa sublocation after crossing simwaga river in Kapkimolwa location for 5.2kms where the line has 2 angle points adjusted in Kapkimolwa location. Near kiptulwa secondary school, the line then scales up the hills and valleys before crossing to lebekwet area in Kongotik sublocation in Kembu where it runs for 14kms passing through Emitiot and Cheboin sublocation in Cheboin location and Koitabsilbwet and Kyogong sublocations in Kyogong location where another angle point introduced to avoid crossing over the mining sites AP18 (Eastings 764641, Northings 9908079). The line then turns westward and runs for 13kms to angle point AP21 (Easting 754810.71, northings 9912767.45) at Itembe sublocation at land. The line then proceeds for another 2.5kms before another angle point AP22 (Eastings 753863.71, northings 9914008.64) turning towards northern part to Bomet substation running for 0.85kms to join the terminal point ((Eastings 754037, northings 9914031) at the Bomet 132kV substation at Sachagwan area.



Plate 2-23: River riparian area and Vegetation Profile in riparian



Plate 2-24: Natural thicket near AP8 and Intercropping Farming of Unions and Maize

2.7 Technical Characteristics of the Proposed 132kV Narok- Bomet Power line

The proposed Narok-Bomet 132kV powerline will be designed and constructed according to KETRACO transmission's Standard Specifications for overhead lines of up to 132kV double circuit. KETRACO engineers and surveyors will be responsible for the specific power-line structure designs and placement of towers after the Power-line route survey.

KETRACO has confirmed the final transmission line tower specifications as they relate to the structure and stay arrangement and foundation details, which be a self-supporting 205(A, B, C, D) type steel lattice transmission line towers will be utilized for the transmission line. The towers will be approximately 30m in height and servitude/ wayleave width of 40m will be required for the powerline. The powerline will have a Delta phase configuration. "Kingbird" ACSR (greased) phase conductors and St 7/3.35mm earth wires will be used. Silicon composite (132kV) insulators will also be used for the line and the tower foundations will comprise reinforced concrete piles. Traditional concrete foundations will also be required.

Most of the construction activity during Project implementation will involve the erection of the transmission line. The line will use self-supported steel lattice towers with concrete foundations as commonly used in Kenya by KETRACO.

This section gives a brief description of the project's material inputs.

2.7.1 The Towers

The basic building block of the TL is the Tower which supports transmission lines (conductors) either on one side (single Circuit) or, on both sides (double circuit). The beginning and end of sections of a TL (angle points) are marked and supported by Tension Towers also called Angle Towers in between which are found at spacing of 270-350 metres. Design features for Towers are presented in Figure 2-7. The towers are mainly erected of stainless steel and range in height from 20 to 35 meters above ground level. On the towers are mounted insulators which support conductors on the towers.

Lattice steel self-supporting towers are recommended for all transmission lines. The recommendation result from an overall evaluation of lattice steel structures versus pole structures (single pole or H-frames) of wood, concrete or steel as accounted for in the following. Although wood and concrete structures could involve a 20-30% cost savings on structures compared to conventional lattice steel structures the performance of wooden poles has proved poor due to their short lifetime and subsequent poor reliability and very high operational and maintenance costs.

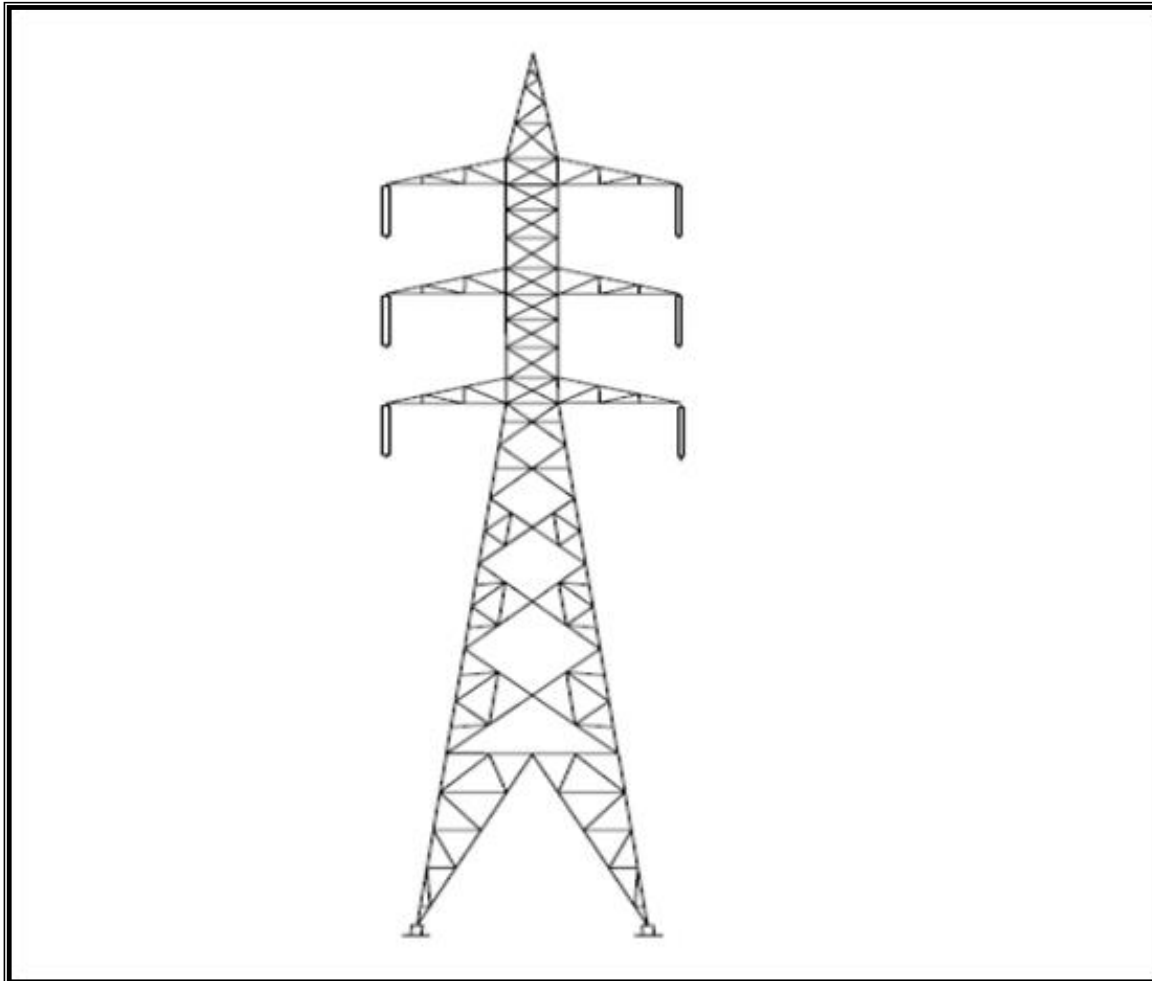


Figure 2-7: Double circuit lattice steel tower configurations

2.7.1.1 Type of Tower

Towers shall be self-supporting and broad base galvanised steel lattice type with body and hillside extensions. The hillside extensions shall be applied for tower legs on the slope so that legs are suited to the original slope of tower site and that excessive land cutting around foundations and land collapse is prevented.

The following tower types shall be designed for the project to meet various tower positions and loadings economically.

- Type-S: Use at tangential positions or angle points up to 2 degrees of horizontal deviation, provided with suspension type insulator sets.
- Type-L: Use at positions of light angle up to 15 degrees of horizontal Angle deviation with tension type insulator sets.
- Type-M: Use at positions of medium angle up to 30 degrees of horizontal angle deviation with tension insulator sets.
- Type-H: Use at positions of heavy angle up to 60 degrees of horizontal angle deviation with tension insulator sets.
- Type-HS: Use at positions of specifically heavy angle up to 75 degrees of horizontal angle deviation with tension type insulator sets.
- Type-T : Use at positions of line termination or 60 degrees of horizontal angle deviation with tension type insulator sets.

2.7.1.2 Tower Design General Arrangement

Towers shall have the general arrangements and configurations shown in the drawings included with the specification. They shall be designed to resist the specified ultimate system loading. Clearances between live parts and supporting steelwork and between the phase conductors and ground or other obstacles shall be as specified.

All tower designs shall be such as to facilitate inspection, painting, maintenance, repairs, and operation with the continuity of supply being the prime consideration.

The design shall be such that the number of different parts shall be as few as possible to facilitate transport, erection, and inspection. The maximum weight of the heaviest single member should be limited to that within the normal lifting capability of the proposed erection equipment.

Main leg members of lattice steel towers shall be formed of the maximum single lengths appropriate to the body or leg extensions and shall not without the Employer's approval incorporate additional spliced sections.

For lattice steel towers a fully triangulated system of bracings shall preferably be adopted. If full triangulation is not adopted, the overall stability and secondary bending stresses must be considered in the design.

Where fabrication processes employed adversely affect the material properties or introduce zones of high stress concentration the overall design of the structures shall take such factors into account.

Cross-arms shall be so arranged that they can be disconnected in the plane of the longitudinal face of the support without disturbing any members forming part of the support body.

The cross-arms should be designed to take and be compatible with the AB CHANCE Live Line maintenance tools and equipment.

Appropriate bird guard protective devices shall be installed to keep away birds from roosting directly over the insulator units.

2.7.1.3 Height of Towers

Height of towers shall be determined in the under-mentioned way:

$$H = Gc + Sg + Li + Hc + Hg$$

Where,

H	=	total height of tower
Gc	=	Necessary ground clearance of power conductors above ground or other objectives.
Sg	=	Maximum conductor sag
Li	=	Length of a suspension insulator set, but nil for a tension type towers.
Hc	=	Vertical spacing of upper conductor cross -arm spacing
Hg	=	Vertical spacing between upper conductor cross-arm and overhead earth wire.

Towers shall be provided with body extensions in a 3m step to a standard height for maintaining necessary conductor ground clearance on various ground profiles. In addition, in the body extensions, each leg will have hillside extensions in a 1m step to suit for the original ground slope. Standard tower structures are shown as well as insulation clearance diagram of conductors.

2.7.1.4 Design Span

The design of all towers shall provide for the following basic, wind and weight spans:

Type of Tower	S	L	M	H	HS	T
Basic span (m)	350	350	350	350	350	350
Wind span (m)	350	350	350	350	350	350
Weight span (m)	700	1,200	1,200	1,200	1,200	1,200
Uplift Weight (m)	0	-300	-300	-300	-300	-300

The term basic span means the horizontal distance between centres of adjacent supports on the level ground which the height of standard towers is derived with the specified conductor clearances to ground in still air at maximum temperature.

The term wind span means half the sum of adjacent horizontal span lengths supported on any one tower.

The term uplift weight means the weights of conductors and overhead earthwire supported upwards at any one tower for reinforcing strength of cross arms.

2.7.1.5 Design Loads

Structural loading shall refer, ASCE Manual and Report on Engineering Practice No. 74 “guidelines for electrical transmission line structural loading”.

The following loads shall be applied in the design of towers:

- Wind Loads

on power conductors and overhead earthwire: 385N/m^2 (on the projected area of conductor or wire)

- On tower structures : 690N/ m^2 (on the projected area of structure members)
- On insulator sets: 385N/ m^2

- Maximum working Tensions of Conductor and Earthwire

- Power Conductor Lynx : 22,500 N
- Overhead ground wire earthwire : 14,100 N

- Vertical Loads

- tower structures: actual weights of tower structures including accessories
- Power conductors: Weight of conductors of specified weight span with accessories
- Overhead earthwire: weight of specified weight span with accessories
- Erection Loads: such loads as workers’ weights on tower members, reaction of temporarily backstays during stringing operation, etc

- Horizontal Angle Effect

-Power conductors and overhead earthwire : horizontal component of maximum working tension of conductors and earthwire due to the specified horizontal angle deviation.

The towers shall be designed for the following wind and weight spans.

TYPE OF TOWER	S	L	M	H	HS	T
Wind Span [m]						
- Normal working condition [m]	350	350	350	350	350	350

- Broken wire condition [m]	260	260	260	260	260	260
Weight Span [m]						
- Normal working condition [m]	700	1200	1200	1200	1200	1200
- Broken wire condition [m]	500	900	900	900	900	900
Uplift weight for cross arms	-	300	300	300	300	300

2.7.1.6 Design Conditions

(a) Assumed Normal Loading Condition:

The assumed maximum simultaneous working loading on towers shall be as follows:

- (i) Vertical loads : as above-mentioned.
- (ii) Transverse loads : wind loads horizontal angle deviation effects
- (iii) Longitudinal loads: wind loads, and erection loads but together with maximum working tensions of power conductors and overhead earthwire for their termination for Type-T tower.

(b) Assumed Broken-Wire Condition:

Under the condition, any one power conductor or an earthwire is assumed to be broken at their maximum working tensions in addition to the loads under the normal condition. In the case of Type-S tower, the pull will be assumed to be reduced to 70% of the specified maximum working tensions.

(c) Factor of Safety:

The following factors of safety for tower structures shall be applied in the design.

- (i) More than 2.5 for the synthetic maximum load under the normal loading condition.
- (ii) More than 1.25 for the synthetic maximum load under the broken-wire condition.

Those factors of safety shall be proved under tower loading tests on the proto-type towers in the manufacturer's testing station, and there should be no failure or permanent distortion during the tests.

2.7.1.7 Design of Towers.

Latticed steel structures shall be designed with geometric configurations based on structural strength, electrical, economic, and safety requirements. Member forces caused by the design factored loads shall be determined by established principles of structural analysis.

Each type of towers shall be designed so that no failure or permanent distortion shall occur when tested with applied force equivalent to 2.5 times the maximum simultaneous working loadings specified in the Clause 10.2.4 [Normal Working Loading] and equivalent to 1.25 times the maximum simultaneous working loadings resulting from the assumed broken wire condition. Design loads shall consider:

- a) Minimum legislated levels
- b) Client specifications including factors of safety,
- c) Expected climatic conditions,
- d) Line security provisions,
- e) Design life of not less than 50 years,
- f) Construction and maintenance operations.

The ultimate design stress, obtained from the working stress multiplied by the factor of safety of 2.5 under the normal condition and 1.25 under the broken wire condition, in tension members shall not exceed the yield point of materials. The ultimate design stress, obtained from the working stress multiplied by the above-

mentioned factor of safety, in compression members shall not exceed a figure obtained from an approved formula to be entered in Tender based on the yield point of materials. Alternately, formulas in the American Society of Civil Engineers standard for the design of self-supporting latticed steel transmission structures ASCE 10- 97. Structural loading shall refer, ASCE Manual and Report on Engineering Practice No. 74 guidelines for electrical transmission line structural loading.

Tower design report shall consist of full structural analysis report showing correctness of dimensional detail calculations, tower profile/layout drawings, shop detail drawings, erection drawings and bills of materials. Shop detail drawings shall be approved by the producing utility Engineer of Record (EOR) regarding compliance with the purchaser's specifications and the strength requirements of the design.

Designed tower full size prototype proof test shall be conducted and approved before tower materials shop production and delivery to site.

2.7.1.8 Materials and Fabrication.

The towers shall be fabricated with mild and/or high tensile steel of the finest quality or other approved materials, of which mechanical properties shall comply with Grade Fe 430 and Fe 510 specified in ISO 630-1980 or equivalent.

No member of the tower shall be less than 6mm in thickness and 50mm in width of flange for leg members of towers and main members of the cross-arm, and 5mm and 45mm for the web and nominal members respectively.

The slenderness ratio shall not exceed 150 for the leg and arm members, 200 for the web members and 250 for the nominal members as compression member and 350 for tension only member.

All the connection shall be made by mild and/or high tensile steel bolts and nuts. No bolt shall be less than 12mm in diameter. All bolts and nuts shall be provided with approved spring washers. Antitheft bolts shall be used from ground level to the tower anti-climb level.

Bolt holes shall not be more than 1.5 mm larger in diameter than the corresponding diameter of bolts. Holes shall be drilled for the members not less than 13 mm in thickness. For the members having thickness below 13 mm, holes may be drilled or punched, but the former is preferred.

All the steel members should have clearly identifiable part numbers which enable quick identification of similar parts. The letters '**KETRACO**' should also be inscribed on each bracing- by punching or any other suitable method, with more than one inscription for parts of length greater than 0.5m.

All burs shall be removed completely by reaming and smoothing before hot-deep galvanising.

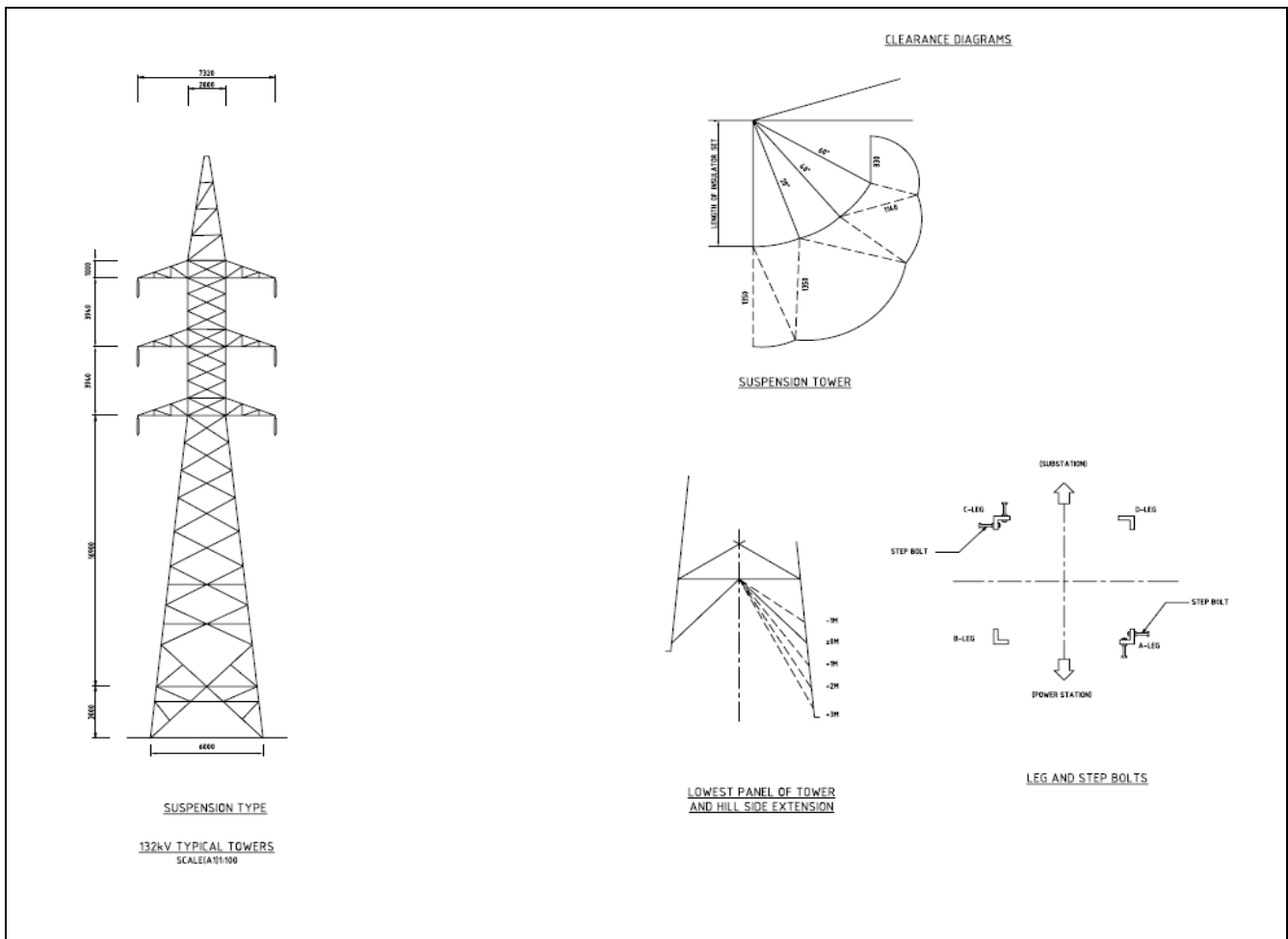


Figure 2-8: Tower configurations

2.7.1.9 Tower foundations

Based on the observation of the ground conditions during the line routes surveys conventional pad and chimney reinforced concrete pad & chimney foundations are recommended. On certain sections where poor soils or submerged conditions are identified a raft type design might be required. Hard rock foundations are not foreseen but weathered rock exists which might require heavy excavation equipment and supply of imported backfill for the pad & chimney foundations. All towers are assumed permanently grounded with an individual tower footing resistance aimed to be less than 20 Ohm. Over the first 1.5 km or 3 to 4 spans out of any substation, all towers, including the terminal towers, should be connected by continuous counterpoise cable, which also should be connected to the substation-earthing grid. At tower sites in urban areas often frequented by people, additional protective earthing should be installed aimed at less than 10 Ohms.

2.7.2 Conductors

KETRACO recommended conductors for the various sub-project options are Aluminum Conductor Steel Reinforced (ACSR) “Wolf” and “Lynx” conductors. This is because its operational performance both electrically and mechanically has proven satisfactory under Kenyan conditions.

2.7.2.1 Conductor Configuration

KETRACO current practice is to use a triangle conductor configuration on their double Circuit lines with the two lower phases on the same horizontal plane. The configuration results in a slightly lower and lighter tower

with a modest cost saving compared to the typical triangular configuration with the three phases on three levels.

Specifications: Conductors comprise the core media through which, power transmission takes place. In the design of the proposed TL, the Wolf Conductor is preferred on account of higher efficiency of transmission, thus resulting in lower losses of energy and cumulative un-served energy. The conductors recommended for the various sub-project options are Aluminum Conductor Steel Reinforced (ACSR) “Wolf” and “Lynx” conductors which are in accordance with KETRACO standards. The technical particulars of conductors are as specified in *Table 2-2*

Table 2-2: Technical specifications for conductor material

Specification		Conductors	
Material		ACSR	ACSR
Conductor designation		Wolf	Lynx
Cross-section	mm ²	194.9	226.2
Overall diameter	mm	18.13	19.53
Stranding Aluminium	No x mm	30 x 2.59	30 x 2.79
Stranding Steel	No x mm	7 x 2.59	7 x 2.79
Weight	kg/km	726	842
Nominal breaking load	N	69,200	79,800
Final modulus of elasticity	N/mm ²	81,000	81,000
Elongation coefficient	x 10 ⁻⁵ /°C	1.78	1.78
Current rating ²⁾	AMP	355	386
Rated DC resistance at	20 °C Ω/km	0.1828	0.1576
Standard	IEC	60209	60209

Note 2: Wind speed of 0.0447 m/s, ambient temperature 20 °C, temperature rise 30 °C and intensity of solar radiation 850 W/m².

Conductor configuration: The current practice of the KETRACO is to use a triangle conductor configuration on double Circuit lines with the two lower phases on the same horizontal plane. The configuration results in a slightly lower and lighter tower with a modest cost saving compared to the typical triangular configuration with the three phases on three levels. For lines longer than 100 kilometers, a full transposition (three sections) of the three phases is recommended due to the impedance asymmetry resulting in a corresponding voltage and current unbalance at the line end.

2.7.3 Overhead Earth Wires (OPGW)

According to KETRACO practice, a single overhead shield wire is recommended for 132 kV lines.

2.7.4 Support Structures

Lattice steel self-supporting towers are recommended for this transmission line. The recommendation result from an overall evaluation of lattice steel structures versus pole structures (single pole or H-frames) of wood, concrete, or steel. Although wood and concrete structures are relatively cheap compared to conventional lattice steel structures the performance of wooden poles has proved poor due to their short lifetime and subsequent poor reliability and very high operational and maintenance costs. Solid concrete poles are manufactured locally but their reliability is low. This is due to the cost involved in transport and erection costs as heavy lifting and erection equipment is required especially on section with poor access conditions. Internationally manufactured hollow spun concrete poles or steel poles could prove competitive to lattice

steel structures due to lower maintenance and way leave costs but the same considerations with respect to transport and erections costs would apply.

2.7.5 Foundations

2.7.5.1 Grounding

All towers will be permanently grounded with an individual tower footing resistance aimed to be less than 20 Ohm. Over the first 1.5 km or 3 to 4 spans out of any substation, all towers, including the terminal towers, would be connected by continuous counterpoise cable, which also should be connected to the substation-earthing grid. At tower sites in urban areas often frequented by people, additional protective earthing would be carried out aimed at less than 10 Ohm.

2.7.5.2 Insulator Strings

Composite silicone/polymer long rod insulators are to be used in the insulator strings for the support of the line conductors. Besides being competitive in price their low weight and compact configuration result in lower transport, installation, and maintenance costs. The electromechanical ratings of the insulators to be installed are U70 and U120 according to IEC standard.

2.7.5.3 Lightning Arresters

Lightning strikes produce high voltages and traveling waves on transmission lines, causing insulator flashovers and interruption of operation. Steel grounded shield conductors at the tops of the towers significantly reduce, but do not eliminate, the probability of direct lightning strikes to phase conductors. The shield wire is designed to protect the power line from lightning.

2.8 Land requirement by the transmission lines

2.8.1 Dimensions of the wayleave:

The practice of KETRACO is to require a way leave corridor of equivalent to 30m width (15m on either side of the Center Line for 132 kV double circuit lines). Along the 30m wide corridor, an appropriate clearance between conductors and vegetation and structures needs to be maintained which requires that houses and trees more than 7.5 metres (Approximately 12ft) are removed for the entire life of the transmission line. However, farming and grazing within the corridor is generally permitted. As for the tower foundations, they will require a permanent area of approximately 6-8 m x 6-8 m (36-64 m²) based on a typical 132 kV line tower.

Gross land requirements in the project: Table 2.3 provides an outline of potential land requirements for the proposed transmission lines. The latter was derived based on GPS-based computation of distances between angle points as marked by coordinates. Based on such computations, total length of the transmission lines is estimated at 81 kilometers which, at a corridor width of 30 metres will require total ROW covering 600hectares. Out of this ROW, a maximum of 1.323ha will be fixed in tower foundations.

Table 2-3: Land requirements for the proposed transmission lines

Land requirement	Dimensions	Area required(ha)
Wayleave	Total length 81km	Area: 600ha

	Width: 30m	
Tower foundations	Dimensions; 49m2	Area:1.323ha
	Total number: 270	

2.9 Transmission Line Bends

A bend in a powerline requires a strain structure and deviating around an obstacle will require a minimum of three bends. These require additional support and consequently, the cost of a power line increases as the number of bends increases. Hence, KETRACO intends to minimize the sharp bends in the powerline and keep it in as straight a line as possible.

2.10 Transmission line Servitudes

The width of the servitude for a 132kV double circuit powerline is 30m i.e., 15m on each side. The servitude needs to be kept clear of bush, trees and/or buildings for access purposes during maintenance. Activities are not allowed in the servitude which may compromise safety. In addition, the profile of the land may not be altered in any way that results in a decrease in the servitude width.

2.11 Lightning

The transmission line lattice towers will be protected by earthwires to dissipate lightning strikes and prevent lightning discharge to nearby objects. In addition to the towers being earthed, in terms of line design and construction, if a tower happened to fall over, the power would automatically be switched off in approximately 30 milli-seconds.

2.12 Project activities: Power line Design, Construction and Operation Activities

2.12.1 Design Phase Activities

These include:

- Feasibility studies
- Detailed design involving survey-work to peg out the ROW on the ground and mark out the Centre Line
- Environmental survey of study area
- Selection of alternative power line corridors and substation sites
- Determination of technically feasible alternatives:
- ESIA input into route selection and obtaining government authorization
- Negotiation of final line route and servitude with affected landowners
- Route survey and Corridor walk-down: To ensure that all site-specific sensitivities are avoided. During this process the exact co-ordinates of the proposed towers will be established.
- Final design of line and placement of towers

2.12.2 Construction Phase Activities

Construction will involve delivery of factory-made components of the lattice structures, conductors, insulators and other components of the transmission line. Foundations will be constructed following which the towers will be erected. The major task will entail mounting of conductors on the towers and connecting to target power intake and off-take facilities following which the project will be commissioned.

The construction phase for the proposed project will include the following activities post-authorization:

- The Contractor shall perform any site investigations in good time as may be necessary for the progress of design and construction on a sound engineering basis.
- Construction site: Construction sites will be sited in areas where least disturbance to potentially sensitive environments will be caused.
- Batching Plants: If Ready mix concrete is not available, small mobile batching plants will have to be established in the area close to the power line.
- Access: Access will have to be created to allow for large construction vehicles to get onto the proposed servitude.
- Surveying, pegging and soil nominations: During construction the route will be surveyed, pegged and the soil nominations undertaken for each of the potential pylon foundations.

Site alteration: It is envisaged that the proposed transmission line route will undergo some alteration during the construction process to accommodate the proposed transmission line and other associated structures. The area has a semi-humid climate, and the proposed site has on farm vegetation which is sparsely distributed but slightly improves very close to the Nyongores and Mara Rivers.

Vegetation clearance: A 30m (15m on either side of the power line) servitude is required for the proposed 132kV power line. Trees and shrubs will be cleared where required along the entire length of the servitude (the vegetation will also be maintained by the proponent in the operational phase of the project). A variety of techniques exists for clearing vegetation from the ROW and controlling the amount of new plant growth. Selective clearing using mechanical means or physical/ manual clearing is recommended for this project. Most of the transmission line corridor is largely dominated by scattered mature eucalyptus, grevillea, cypress, and different indigenous trees of varying height hence there will be minimal interference with the vegetation. In several areas there are heavy riparian vegetation and subsistence agricultural crops to be crossed by the line. Hence any clearing is expected to be minimal, and the Proponent intends to preserve and include as much of the low-lying existing vegetation as possible in the development of the transmission line. The Proponent shall ensure that the vegetation is cleared using the recommended method. There will be need to enhance the biodiversity and scenic beauty of the area by planting more indigenous plants when the project is completed.

- Supply of Civil work parts, transformers, full Transmission Line, tools, electrical equipment, and delivery to project site.

Pylon footings: Foundations will be laid for the footings of the pylons. The first step is the excavation of the pylon foundations, the reinforcing thereof and finally the concreting of the foundations. The contractor shall carry out the soil excavation process with utmost care to ensure that the excavated soil is not improperly heaped or not carried away by any surface flows to any nearby surface waters causing siltation. The excavated soil will be used to backfill.

- The equipment required to excavate the foundations can be manual labour, excavator or in the case of hard rock – a drill rig will be required. The concrete will have to be transported via concrete trucks to the required locations.
- Steelwork structures: The towers will be erected in piece-meal; in segments. After the foundations and footings have been installed the construction team will transport the various steel parts of the towers to the site and start erection of the pylons. This process again requires a lot of manual labour and often mobile cranes are used to assist with the erection of the towers.
- Stringing: Once the towers have been erected, cables will be strung between the towers. Once stringing and tensioning is complete the line is considered constructed, where after it will be tested prior to being commissioned.
- Rehabilitation of disturbed areas and protection of erosion sensitive areas
- Testing and commissioning

The construction phase for the proposed project will take, at most, 18 months to complete (from the time of NEMA licence issuance and contract award to contractor).

Throughout the project life, the Proponent and Contractor shall adhere to all requirements of National Environmental Management Authority (NEMA) and any other applicable legislation regarding Environmental and Socio – economic impacts.

Construction supervision: Safety Protocol and established International Environmental Protection Regulations/Standards shall guide the Contractor. This will always include safety wear and the Contractor will appoint a Certified Safety Officer on site during all construction activities. The Contractor shall also provide first aid equipment since the proposed line passes through a remote route relatively far from medical service facilities.

Modest construction procedures will need to be followed to reduce noise levels and the production of dust that may affect the people and scare any wild animals within vicinity.

- Additionally, during the construction phase:
 - close supervision shall be carried out to ensure:
 - Workers always put on necessary safety gear (including hand gloves, helmets, safety shoes with metal tipped toes, earmuffs, overalls, and dust coats). Provision of appropriate safety belts to those workers performing their duties at elevated heights
 - Motorized equipment are checked and certified to ensure that they are in good working condition, safe to use and produce minimal noise levels not forgetting reduced smoke emission.
 - First aid kit and firefighting equipment (portable cylinders) are provided and placed at strategic positions that can be easily accessed
 - Proper disposal of waste material and toilet facilities are provided for construction workers
 - Emergency response procedures are in place and all workers are trained in affecting them.
 - Any work involving deep excavations, elevated heights and lifting heavy loads, poses several risks to personnel. The Contractor shall develop a Safety Plan before commencement of each phase of the construction. This will ensure that personnel are equipped with the correct protective clothing and equipment and are ready to work safely while also safeguarding the environment.

2.12.3 Operational Phase Activities

A permanent area (30m in width, i.e., 15m clear each side from centerline) of land will be required to accommodate the transmission line, when completed. A parallel strip of land through those sections of the route which pass through vegetation shall be completely cleared. The width of the strip may vary according to the mean height of the vegetation and shall be determined by ensuring that any standing tree would not cause flashover from a conductor deflected up to 45° from the vertical. In determining the flashover clearance and in estimating the mean height of the vegetation due allowance shall be made for seasonal growth. In addition, any tree that may fall in the direction of the overhead line shall be cleared unless located more than 15m plus the height of the tree clear of the route center line.

Routine maintenance is carried out along the ROW to ensure the appropriate clearances between towers, conductors and vegetation and other objects are maintained according to the required safety/operation specifications listed above. A 30m wide path along the line route will be required in the absence of a public road. Maintenance is normally carried out twice a year (dependent on-site conditions).

Upon powering, the project will then be operated by the KETRACO alongside other investments in target districts. During operation phase of the project, ROW will be maintained through manual vegetation clearing. Once the lattice towers are erected and structural integrity established, minimal maintenance is required. Routine aerial inspection and ground inspection will however be done annually.

2.12.4 Decommissioning Phase Activities

The physical removal of the power line infrastructure would entail the reversal of the construction process.

- A rehabilitation programme would need to be agreed upon with the landowners (if applicable) before being implemented.
- Materials generated by the decommissioning process will be disposed of according to the Waste Hierarchy i.e., wherever feasible, materials will be reused, then recycled and lastly disposed of. Materials will be disposed of in a suitable manner, in a suitably licensed facility.

All the mentioned decommissioning activities would be subject to a separate Environmental Authorization process at the appropriate time.

Towards development of the transmission lines, detailed activities are anticipated as follows: -

Area of Impact

The area of immediate impact will be the Line Corridor Right-Of-Way (ROW) which will be 30m in width by 81km in length from Narok substation in Narok County to Kapkwen substation in Bomet County. A parallel strip of land through those sections of the route which pass through vegetation will also be completely cleared of all trees, scrub, and undergrowth above a height of 150mm during the construction stage. Appropriate clearance between conductors and vegetation/structures along this corridor will be maintained throughout the life of the transmission line. Cropping and grazing beneath the conductors is normally permitted.

Tower foundations will require a permanent area of approximately 7m x 7m (49m²) based on a typical 132 kV line tower. The temporary area required during tower foundation construction will be 10m x 10m. Tower foundation materials and equipment will be stored in the area reserved for stringing along the line corridor.

Project's Decommissioning Activities

The Proponent will acquire way leave from the affected persons to install and string the transmission line over their land. However, in the event of decommissioning & demolition of the transmission line, the Proponent should restore the host environment close to its original state.

The demolition exercise shall involve the following:

- Demolish and remove all the concrete works
- Demolish and remove transmission line and associate structures
- Demolish and remove the tower structures
- Carefully remove all the electrical fittings and associated cables
- Demolish and carefully handle components that contain chemicals like the transformers
- Ensure proper handling of the demolished materials and have an authorized and guided transportation and disposal away from human settlement, water bodies and wildlife conservation area

KETRACO will submit a decommissioning plan to NEMA in good time prior to decommissioning. The decommissioning plan should include a restoration plan.

The host environment should be rehabilitated and restored to its former state through:

- Approved and appropriate landscaping methodology.
- Planting of indigenous vegetation.
- Removal of any soils that may have been impacted by oils or fuels for offsite (away from the project area) remediation.

2.13 Project Implementation

The Project will be implemented in seven stages, namely, Construction of tower foundations, Erection of the towers, Installation of insulators and other tower accessories, conductor stringing and termination, inspection and defects correction, commissioning after defect correction and final as built drawings.

In line with similar projects implemented in Kenya, construction is expected to start after contract signing following international competitive tendering. Pre-construction activities associated with design work include soil investigations and detailed survey of the transmission line route. Actual mobilization for construction work will follow final design. The mobilization period includes activities for preparation of material storage areas, water, power and communication.

Construction of the transmission line will then start by preparation of tower foundations, followed by tower erection and conductor stringing. Minor work will be required within the substations at Narok and Bomet to connect the conductors to the electricity.

The dominant land use along the transmission line route is rain fed agriculture and crops are normally grown only during the rainy season. The dominant cash crop in the area is wheat and Maize. The land is left to fallow and/or used for grazing during other times of the year. During this period and due to the absence of paved roads it will not be possible to transport material or to carry out construction work. Also, during heavy rains, it will be very expensive to properly store building materials, especially cement.

For these reasons most of the site works will proceed during the dry season when there is no cultivation. This will facilitate construction and reduce impact on crops to a minimum. Working during the dry period will also provide job opportunities for local people after the busy cultivation season.

2.14 Site and Land Ownership within routes of traverse

The proposed transmission line will traverse areas comprising land owned by various public and private entities. Land uses along the line route are mainly agriculture including sparsely populated settlements. Over 98% of the proposed project area to be traversed is privately owned. The bulk of the land is controlled by over 60% of small holder farmers and plot owners. It is anticipated that the most significant adverse socio-economic impact will be the need for compensation and relocation of people affected by the project. A Resettlement Action Plan (RAP) has been prepared in this regard.

2.15 Construction Materials, Products, By Products and Waste

This section of the report qualitatively outlines the resources that are required for construction and implementation of the project. Exact quantities of materials are not known at this stage of the project. Consequently, an identification and estimation of the resources required for construction and implementation of the project are provided in the following subsections.

This section further provides an overview of the products, by-products and wastes to be generated by the project. Most of these will be generated during the construction phase of the project while some will be generated during the operation and decommissioning phases.

2.15.1 Input Materials

The Transmission Line will be constructed in accordance with current best practice and procedures in the international wide industry that are not expected to compromise the safety of the neighboring communities as well as the general environment and to ensure the longevity and efficient operation of the works. The following inputs will be required for construction:

- (i) Line conductors
- (ii) Insulators
- (iii) Components of the tower (lattice steel brackets)

- (iv) Cement
- (v) Sand
- (vi) Ballast
- (vii) Hardcore
- (viii) A construction labour force (of both skilled and unskilled workers).
- (ix) Circuit breakers
- (x) Aggregates
- (xi) Concrete Blocks
- (xii) Lighting arresters
- (xiii) Earth wires
- (xiv) copper Earth rod
- (xv) Black Bolts, Screws and Nuts
- (xvi) Steel plate, sheet and strip
- (xvii) Cables

Labor

The size and the composition of the workforce will be at the discretion of the contractor(s). The contractors will adhere to the Employment Act of 2007 in the recruitment and management of the employees. The contractor will be required to employ the locals for the unskilled labour so that the locals will appreciate the importance of the project.

2.15.2 Machinery and equipment

- Excavators
- Hiab's
- Drilling machines
- Mini Concrete mixers
- Tele logger
- Lifting machines (cranes)
- Carper pillars (Earth Movers)
- Hoists
- Gins
- Pullers and tensioners
- Anti-twisting rope
- String blocks
- Alliminium alloys gin poles
- Motorized winches
- Earth anchors
- Wrenches
- Puch tools
- Bending tools
- Electronic dynameter
- Trucks
- Water boozers trucks

2.15.3 Construction Phase

The final product after construction phase is a modern substation and its associated structures.

By-products

During the construction phase of the project, it is envisaged that the by-products might include:

- Metal cuttings generated from the construction activities
- Any excess construction materials brought to the project site by the contractor which can be reused later
- Excavated material

Waste

During construction the proposed project is anticipated to generate different waste which shall include:

- **Domestic Waste from the Construction Area**

The workers will not be supplied with any forms of foodstuffs. They are expected to buy or carry their own food. Containers which the workers will use to carry their food are expected to increase within the site and in the immediate vicinity. Other forms of waste include sanitary waste and therefore the provision of sanitary facilities will need to be considered both for the site construction workers and the visiting population.

Site Construction Waste

The project will generate waste from the site construction activities which includes:

- Excavated soils and vegetation.
- Construction equipment and maintenance wastes.
- Dust and fumes.
- Scrap metals.
- Packaging materials, etc.

- **Dust**

The construction activities that will occur particularly during the site excavation process will generate dust and other particulates particularly during dry weather conditions that will be released into the atmosphere.

- **Smoke Emissions**

The site machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions when in operation during the construction activities. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.

2.15.4 Operation Phase

Products

The primary product of the proposed project during the operational phase will be 33/11kV power distribution substation.

By-products

The only byproduct anticipated to be generated during operational phase is conductor wires and scrap metals during replacement which takes several years before being replaced.

Waste

The wastes that will be generated will include.

- **Domestic Waste**

Some of the domestic waste to be generated at the facility will waste such as paper, empty cans.

- **Process waste**

No waste is anticipated from the process since the project entails substation and its associated infrastructures only.

2.15.5 Decommissioning Phase

Products and By-products

During the decommissioning phase it is expected that there will be no product. However, the By-products during decommissioning phase will include:

- Metal generated from the decommissioning of substation and associated infrastructure; and
- Foundation materials which can be donated to individuals for reuse

Waste

During the Decommissioning phase of the proposed project, several waste products are expected to be generated. These shall include:

- Metals from substation infrastructure
- Remains of concrete from demolition of substation foundation
- Dusts and fumes.
- Scrap metals.

- **Dust**

The activities that will occur particularly during the demolition process will generate a considerable amount of dust and other particulates that will be released into the atmosphere.

Smoke Emissions

The demolition machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.

2.16 Target Group for the ESIA Report

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction and operation of the proposed transmissions line 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.

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

- Funding agencies and donors.
- Relevant government ministries and agencies.
- Affected and Interested persons.
- Planners and Engineers to be involved in preparation of designs and plans for transmission lines
- Contractor to be engaged in the construction works for the transmission line.
- People to be involved in the management and operation of the Transmission Line and associated infrastructures.

CHAPTER 3. BASELINE INFORMATION OF THE PROJECT AREA

This chapter describes the current physical, biological, and socio-economic setting along the proposed transmission route. The information presented here has been obtained from primary and secondary sources. The study assembled, evaluated, and presented baseline data on the relevant environmental and socio-economic characteristics of the transmission routes and surrounding areas of influence. In brief the chapter is outlined as follows:

- Physical Environment – topography, landforms geology, soils climate and meteorology, air quality, hydrology etc.
- Biological Environment - i.e., flora and fauna types and diversity, endangered species, sensitive habitats, wildlife within protected areas and other dispersal areas.
- Social and cultural environment (including present and projected, where appropriate) - i.e., population, land use, planned development activities within the subproject area, community structure etc.

3.1 Narok County

3.1.1 Location, size, and administrative units

Narok County is situated in the southern part of the Great Rift Valley with a total area size of 17,921.2Km². Narok lies between latitudes 0° 50' and 1° 50' South and longitude 35° 28' and 36° 25' East. The county borders the Republic of Tanzania and six other counties: Bomet, Nyamira, Kisii, Nakuru, Migori & Kajiado.

The county headquarters is at Narok Town. The county covers an area of 17,933.1 Km² representing 3.1 per cent of the total area in Kenya and hence the eleventh largest county in the country. Figure 2-1 shows the location of the county in Kenya.

The transmission line traverses through Narok South and Narok North subcounties and 4 locations and 7 sublocations as indicated in table Table 3-1. Ilmasharian, Olopito, Olorroito, Kotolian, Nkoban, Ololunga, Nkareta, Melelo and Ilmotiok.

Table 3-1: Administrative units traversed in Narok County

COUNTY	SUB COUNTY	LOCATION	SUB LOCATION	
Narok	Narok North	Lower Melili	Ilmashariani	
		Nkareta	Nkareta	
	Narok South	Ololunga	Ololunga	
		Ilmotiok	Olopito	Olopito
			Nkoban	Nkoban
			Oleshapani	Oleshapani
			Melelo	Melelo

Source: KETRACO RAP, 2021

3.1.2 Physical Environment

3.1.2.1 Climatic Baseline

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

and partly cloudy. Over the course of the year, the temperature typically varies from 15°C to 28°C. The March to June season receives high intensity rainfalls that support growth of vegetation which is food for wild animals. The seasons are also important to farmers in planning for planting and harvesting.

The general climate of the county is shown in Figure 3-1.

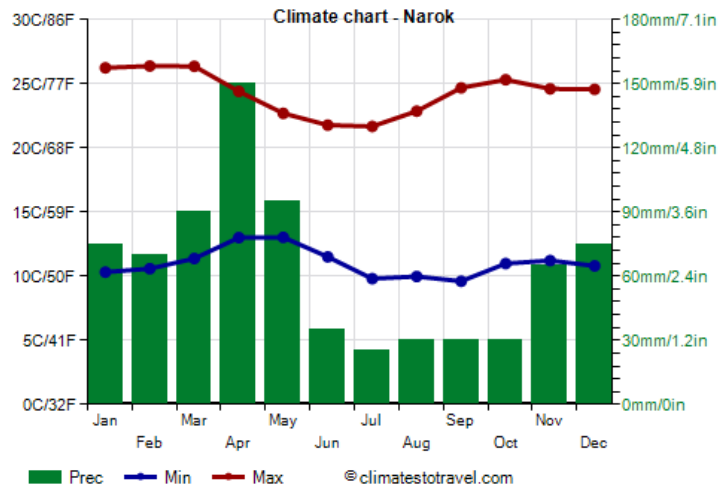


Figure 3-1: Narok County general climate data 2021

Source: Climatestotravel.com

The climate in the project area is largely influenced by the altitude and physical inherent physical features. Sub-humid type of climate is only characterized in Ilmotiok (at the foot slopes of Mau escarpment) while semi-humid climate is common in the other parts of the area of traverse.

3.1.2.2 Topography

Narok county lies within the Great Rift Valley, and is serviced by several rivers, flowing from highlands through arid and undulating landscapes. It is home to numerous volcanic landforms with areas of prominent geothermal activities. The highland areas of Mau escarpments, rising to an attitude of 3,100m above sea level provides fertile ground for farming and source to major rivers like Mara and Ewaso Nyiro with Mara River being the single major river that passes through Maasai Mara Game Reserve and ultimately draining into Lake Victoria.

Along the proposed transmission line, the gradient is generally gentle in traverse supporting large scale agriculture. However, gullies resulting from soil erosion especially in the undulating landscapes were observed around Ilmotiok and Narok town area. One such gully in Ilmotiok ridge (figure 3-2) is a seasonal water way which is deepening and expanding with years and the contractor will take caution not to place pylons close to the gully. The ground is unstable and introducing heavy civil works may promote soil erosion and exacerbate land degradation as well as risking on the stability of the power line. The gully locally referred to as mukuru is characterized by thick indigenous trees at the edges. Farms have been done to proximity of the water way.



Plate 3-1: Sections of terrain along route of traverse in Narok

3.1.2.3 Hydrological resources

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

Along the proposed route, most streams are seasonal and permanent rivers like the Mara support local livelihoods. Dams e.g., Lekimbo dam and silanga support the communities especially during dry season. The proposed line crosses Skinkiter, Ewaso Nyiro and Mara rivers (figure 3-3) which are permanent and several seasonal rivers and seasonal dams (silangas). Hydrological resources are important to the community who use them for sourcing drinking water, watering their livestock and small-scale horticulture. The contractor should ensure no towers are located proximal to the river and none of his activities including transportation and stringing of conductors cause water contamination.



Plate 3-2: Mara River crossing near AP 17

3.1.2.4 Geology and Soils

Soil types in the county are determined by characteristics of the underlying basement rock and range from those developed on mountains to those developed on plains and swamps. The main soil types in the county include: Mollic andosols, luvisols, chromic luvisols, luvic and ando-luvic, phaeozems, chromic vertisols and chromic aerosols as indicated in Figure 3-2. Majority of soils in the district are deep and well drained. Shallow

and poorly drained soils are found in a few places in Masai Mara, East and Southeast from Narok town to Ngurumani Escarpment and on the surrounding hilly and swampy areas. Areas with deep and well-drained soils include hilly and mountainous areas of Mau escarpment, Ngorengore, Shatuka, Suswa and Loita hills

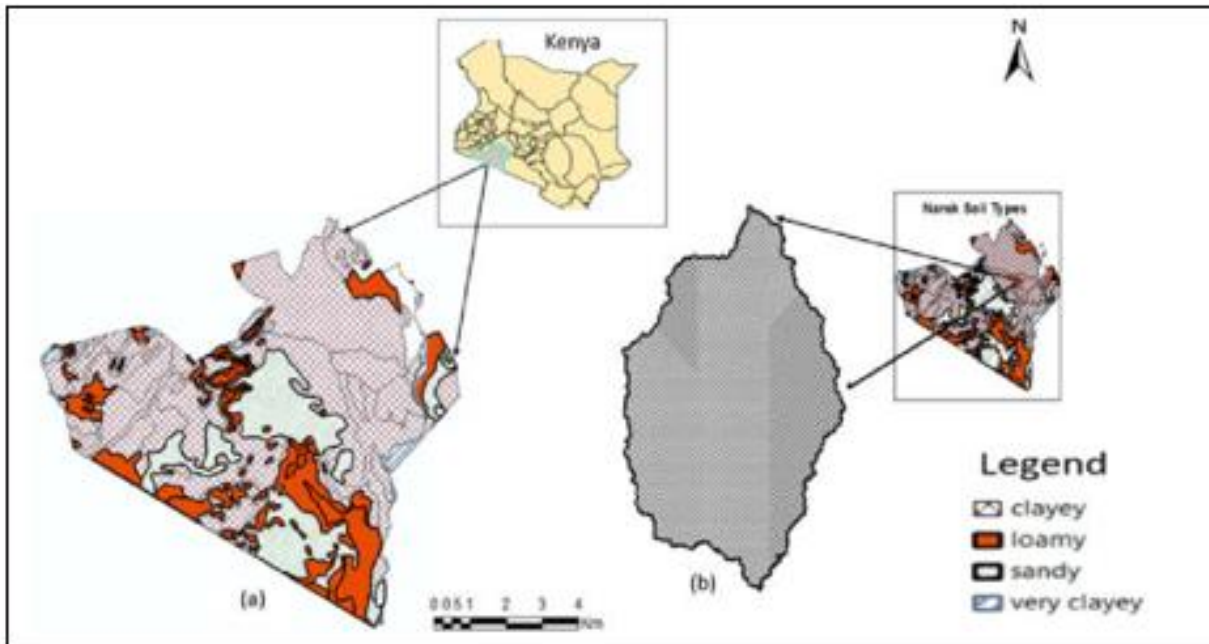


Figure 3-2: Soil types within Narok county

Source: Researchgate.net

It is important to note that the soils along the transmission line corridor are mainly sandy/loamy with a blend of clay which is mainly referred to as black cotton soils, the soils are mainly characterized by weak structure hence prone to erosion, hence need to take care during construction to ensure soil erosion is controlled.

3.1.3 Biological Environment

3.1.3.1. Ecological Conditions

Narok county has a robust ecological system that residents depend on for agriculture, tourism, water, and many other benefits. The county's ecological conditions are influenced by the soil type, altitude, vegetation, rainfall pattern and human activities. The two dominant vegetation types in the county include forest land in the Mau area and grasslands and shrubs in the lowland areas of Suswa, in Narok North, Osupuko and Loita divisions in Narok South as well as the Mara sections in Transmara.

The dominant vegetation type in the project area of influence is grassland and shrubs that have been hugely influenced by the inherent soil type and rainfall patterns.

3.1.3.2. Flora

The dominant vegetation in the county includes forest land in the Mau area and grasslands and shrubs in the lowland areas of Suswa, in Narok North, Osupuko and Loita divisions in Narok South as well as the Mara sections in Transmara.

*The vegetation on the proposed route in the includes grass lands and shrubs, indigenous and exotic trees and agricultural crops. Some of the indigenous tree species and their uses includes: Osokonoi (*Warbugia ugandensis*)- tooth brush, medicinal, Oleleshwa (timber, perfume), olkilinyei –(*Rhoicissus tridentate*)- timber,*

slaughtering, *olpalagilagi*(timber, cultural/ occasions), *oreteti*(medicinal), *olkokola*(medicinal), *olmorogi* (*Dovyalis abyssinica*)-medicinal), *olmisigiyo* (*Rhus natalensis*), acacia trees, croton, baobab, cactus etc. Exotic species planted in most farms includes *gravelia robusta*, *eucalyptus* and wattle bark.

The proposed line will not traverse any gazetted forest; the closest forest is Mau which is located approximately 15km away in a northerly direction. Plate 3-3 shows the typical vegetation along the transmission line particularly between Narok substation and Ilmotiok area.



Plate 3-3: *Tarchonanthus camphoratus* (Oleleshwa) thicket with grassland profile along proposed route of traverse

3.1.3.3. Fauna

In Narok County, the Maasai Mara is the largest ecosystem. Maasai Mara Game reserve is a home to the country's highest wildlife density and as such is Africa premium wildlife destination. The reserve is home to a variety of wildlife including Wildebeests, Gazelles, Zebras, Warthogs, Hyenas, Giraffes, Elephants, Lions, Leopards, and Elands. With increasing human encroachment activities to the reserve, cases of human wildlife conflict have been on the rise and thus threatening sustainability of the reserve and the tourism sector at large.

However, as indicated in Figure 3-3: Alignment of the proposed transmission line in relation to Maasa Mara Game Reserve and Mau Forest, the proposed transmission line does not cross or is close to the Maasai Mara Game Reserve.



Figure 3-3: Alignment of the proposed transmission line in relation to Maasa Mara Game Reserve and Mau Forest

3.1.3.4. Avifauna

Even though Narok County has important bird areas such as Mau Forest, Loita forest, Enosopukia forest and Laila Forest which are habitats for a variety of bird species; it should be taken to account that the proposed power line will not be routed in such areas. Some endangered bird species such as Sharpe's Longclaw (*Macronyx sharpei*) and Aberdare Cisticola (*Cisticola aberdare*); both endemic in Kenya are found in Mau Narok/Molo Grasslands in Narok county. This important Bird Areas (IBAs) are also renowned for holding a significant population of Jackson's Widowbird, another species of conservation concern. Most of the birds of concern do not traverse the proposed transmission route (See Avian study report in Annex 2).

There are several bird species within the area, but the proposed transmission route is not a bird migratory route. Most birds traversing the proposed route are resident and attracted by grains in the wheat and maize farms and the livestock herds of the pastoral community. These include quelea birds, weaver birds, quails, among others. Some birds of importance are found in Narok forested areas of Mau, Loita, Enosopukia and Kilgoris but it should be noted that the proposed line does not traverse these forested areas.

3.1.3.5. Environmental threats and natural disasters

In Narok, environmental degradation in the county is mainly because of unsuitable farming methods, effects of climate change, poor solid waste management, soil erosion, inadequate sanitary facilities, massive deforestation for charcoal, timber, and firewood; land clearing for agricultural use; poor physical planning in urban areas; quarrying activities; pollution from agro-chemicals and alien and invasive species. Drought and famine is one of the main environmental threats currently faced in Narok County. Over 30% of the population in the county resides in the semi-arid areas

Natural disasters such as Earthquakes, flooding/ Tsunami, and volcanic eruption pose a risk on large infrastructure such as power lines. In terms of overall seismic risk, Kenya faces a relatively low earthquake hazard in comparison to neighboring countries with hazard levels highest in the north-west and south-west

regions. The presence of part of the East African Rift, which runs through the west of Kenya, however, means that Kenya is vulnerable to seismic activity and related natural disasters.

Kenya is traversed by the seismically active Great African Rift Valley, one of the most earthquake prone areas of the world (MSSP n.d.). Consequently, the area of the Great Rift Valley within Kenya and parts of the Nyanza basin are at risk of earthquake and volcanic activity.

Figure 3-4 shows the major cities in relation to seismic hazard. Of note is that the most populous cities Nairobi and Mombasa are in areas with low and very low seismic hazard. Nakuru, Eldoret and Kisumu, with populations of over 200,000, are based in an area of medium seismic hazard.

Narok County (including the project area of influence) falls within medium seismic hazard risk as indicated in Figure 3-4

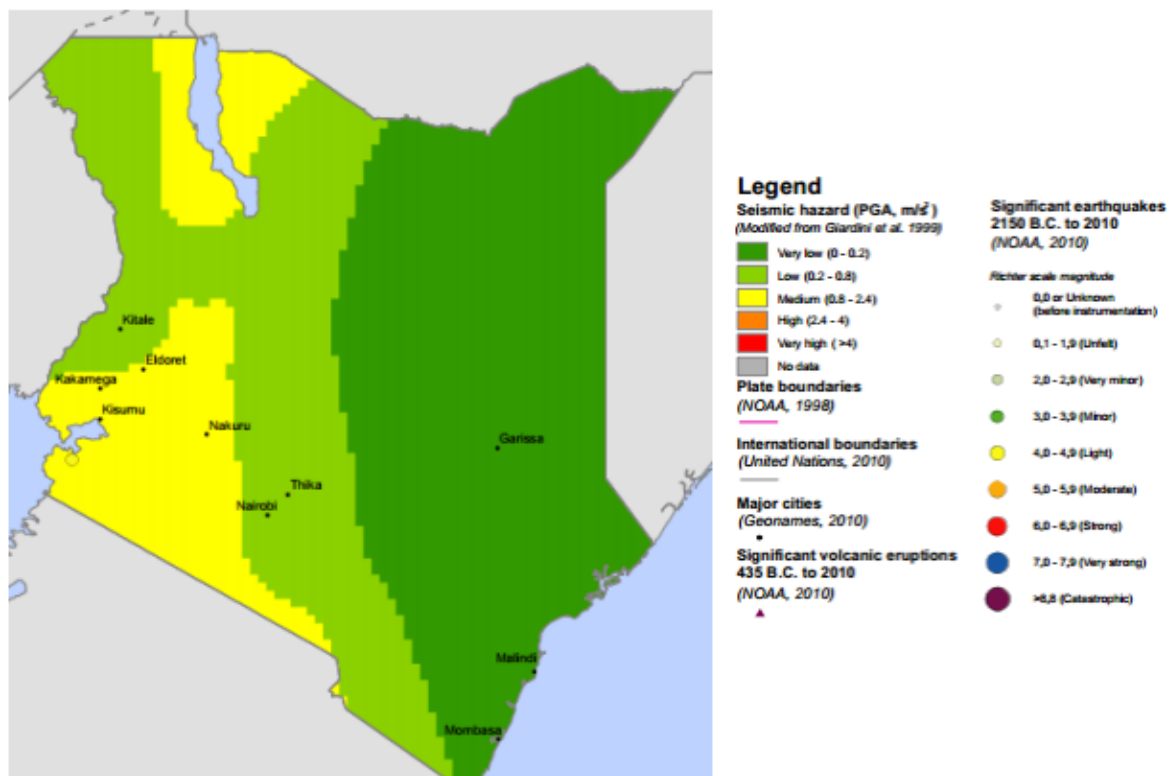


Figure 3-4: Seismic distribution Map of Kenya

Source: Rao, 2013

Narok county is a disaster prone county and experiences regularly a number of hazards, the most common being hydro-meteorological which are mainly weather induced such as; floods ,droughts, landslides ,lightning /thunderstorms, wild fires, and strong winds .anthropogenic factors like land degradation, deforestation of catchment areas, poor agricultural practices, inappropriate land use systems changing living conditions, among others as summarized in Table 3-2

Table 3-2: A Summary of Environmental Threats Narok County

Threat Issue	Hotspot areas	Hotspot areas that are within the project's area of influence	Contribution to Environmental Degradation
Deforestation	Forests e.g Mau Narok	No gazetted forest in the proposed route area	Soil Erosion, land degradation, Climate change.
Poor physical planning	Narok county towns	Ilmashariani, Ololunga Locations	Floral Habitat fragmentation, water and air pollution,
Land clearing for charcoal	Forests e.g private forests and gazette forests e.g S. W Mau	Ololunga. Olopito Locations	Pollution, Soil Erosion, land degradation, Climate-change
Sand Harvesting	Hilltops River banks	Amala river banks Engare ngobit	Salt brine, pollution of Underground water, Diseases,
Air pollution from industrial activities	Urban Centers within Narok County	No emissions observed from industries	Respiratory Diseases, acidic rainfall
Solid Waste	Urban areas Homesteads	Narok township Ololunga Center	Land degradation, various diseases,
Overgrazing	Pasture Lands	Olalmutiai between AP5-AP7	Terrestrial biodiversity loss
Draining & flow diversion	Wetland areas	Nkareta. Between AP14-AP15	Lowering of water table and aquatic species loss
Mono cropping	Crop Lands	Rotian ,Ilmotyok, Oletepesi	Degradation of soil quality leading to poor yields
Soil Erosion	Surface run-off channels	Nkareta Ilmotiook	Landslides, massive siltation of wetlands,

Land degradation due to a combination of natural and anthropogenic triggers has, for instance, resulted in soil erosion as observed in some sections of the line particularly in Oltepesi area as indicated in plate Plate 3-4. It should be noted that the contractor shall have to implement robust tower construction technologies such as benching in order mitigate against soil erosion risk and consequently ensure tower integrity within the specified design timelines.



Plate 3-4: Typical degraded environment in Oltepesi area near Mulot town

3.1.4 Socio- Economic Baseline

3.1.4.1. Land tenure and land use

Land ownership in Narok falls into three main categories namely, community land, trust land and private land. The mean land holding size for Narok County is 16.2 Hectares. In the county, there are alternative land uses which are open to landowners, namely agricultural, livestock and wildlife production. The most prevalent land-use in the county is mixed farming units, with portions of the farm allocated to tree crops, cash crops and vegetables, while fallow land is used to graze livestock. Plate 3-5 indicates some of the key land uses the project area namely mixed crop farming and grazing.



Plate 3-5: Land use practices: large scale maize plantation and subsistence intercropping

In Freehold, land is governed by the Land Registration Act, 2012. The Act provides that the registration of a person as the proprietor of the land vests in that person the absolute ownership of that land together with all

rights, privileges relating thereto. Some of the land in Narok are also under ranching but the land titles are still freehold hence it will not be difficult to acquire the wayleaves for the powerline.

Along the way leave, the land that will be affected in Narok falls under free hold tenure system whereby individuals have legal ownership of land through title deeds. This is land that is claimed by affected households as documented in the lands office and or ownership document. Even though the land tenure in the project area is free hold with ownership of legal documents majority of the Project Affected Persons (PAPs) did not have the land registered under their names. According to RAP findings less than half of the PAPs had land registered under their names and had the title deed. On the other hand, other PAPs said that the land they own is registered under their parents or their deceased parents, some are registered under the seller and others under deceased spouse among others. This implies that a good number of the PAPs have not done land succession which is likely to delay the process of land payments/compensation. The mitigation measure for this is sensitization of PAPs to begin the succession process so that the right documents will be available in time for compensation.

Land is either individually owned in high potential areas or communal owned in low potential areas. For the individually owned land men are the sole owners and would have their sons inherit them. *The ESIA and RAP team also noted that land leasing was very common and most of the farms under large scale agriculture was leased out. Findings from RAP and ESIA studies indicate that the cumulative right of way required for the transmission lines is approximately 600 acres.*

3.1.4.2. Demography

In Narok according to the KNBS 2019 Census, population stood at 1,157,873 persons consisting of 579,042 males and 578,805 female and 26 intersex as indicated in Table 3-3

Table 3-3: Population distribution in Narok County

Sub – County	Male	Female	Intersex	Total
Narok East	58,699	56,617	7	115,323
Narok North	128,024	123,829	9	251,862
Narok South	118,441	120,029	2	238,472
Narok West	97,085	98,198	4	195,287
Trans Mara East	54,545	56,637	1	111,183
Trans Mara West	122,220	123,491	3	245,714
Mau Forest	28	4	-	32
Total				1,157,873

Source: KNBS National and Housing census, 2019

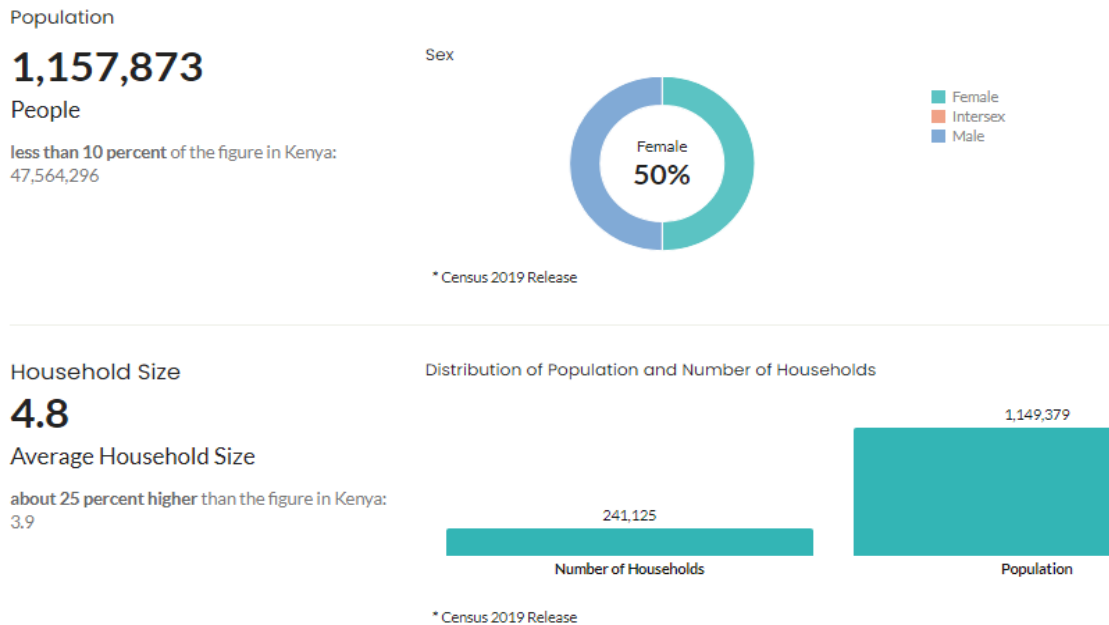


Figure 3-5: Population and Household size statistics in Narok County

Source: KNBS National and Housing census, 2019

The proposed transmission line traverses Narok North and South Sub Counties. The total number of projects affected persons are 80 in the Narok side. The findings from the RAP study further show that the youngest head of household was 22 years while the oldest was 91 years. According to the survey, the average age of the affected population is 48 years. Eighteen per cent of the population is aged between 22 and 35 years with the 36 to 50 years accounting 34% of the PAPs. Those aged between 51 to 59 years accounted for 15.2% while 60 and above years were 21%.

3.1.4.3. Ethnicity

Narok County is predominantly inhabited by the Maasai community. However, urban centers like Narok town are cosmopolitan with different ethnic groups mostly engaged in business. During the study, the line was divided into two parts i.e., portion inhabited by the Maasai people, and the other portion inhabited by the Kalenjin speaking communities. From Narok 132 kV substation to the 42.5km point, just at the border of Melelo sub location is inhabited by the Maasai people who own larger portions of land with low population density. The Kalenjin community largely inhabit Ilmotiook location all the way to the Mara River, the border between Narok and Bomet Counties.



Plate 3-6: The Maasai people of Narok

3.1.4.4. Family Institutions

The Maasai community recognizes the man as the head of the household. However, women are still not empowered since in Narok county most of the agricultural labour is provided by women in the rural households, yet they only have access to the least accruing benefits.

Traditional practices and lack of appreciation of girl child education, children abuse, early and forced marriages, exclusion of women from leadership, property ownership and inheritance, inadequate technological flow, preference to educate the boy child as compared to the girl child. The United Nations regards gender equality as a human right. It is underscored as one of the eight sustainable development goals. Empowering women is an indispensable tool in advancing developments and reducing poverty. However, discrimination against Maasai women in gender-based violence, economic, political, and harmful traditional practices remain the most pervasive and persistent form of inequality.

In her study of the Maasai culture Leleto, N. (2013) attests to this view of gender-based discrimination of women in the family set up. Women's role are mainly reproductive, child rearing and undertaking household chores. They are further viewed as possessions of the male members- their husbands and fathers. There is heavy dis- respect towards the women in the society for they are not considered as "equals" within the household.

The proposed transmission line will be set within the Maasai community where there is still potential for gender – based discrimination. The proposed transmission line will therefore integrate gender-based interventions such as equitable access to employment opportunities in mitigating against gender-based discrimination at family level.

3.1.4.5. Indigenous people, Vulnerable and Marginalized groups

These are persons who by virtue of gender, age, physical or mental disability and economic disadvantage may be more adversely affected by resettlement than others and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits. They include:

- Female headed households.
- Elderly headed households.
- Disabled.
- Children headed households

In Kenya, these groups are referred to as vulnerable and marginalized groups (VMGs). The Maasai people who are found in Narok and other counties are referred to as VMGs. The project considers the vulnerable persons amongst the Maasai community based on other indicators such as elderly, women headed households and where head of household has special needs.

The Maasai people is the main ethnic group occupying Narok county. Findings from the RAP survey 2021, indicate that there were three (3) female headed households in the study area which were categorized as vulnerable.

3.1.4.6. Economic activities

The main income generating opportunities available in the county are agriculture (crop farming and livestock rearing), trade and tourism. The three sectors dominate the economy of the county and have created income and employment opportunities for majority of youth in Narok.

Youth unemployment in the county poses a serious threat to the economy. According to Analytical report on Labour Force Dynamics (KNBS, 2012), Narok North (including Narok East), Narok South (including Narok West) and Trans Mara Sub-counties have unemployment rates of 3.8, 3.4 and 2.8 per cent respectively.

Findings from the study indicate that the main economic activities in the project area of influence include farming, employment and business undertakings as indicated in Table 3-4

Table 3-4: Main economic activities of PAPs along the traverse route

Main economic activity	Frequency	Percentage
Farming	47	66.2%
Employed	10	14.1%
Business	12	16.9%
Unemployed	2	2.8%
Total	71	100.0

Source: KETRACO RAP Survey 2021

The proposed transmission line is anticipated to contribute towards the reduction of unemployment rates in traverse area, that is, Narok North and South sub counties.

Agriculture

Large scale wheat and maize farming is mainly practiced in Narok County. The inhabitants also keep large herds of cattle, goats and sheep which can adapt to dry seasons.

Livestock rearing is also a major economic activity in the county. The activity is concentrated in the lowland areas. Zebu is the main breed of cow reared in the county. According to livestock production summaries for 2012, there were 1,227,879 cattle, 1,134,049 sheep, 752,477 goats, 68,789 donkeys, 670,898 poultry, 299 pigs, 5,643 rabbits and 8 camels. In addition, the county had a total of 54,823 beehives.

From the RAP Study in 2021, It was observed that more than half (66.2%) of the PAPs were involved in farming which includes livestock rearing and crop farming. This is partly because the project area is also in a rural setting and majority of the PAPs have low levels of education. 16.9% of the population are involved in businesses which include selling and buying of livestock produce and sale of main crops (maize, wheat, and beans), boda boda and other business.

Tourism

The County has several tourist attractions sites. Among them is the world 's famous Maasai Mara National Reserve **Plate 3-7** featuring the breathtaking view of the annual wildebeest's migration where over 1.5 million white bearded wildebeest and 250,000 zebra cross the crocodile infested Mara River. The animals cross into Maasai Mara National reserve from Serengeti National Park in July and depart in November. Other tourist attractions include the rich Maasai culture, the sceneries in Mau complex and hill tops that are spread across the county. However, not much in terms of investment has been done to make the hill tops choice destinations for tourist.



Plate 3-7: A general view of Maasai Mara National Reserve

3.1.4.7. Settlement Patterns and Housing

The area is sparsely populated as evidenced by characteristics of settlements in the larger Narok county. residents also have large parcels of land which contributes to the sparse settlements as depicted in Plate 3-8. This presents an opportunity for minimization of Project Displaced Persons (PDPs).



Plate 3-8: A section of the project area in Melelo location depicting huge tracts of land with sparse settlement

The traditional housing for the Maasais are the manyattas. However, most houses were semi-permanent with a few permanent houses along the proposed route a result of modernization and globalization. The traditional houses were built by the women, but the role has been taken up by men to build modern houses.

Findings from the RAP studies indicate that a total of number of 80 households with 254 structures will be affected as indicated in Table 3-5.

Table 3-5: Number of structures to be affected by the transmission line in Narok

	Main dwelling unit	Toilet	Commercial building/kiosk	Water tank	Gate	Animal shed	Fence	Other
Ilmashariani	1	0	0	0	0	0	1	0
Lower Melili	8	1	1	0	0	6	0	3
Nkareta	3	2	0	0	1	2	0	3
Oloroito	12	2	0	0	0	17	1	3
Eldonyio - Ngiro	9	2	0	0	0	7	0	1
Melelo	28	11	0	0	0	15	0	1
Ilmotiok	48	22	0	0	0	24	1	1
TOTAL	109	40	1	0	1	78	3	22

Source: KETRACO RAP Survey, 2021

3.1.4.8. Trade and Industry

There are various markets and trading centers, with some having shades and other facilities. Continuous refurbishment of the markets is necessary to improve the levels and ease of doing business within the county. Some of the markets and trading centers include: Kilgoris market, Olmeli market, Uhuru market (fenced), the Esoit market and cattle sale yard, Ogwedhi sale yard, Shartuk market and sale yard, Endonyo Onkopit market and sale yard and Duka Moja market and sale yard.

Trade in Narok County is predominantly based in Urban Centers. There are 2 Major Urban Centers: -Kilgoris and Narok Town. There are other Urban Centers that are growing fast, including Logorian in Transmara West and Nairagie Enkare in Narok North There are 198 other smaller urban shopping centers, and more than 25 markets in the county.

These Towns, Urban Centers and Markets serve mainly as trading hubs for farm produce and supply-chain to trade with other parts of the country. The centers also serve as the county's retail and wholesale trading hubs. The county has 198 registered retail trades and 600 registered wholesale traders. In general, there are: 198 shopping Centers, 6000 Registered Retail Traders, 198 Registered Wholesale, 1 Bakery, 497 Bar and Restaurants, 131 Unclassified Hotels, 39 Classified Hotels, 3574 Jua kali artisans 3574 and 7 Jua kali associations.

The main towns, shopping and market centers in the project area include Narok (county headquarter), Ololunga and Mulot (located at the border with Bomet County).

3.1.4.9. Education & Literacy levels

There are 624 primary schools in the county. The teacher to pupil ratio is 1:51 on average. The gross enrolment rate is approximately 89 per cent while the net enrolment rate is approximately 79.5 per cent. Dropout rate is a serious concern mainly due to nomadic pastoralist way of life particularly with the Masaai community. The total number of secondary schools in the county is 77. The ratio of teachers to students is 1:62. The average age of attendance is 14 years. Completion rate at this level is 72 per cent. According to the 2018-2022 Narok County Integrated Development Plan, the literacy level in the county is about 63 per cent and women literacy level is 31 per cent compared to men at 69 per cent. The difference is attributed to the maasai traditions that favored the boy child compared to the girl child and advocated for girls' early and forced marriages.

Table 3-6: Gender of household head by highest level of education

Gender	Highest level of education				Total
	No formal education	Primary	Secondary	Tertiary education	
Male	15.4%	63.5%	17.3%	3.8%	100%
Female	25.1%	57.9%	15.7%	1.3%	100%

Source: KETRACO RAP Survey 2021

No public school is traversed by the transmission line

However, some of the schools within the project area of influence in Narok County are; Kyongong secondary, Lekimbo primary and secondary, secondary, Norera primary, Aganga primary and secondary, Illmotiook primary, Kaproret primary, Olerut primary, Olemuna secondary, Ilmashariani primary, Olorito primary, St Kizito catholic primary, Enelerai primary and Kotolian primary, among others. Potential impacts to children could be related to accidents as children can think of climbing the towers. To mitigate this impact, the stakeholder engagement plan will include sensitization on safety to the schoolchildren, which will be conducted in the schools that neighbor the transmission line.

3.1.4.10. Energy Access

Electricity connectivity in the county is very minimal. In 2019, only six per cent (9,903 households) had been connected to the electricity grid. Firewood was the main source of cooking fuel used by 83 per cent of the county households. The use of solar energy in lighting was at 1.4 per cent comprising of 2,301 households. Wind energy utilization has not been exploited in the county.

However, the Kenya power company has embarked on increased connections in the county though the challenge as observed was the fact that the locals own huge chunks of land therefore costly to connect.

According to 2018 – 2022 Narok County Integrated Development Plan (CIDP), just 1% of residents in Narok County use Liquefied Petroleum Gas (LPG), and 2% use paraffin. 80% use firewood and 17% use charcoal. A further 29% use lanterns, and 54% use tin lamps. 8% use fuel wood. Electricity use is mostly common in male headed households at 7% as compared with female headed households at 4%. Narok North constituency has the highest level of electricity use at 16%. This is indicated in Figure 3-6.

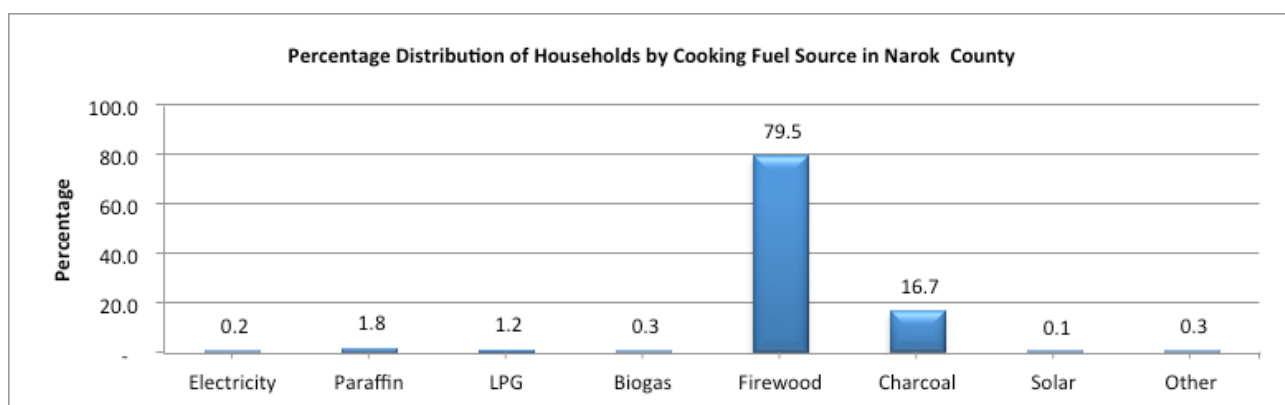


Figure 3-6: Percentage Distribution of Households by Source of Cooking Fuel Source in Narok County

Source: Narok County CIDP 2018-2022

Results of the 2021 RAP study Table 3-7 indicate that 5.6% and 95.8% of households used electricity and firewood for cooking respectively. This clearly shows that most (95.8%) of the household do not have access to clean sources of energy.

Table 3-7: Energy sources for cooking among PAPs along transmission route Corridor in Narok County

Energy source	Frequency	Percentage
Electricity	4	5.6
Solar	67	94.4
Gas cooker	3	4.2
Firewood	68	95.8

Source KETRACO RAP Study 2021

3.1.4.11. Water and Sanitation

A total of 35% of residents in Narok County use improved sanitation, while the rest use unimproved sanitation. Use of improved sanitation is higher in male headed households at 37% as compared with female headed households at 31%. Emurua Dikirr constituency has the highest share of residents using improved sanitation at 55%. That is twice Narok West constituency, which has the lowest share using improved (modern) sanitation. Emurua Dikirr constituency is 20 percentage points above the county average. Ilmashariani ward has the highest share of residents using improved sanitation at 71%. That is 24 times Naikarra ward, which has the lowest share using improved sanitation. Ilmashariani ward is 36 percentage points above the county average.

The county has unique rural and urban challenges with regards to sanitation. The main urban centres i.e; Kilgoris and Narok have neither sewerage nor good drainage system. Lack of these systems has exposed these towns to risk of disease outbreak especially during the rainy season. Management of waste is also haphazardly done making the urban centres dirty and posing health challenges. Waste products of about 10 per cent of the households are collected by the local authority, 2 per cent by private firm while 30 per cent of the households use garbage pit. In 2009, approximately 80,842 of the households in the county used latrines (covered and uncovered) for waste disposal while about 81,700 households excreted in the bush resulting to outbreaks of water borne diseases such as cholera and diarrhoea especially during the rainy seasons.

Water resources management and its use is managed by the different authorities as established under the Water Act 2016. The main water bodies that manage water resources are: Narok Water and Sewerage Company, Narok Water Resources Authorities, Water Resources Users Association, National Water Harvesting and Storage Authority, Water Services Regulation Board, Water Sector Trust Fund and Water Tribunals. The main sources of water in the county include piped, stream, spring or borehole, lake or dam and vendors as indicated in Figure 3-9

According to KNBS, 2019 only 6.9% of the County has been connected to piped water.

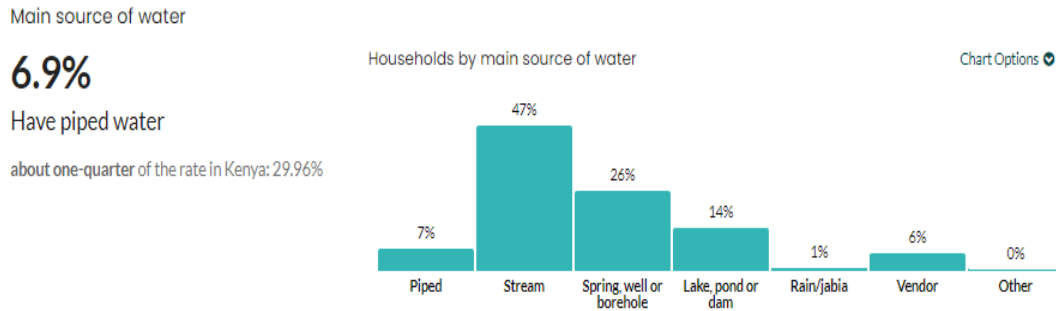


Figure 3-9: Main source of water in Narok County

Source: KNBS, 2019

During the field study, it was noted majority of PAPs where the proposed line will traverse mostly use the water from streams, rivers e;g mara river, springs, and water pans.it was observed that most households along the project site used latrines (covered and uncovered) for waste for disposal of ablution waste. The study further indicates that a total of 40 sanitary structures will be affected along the wayleave corridor. Narok Water and sewerage company covers mostly the urban areas and small towns and does not cover most of the rural areas where the transmission line will traverse apart from Ilmashariani take off area which is within Narok town

3.1.4.12. Information, Communication and Technology

The county has a total of six post offices which are distributed across the six sub-countries with a total of 2700 letter boxes installed. On mobile telephony, over 88,000 households in the county which is approximately 52 per cent own mobile telephone. Despite Narok town being connected with fibre optic cables to enhance access to internet services only less than three per cent of the population use internet services which implies low level technology penetration

3.1.4.13. Public Health

Health services are offered in three tiers namely: tier one which is composed of community, tier two composed of primary health care facilities i.e., dispensaries and health centers and tier three comprises of hospitals. In Narok County, in total, there is one county referral hospital, three subcounty hospitals, 6 mission hospitals, 2 nursing homes, 36 health centers, 110 dispensaries and 47 clinics.

In total there is more than 788 technical health personnel among them 36 medical doctors, 347 nurses and 105 clinical officers and 10 dentists. The doctor/ population ratio is 1:40000, nurse/population ratio is 1:15000Five most common diseases in order of prevalence are upper respiratory tract infection (27%), skin diseases (13 %), diarrhoea (10 %), malaria (9.5%), and pneumonia (6%) among other conditions. Largely, these conditions could be because of poor sanitation.

There is one major hospital in Narok County i.e., Narok County Referral hospital. Others are various smaller health facilities. The average distance to the nearest health facility for the PAPs is 5.6km. The shortest distance covered to a health facility is 0.2km and the longest distance covered is 20km especially for the big hospitals. No health facility will be relocated because of the project as the proposed project will not traverse any health facility. However, there are various health centers in the vicinity in traverse that can easily be accessed by PAPs and project workers

Contagious diseases. (HIV/ AIDS)

The HIV prevalence in Narok County is at 3.1% compared to National level of 5.6%. HIV counselling and testing stands at 58% (National 76%) and Prevention of Mother To Child transmission (PMTCT) coverage is 77%

(National 69%). The project will take precautions not to exacerbate the situation including provision of VCT services and Condoms to workers.

3.1.4.14. Infrastructural Development

Physical infrastructure plays a major role in development as it opens up the area for other activities and links the county with other counties. The major players in the development of this sector are Narok County Government, KeRRA and CDF. The county has one major highway which links it with Nairobi city, Kisii, Bomet and Nakuru counties. The highway is approximately 130 Kms (from Mai Mahiu to Mulot). The improvement of Narok- Nakuru road is likely to catalyze the marketing of agricultural produce from the Mau region of the county.

The county has a road network of approximately 2,798.4 Km (260 Km bitumen, 840Km gravel surface and 1,698.4Km earthen) connecting the various administrative units of the county. However due to the bad terrain most of these roads are unreliable especially during rainy seasons when most of them are rendered impassable. During project implementation the contractor will need to create access roads to the remote locations. Currently there is no rail Network in Narok County, however there are several airstrips most of which are in the Maasai Mara game reserve; These include Narok airstrip, Angama, keekorok, olare orok which are sustainably managed by KCCA.

Narok is the only airstrip in the project area. The proposed transmission mainly crosses the two tarmac roads, that is, Maii Mahiu – Kaplong road and Mulot Sugoo road as shown in Plate 3-10.



Plate 3-10: Crossing Point at Olopito showing main tarmac-Narok-Njoro – Nakuru highway

3.1.4.15. Poverty, Gender and GBV

Poverty and unemployment were identified as twin problems afflicting a large proportion of the people. Despite the enormous resources expended by the government towards poverty alleviation programmes, poverty in the county persists. The causes of poverty include unemployment, insecurity, landlessness, lack of basic services such as health, education, social services, and inadequate credit facilities. Women, children, unemployed youth, and the elderly people are the most affected members of the community.

The poverty line is a threshold below which people are deemed poor. Nationally, 45.2 percent of the population in general, and 50.5 percent in rural areas lives below the poverty line. In Narok, the proportion of individuals below the poverty line stands higher at 41 percent (KNBS and SID 2013). This calls for projects so to increase household incomes and reduce poverty. There has been little progress on gender mainstreaming in the past as gender issues have been viewed as efforts to kill good old traditions and culture. Narok has a gender inequality index of 0.65 against a national average of 0.55. This shows loss in potential human

development due to inequality between female and male achievements. Traditional practices and lack of appreciation of girl child education, children abuse, early and forced marriages, exclusion of women from leadership, property ownership and inheritance, inadequate technological flow, preference to educate the boy child as compared to the girl child, Female Genital Mutilation and rape, all impact negatively on the development of the county. In the county 65 per cent of agricultural labour is provided by women in the rural households, yet they only have access to 40 per cent of the accruing benefits.

The most prevalent form of GBV, primarily meted out to young girls, is female genital cutting (FGC), followed by early marriage. FGC is outlawed throughout Kenya, and the government, religious organizations, and nongovernmental organizations are publicly opposed to the practice, but many locals think it is an important of their culture and continue the practice in secret. The prevalence of FGC in Narok is estimated at 78 percent (KNBS 2014a). Economic violence is another form of GBV. In Narok County, land is predominantly owned by men; widows are often excluded from their right to inherit land, contrary to current inheritance law under which men and women receive equal treatment.

Violence against children is closely related to GBV in multiple ways. According to the County Gender Technical Working Group, child/adolescent pregnancies comprise an estimated 41 percent of all pregnancies in Narok County. Another form of violence against children evident in Narok County is child labor. Young boys who do not want to attend school reportedly work at sand mines, and as they find they can earn modest incomes in this way they are often tempted to drop out of school completely.

3.2 Bomet County

This section presents the location, administrative and bio-physical and social characteristics of the traverse in Bomet County.

3.3.1 Location, Size, and administrative units

Bomet County lies between latitudes 0° 29' and 1° 03' South and between longitudes 35° 05' and 35° 35' East. It is bordered by four Counties, namely: Kericho to the North, Nyamira to the West, Narok to the South and Nakuru to the North-East. The County covers an area of 2037.4Km.

Bomet County is divided into five (5) Sub-Counties (Constituencies), 25 wards, 66 locations, 177 sub-locations and 1,977 villages as shown in table 1. The locations and sub-locations are administrative units of the national government. The Bomet County Government Coordination Act, 2014 established Sub-County, Ward, Community and Village administration.

Table 3-8: Administrative Units and Area by Sub-County/Constituency

Sub-County (Constituency)	Wards	Area in Km ²	No. of Locations	No. of Sub-locations	No. of Villages
Bomet Central	<ul style="list-style-type: none"> • Silibwet, • Singorwet, • Ndaraweta, • Chesoen • Mutarakwa 	26 6	8	24	294
Bomet East	<ul style="list-style-type: none"> • Longisa, • Kembu, • Chemaner, • Merigi • Kipreres 	31 1.3	10	27	320

Chepalungu	<ul style="list-style-type: none"> • Sigor, • Kongasis • Chebunyo • Nyongores • Siongiroi 	53 5.8	15	42	465
Sotik	<ul style="list-style-type: none"> • Ndanai/Abosi • Kipsonoi, • Kapletundo • Chemagel • Manaret/Rongena 	47 9.2	17	48	471
Konoin	<ul style="list-style-type: none"> • Kimulot, • Mogogosiek • Boito, • Embomos • Chepchabas 	44 5.1	16	36	427
	Total	2037.4	66	177	1977

Source: CIDP Bomet County (2018 – 2022)

In Bomet County, the line traverses Bomet East and Bomet Central subcounties. The sublocations traversed include Kobeiyon, Kiptulwa, Kongotik, Emitiot, Cheboin, Kyogong, Kabisoge and Itembe sublocations as indicated in Table 3-9. The locations and sub-locations are administrative units of the National Government.

Table 3-9: Bomet County Administrative Units

COUNTY	SUB-COUNTY	LOCATION	SUBLOCATION
Bomet	Bomet East	Kapkimulwa	Koibeiyon
		Cheboin	Emitiot
		Kyogong	Kyogong
	Chepalungu	Itembe	Itembe

The detailed route adopted is given in transmission line route firming report attached to this report in annex 10.

3.3.2 Physical Environment

3.3.2.1 Climate and agro – climatic systems

In Bomet County, the rainfall in the area ranges between 1000 mm and 1400 mm. Rainfall is evenly distributed except for the short dry season in January and February. The wettest months are April and May. Overall, there is little break between short and long rains in the whole County. In the extreme south, rains start in November and continue intermittently until June. June to November is the dry season. In the extreme north, rains start towards the end of March and continue intermittently up to the end of December. The temperature levels range from 16^o C to 24^o C with the coldest months between February and April, while the hot seasons fall between December and January as indicated in Figure 3-7

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

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	17.9 °C (64.2) °F	18.8 °C (65.9) °F	18.7 °C (65.6) °F	17.9 °C (64.1) °F	17.5 °C (63.5) °F	16.8 °C (62.2) °F	16.5 °C (61.7) °F	16.9 °C (62.4) °F	17.6 °C (63.7) °F	18.4 °C (65.1) °F	17.5 °C (63.5) °F	17.4 °C (63.3) °F
Min. Temperature °C (°F)	12 °C (53.6) °F	12.4 °C (54.3) °F	12.8 °C (55.1) °F	13.4 °C (56.1) °F	13.2 °C (55.8) °F	12.3 °C (54.2) °F	11.8 °C (53.3) °F	12.1 °C (53.9) °F	12.5 °C (54.4) °F	13.2 °C (55.8) °F	12.7 °C (54.9) °F	12.2 °C (53.9) °F
Max. Temperature °C (°F)	23.9 °C (75.1) °F	25.4 °C (77.7) °F	24.9 °C (76.8) °F	23.2 °C (73.8) °F	22.5 °C (72.5) °F	21.7 °C (71.1) °F	21.6 °C (70.8) °F	22 °C (71.7) °F	23.1 °C (73.6) °F	24 °C (75.1) °F	23.1 °C (73.5) °F	23 °C (73.4) °F
Precipitation / Rainfall mm (in)	133 (5)	77 (3)	162 (6)	227 (8)	127 (5)	86 (3)	52 (2)	69 (2)	65 (2)	90 (3)	197 (7)	176 (6)
Humidity(%)	65%	57%	63%	73%	71%	68%	65%	64%	60%	59%	71%	70%
Rainy days (d)	9	7	11	13	11	9	7	7	7	7	12	11
avg. Sun hours (hours)	9.6	10.1	9.5	8.7	9.0	8.5	8.2	8.7	9.5	9.7	8.8	9.1

Figure 3-7: Bomet county climatic data

The variable climatic conditions in Bomet County result in a wide range of agro-ecological systems **Figure 3-8** suitable for growing crops like maize, beans, cow pea and vegetables. The agro-climatic conditions in the county are more suitable for a wide range of crops with tea and maize being the most dominant ones.

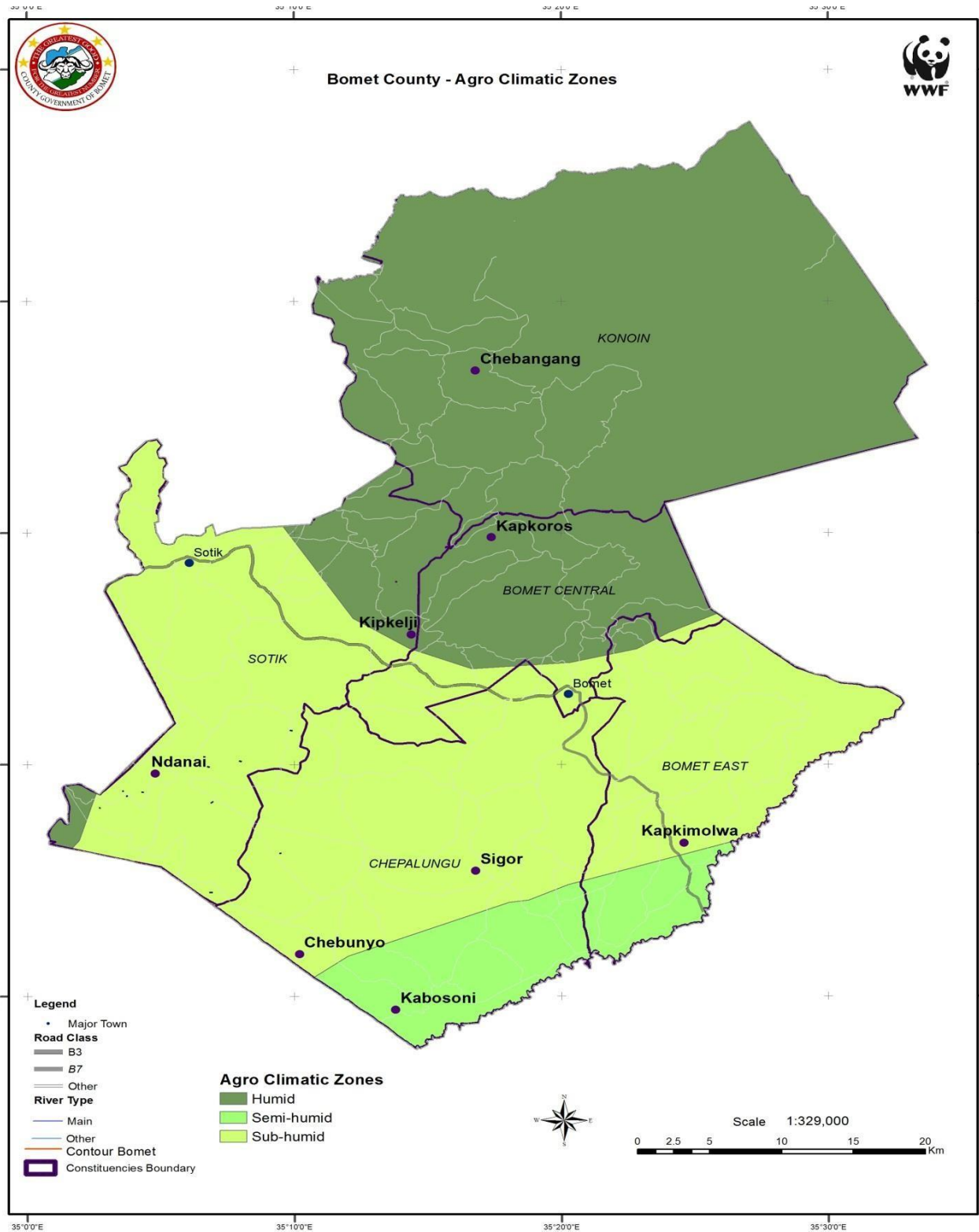


Figure 3-8: Agro – climatic zones in Bomet County

The proposed transmission line almost traverses Bomet East and partly Bomet Central subcounties which according to figure 3-7 fall under sub – humid agro – climatic zone.

3.3.2.2 Topography

A large part of the County is characterized by undulating topography that gives way to flatter terrain in the south. The overall slope of the land is towards the south, except the northeastern part which rises eastwards towards the 3,000m high Mau Ridges. The land slopes gently from Kericho plateau to about 1,800m in the lower area where the land is generally flat with a few scattered hills in Chepalungu and Sigor plain. The higher altitudes in the northeastern parts of the county are particularly suitable for tea and dairy farming. The middle part of the county which lies 2,300m above sea level.

In Bomet county, a larger section of the area of traverse is gently sloppy. The Bomet section is further characterized by undulating hilly topography especially from Ilmotiok (Mara River) to Kyogong that gives way to flatter terrain in the South. The area around 132kV substation in Itembe location is generally flat followed by sloppy area of Kabisoge towards Kyogong secondary school. Kyogong area is also characterized by small hills which are currently used for harvesting sand, murrum and ballast. Ilmotiok area is also hilly, but the area is covered with small shrubs and vegetation which has not been disturbed hence also acts as barriers for soil erosion.

3.3.2.3 Hydrological resources

The county is well endowed with water resources. Permanent rivers originating from the Mau Forest and flowing through the county are Oinab Ng'etunyet, Nyongores, Kipsonoi, Itare, Kiptiget, Chemosit, Amalo and Maramara. Sisei River originates from several swamps in Bomet Central Sub- County and is fast diminishing due to intensified cultivation along its banks and catchment areas. Most of the population draw water from rivers, water pans and springs. Rainwater harvesting is practiced by the households that have corrugated iron roofs. The county government has protected a total of 27 springs since 2013.



Plate 3-11: Nyongores river crossing point in Bomet county

In Bomet County, the proposed transmission line traverses mainly the Nyongores permanent river (Plate 3-11). Along the route of traverse, the towers in riparian areas will be located outside the permissible locations (safe distances) to minimize impacts on any biodiversity along the riverine ecosystems. The crossings on rivers will be reduced to as much as possible. For instance, during route firming, the crossings on Nyongores river were reduced from 3 crossings to 1 crossing.

3.3.2.4 Geology and Soils

The underlying geology of the County is comprised of volcanic, igneous, and metamorphic rocks. In addition to tertiary lava (phonolites) and intermediate igneous rocks, there are basement systems (granite), volcanic ash mixtures and other pyroclastic rocks. Also present are quaternary volcanoes to the Southwest parts and faults along the Mau escarpment bordering Narok County. The soils of the county are those developed on

ashes and other pyroclastic rocks of recent volcanoes. In some areas, they are imperfectly drained, moderately deep to deep, very dark greyish brown to dark yellowish brown, firm to very firm, slightly sodic, silty clay loam to clay, abruptly underlying a thick topsoil of friable, silt loam to clay loam (solodic PLANOSOLS). In other areas, the soils are an association of well drained, very deep, dark redish brown, very friable, and smeary, sandy clay loam to clay, with a thick humic topsoil; on interfluvies (mollic ANDOSOLS), to well drained, moderately deep, dark brown to dark reddish brown, very friable and slightly smeary, clay loam to clay; on valley sides (andoeutric CAMBISOLS, partly lithic phase).

Black cotton, clayey – sandy, clayey – loamy and loamy – sandy are the common soils along the transmission line corridor in Bomet county. During construction, there will be adequate geological survey that will enable design engineers to do proper footing of towers without destabilizing the underground soil and rock. No blasting will be done during construction.

3.3.2.5 Environmental threats

There are several environmental threats encountered in the county which include, loss of biodiversity because of pressure from increasing population, erratic weather conditions and climate change, deforestation, landslides in some parts of Konoin sub-county, invasive noxious aquatic species such as *savinia molesta*, maize necrosis disease, solid waste and in-door air pollution. The major degraded areas and contributors to environmental degradation within the county include hill tops and hill slopes; wetlands and riverbanks caused by planting of eucalyptus trees; wetlandreclamation; surface run-off channels leading to soil erosion; sand and stone mining areas; gazetted forests; crop lands because of mono-cropping; and pasture lands due to overgrazing as indicated in Table 3-10

Table 3-10: A Summary of Environmental Threats Bomet County

Threat Issue	Hotspot areas	Hotspot areas that are within the project's area of influence	Contribution to Environmental Degradation
Deforestation	Forests e.g. South West Mau Forest	No gazetted forest in the proposed route area	Soil Erosion, land degradation, Climate change.
Charcoal Production for commercial purposes	Forests e.g private forests and gazette forests e.g S. W Mau	No gazetted forest in the proposed route area	Pollution, Soil Erosion, land degradation, Climate-change
Quarrying (ballast, Hardcore)	Hilltops	Masare hills in Kyogong Location AP18-AP19	Noise, visual, air pollution, land degradation, water sources pollution, Water borne diseases,
Sand Harvesting	Hilltops River banks	Masare hills in Kyogong Location	Salt brine, pollution of Underground water, Diseases,
Air pollution from industrial activities	Urban Centers	No industries were observed.	Respiratory Diseases, acidic rainfall

Threat Issue	Hotspot areas	Hotspot areas that are within the project's area of influence	Contribution to Environmental Degradation
Solid Waste	Urban areas Homesteads	Chemarain, Longisa, Kaplong towns	Land degradation, various diseases,
Overgrazing	Pasture Lands	Kaplong location	Terrestrial biodiversity loss
Draining & flow diversion	Wetland areas	Aganga sub-location	Lowering of water table and aquatic species loss
Mono cropping	Crop Lands	Itembe Location	Degradation of soil quality leading to poor yields
Soil Erosion	Surface run-off channels	Kyogong location	Landslides, massive siltation of wetlands,

3.3.2.6 Climate Change, Disaster and Seismic Risk

Despite good rains and soils, food insecurity is a critical issue in Bomet County with approximately 36.2% of households being considered food poor (MoLF, 2017). Food scarcity peaks between the months of January and April each year, when harvested stocks are generally depleted. Food insecurity in the county can be partly attributed to the occurrence of climate related hazards. These include drought, uncertainty in growing seasons (onset and duration), intense rains as well as changes in weather and climate over time. These hazards have been coupled with several agricultural challenges such as prohibitive prices of agricultural inputs, pests and diseases, post-harvest losses amongst others.

The most common adaptation strategies to climate hazards for crops include planting of improved varieties, staggered planting, in-field soil and water conservation practices, tree planting, food storage, value-added processing, and small-scale water harvesting. For livestock, main adaptation strategies include improved livestock breeds, water harvesting, breed diversification, fodder production and feed conservation. Longer term resilience and adaptation strategies suggested for the County include expansion of cold storage facilities for crop and livestock products, expansion of water harvesting and efficient irrigation, investing in local processing facilities for key value chain commodities and capacity building of cooperatives on agricultural marketing. Off-farm services such as early warning systems; agricultural extension trainings on climate hazards and good agricultural practices; and market information are offered to farmers to increase their climate-adaptive capacity. Such services are offered by a variety of actors, from government (such as the KMD, veterinary, agriculture, fisheries, and livestock departments) and NGOs. Women and youth are among the most vulnerable groups in the county, with the lowest adoption rates of adaptation strategies.

In terms of disaster risk, Bomet county has developed Bomet county Disaster and Management Act, 2014 to give guidelines and provisions for managing disasters and emergencies for effective planning. The County government has also initiated climate smart agriculture as a way of cushioning livelihoods against impacts of climate change.

Kenya is traversed by the seismically active Great African Rift Valley, one of the most earthquake prone areas of the world (MSSP n.d.). Consequently, the area of the Great Rift Valley within Kenya and parts of the Nyanza basin are prone to earthquake and volcanic activity.

Figure 3.14 shows the major cities in relation to seismic hazard. Of note is that the most populous cities Nairobi and Mombasa are in areas with low and very low seismic hazard. Nakuru, Eldoret and Kisumu, with populations of over 200,000, are based in an area of medium seismic hazard.

Bomet county (including the project area of influence) falls within medium seismic hazard risk as indicated in Figure 3.14

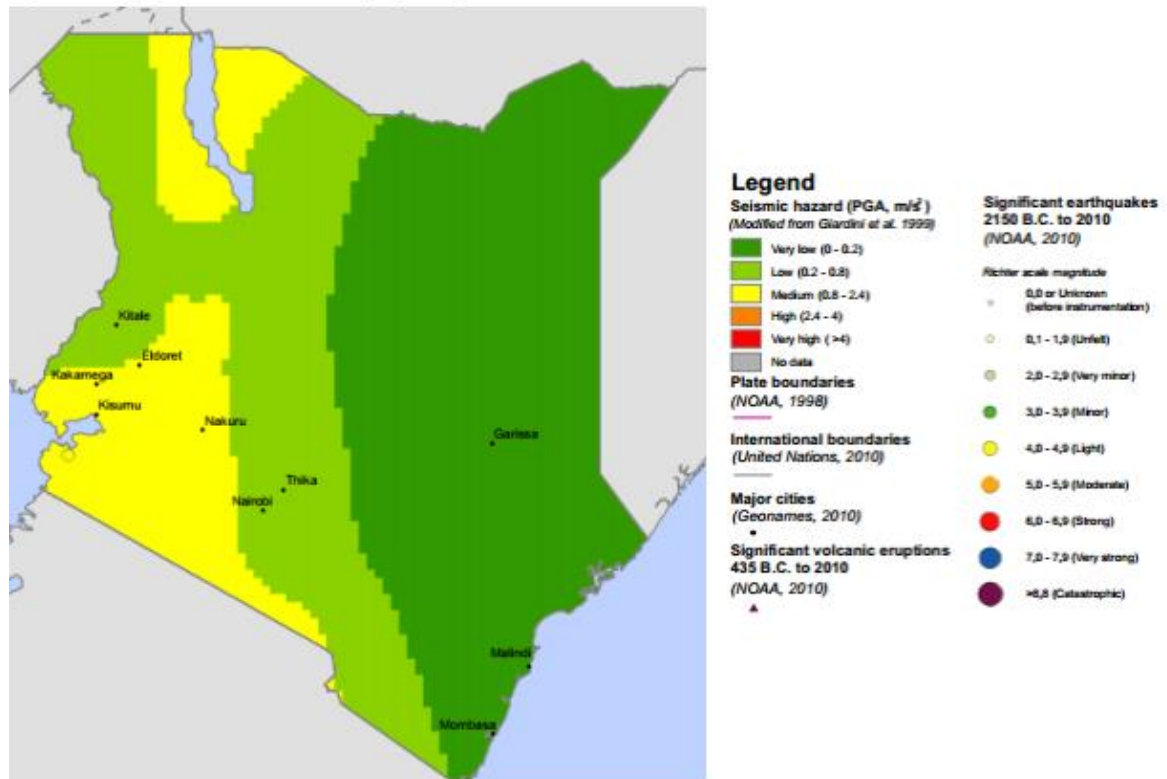


Figure 3.14:- Seismic Distribution Map of Kenya -Bomet

Source: Rao, S (2013)

3.3.3 Biological Environment

3.3.3.1 Ecological conditions

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

3.3.3.2 Flora

The vegetation cover in the Bomet is relatively dense with the occurrence of both indigenous and exotic vegetation covers in various farms. The dominant exotic species found in Bomet include *Eucalyptus grandis*, *Cupressus lusitanica*, *Bottle bush species*, *Gravellia robusta*, *Cypress*, *Azadiracta indica*, *Acrocarpus fraxinifolius*, *Casuarina agustifolia*, *Jacaranda mimesifolia* and *Terminalia mantaly*.

The dominant natural species include: *Acokanthera schimperi* (Kelyot), *Spathodea campanulate*, *Ficus sycomorus*, *Croton macrostachyus* and *Phoenix Reclinata* (Palm Tree).

There are two main types of forests in the county namely, natural forests and plantation forests. Most of the natural forests in the county are gazetted government forests though some large-scale tea estates and landowners have maintained part of their lands under these forests mostly along riparian areas which may fall under the category of un-gazetted forests of which the hectares are yet to be established. Gazetted forests in the county cover an area of approximately 802.3km² (CIDP, Bomet County, 2018 – 2022) as indicated in Table 3-11. Plantation forests in the county fall under two categories namely gazetted plantation forests and private forests.

Table 3-11: Forest name and Size in Bomet County

No.	Forest	Area (ha)
1	Chepalungu	47,977.1
2	Itare	16,200
3	Mara mara	16,000
4	Ndoinet	50
	Total	80,227.1

Source: Bomet County CIDP, 2018 - 2022

There is only one government gazetted plantation forest (Chepalungu forest) which is under the Plantation and Livelihood Improvement Scheme program (PELIS) where 300 hectares have already been established with a potential 200 hectares due for establishment. The species mainly planted in these sites are *cupressus lusitanica* (cypress) and *eucalyptus grandis* (eucalyptus) Plantations of eucalyptus species established by Nyayo Tea Zone Corporation along the peripheries of indigenous forests within the county were created as buffer zones between private farms. The forests fall under an amorphous category which is neither under natural forests nor plantation forests. These are forests established on privately owned lands often of varying sizes depending on the land holdings. They range from small holder woodlots to large plantations like those established by the large-scale multinational tea growing companies such as Sotik Tea and Finlays. The main product is wood fuel for sale to tea curing factories managed by Kenya Tea Development Agency (KTDA) and electricity transmission poles.

The proposed line will not traverse any gazetted forest and plantations but will cross small scale Private forests (Figure 3-3). Plate 3-13 indicates crossing on River Nyongores riparian vegetation.



Plate 3-12: An overview of fallow forested private land



Plate 3-13: Riparian vegetation along Nyongores River

3.3.3.3 Fauna and Avifauna

Mau forest is also a habitat to an impressive number of large animals such as buffalos, leopards, hyenas, antelopes, elephants, some of which are of international conservation concern. The forests are also a home to a rich variety of birds and is said to represent the richest montane avifauna in Eastern Africa. The section of the Mau Forest in Bomet County is home to rare animal species like bongo, giant forest hogs, cooper tailed monkeys, black and white Colobus monkeys, elephants, leopards, buffalos and abundant birdlife.

Some of the common birds found in area include goshawks, buffalo weaver and palm nut vultures, African skimmers, other birds are weaverbirds, sunbirds, kingfisher, Dusky Turtle Dove, Yellow-crowned bishop; Long tail widowbird, Broad-Billed Roller, Striated Heron, Cattle Egret, Common Squacco Heron, Marabou Stork, Sacred Ibis, Lizard Buzzard, Long –Crested Eagle, Winding cisticola, Ruffus chatterer, Red –billed firefinch, hunters Cistola, gunea fowl, greater sand plovaer, steepe eagle and Speckled pigeon and hornbills (KPLC, Avifauna study, 2018).

Some of the bird species found in the area are shown in Plate 3-14



White-Browed Robin Chat



Marabou Stork



Hunter's Cistola



Vulturine Gunea Fowl



Greater Sand Plover



Steepe Eagle



Crowned Plover



Malachite Kingfisher



Lilac-Breasted Roller



White-Bellied Go-Away -Bird



Spur-Winged Plover



Common Ringed Plover



Northern Brownbul



Grey-Headed Sparrow



Augur Buzzard



Red-Billed Hornbill



Broad-Billed Roller



Eurasian Bee-Eater



Cranes



Carmine Bee-Eater



Collared Sunbird



Hadada ibis spotted in a water pan within the area



Great Egret within the study area



Black Headed Heron



Helmeted Guinea Fowl within the study area



Pied Crows



Superb Starling

Plate 3-14: Selected bird species found in the project area in Biomet County

Source: KPLC Avifauna study report, 2018.

There is no documented endangered bird species within the area of transmission line traverse in Bomet county. The migratory routes are around Mau Narok area which is approximately 50km off the proposed line route. Since the proposed area is far from Mau Forest, it has several types of birds and most of the birds are lesser birds but small ones which can easily manoeuvre through the proposed line. Most of the birds noted along the proposed line and its vicinity do not fall under the endangered or the threatened species (See Annex 2 on Avian study carried along the TL).

3.3.4 Socio-Economic Environment

3.3.4.1 Land Tenure, Holding and Land Use

About 90% of land ownership in the county falls under the category of absolute land proprietors with 60% of the households having acquired title deeds and the rest have succession issues. The current mean holding size of Bomet County is at an average of 1.55 Ha due to increased population. Approximately 80% of all commercial lands by the lessor government for a specific period with specific conditions defining the lease documents. Bomet and Sotik towns have leasehold titles. Approximately 86% of the households have acquired titles for their pieces of land and this has enabled many of them to participate actively in gainful economic activities as they can easily access credit for development.

An estimate of 14% of the households have no title deeds and this include people displaced from the Mau Forest in Konoin Sub- County. The county has an even settlement distribution in the agricultural lands. Urban centers such as Bomet and Sotik are dictated by development plans and their peripheries have attracted densely populated patterns. After the settlement of Mau Forest Internally Displaced Persons (IDPs), incidences of landlessness in the county are negligible.

Land ownership is key in the project area given that the main livelihood activities are land based. The average size of land ownership ranges from 3 acres to 10 acres (RAP study, 2018) most of the land ownership is free hold with titles. The main challenge is that most of the project affected persons have land which is registered under their deceased fathers. Land succession processes have not been keenly embraced by a majority. On the other hand, many elderly heads of households have also not legally divided land. They claim that if young men are issued with land with titles, they will sell and buy boda boda (motorcycle) an asset which cannot be compared to land. This matter is likely to slow the compensation process for the way leave.

Approximately 90 percent of land in the county is agricultural while 10 percent is commercial. The total land area in the county is 2,037.4 Km², with 1,716.6 Km² being arable land. There are also gazetted forests such as

Tinet in Konoin Sub- County and Chepalungu in Chepalungu Sub- County that occupy about 483.1 Km². Of the county total land area, approximately 230.1 km² is non-arable while the area coverage for the market centers is 2 Km². All agricultural land is freehold with absolute land proprietors enjoying unlimited interests.

From the RAP study findings, the main land use activities in the project area include crop farming, livestock keeping, and sand harvesting as indicated in Plate 3-15

The PAPs in Bomet County do farming on small scale mainly for subsistence and sell out any surplus. This is because the land sizes are small with the average ownership of land being 3.2 acres according to the socio-economic survey. The main crops grown are maize and beans across all the sub locations but in Kapkimolwa sub location in Bomet East Subcounty some PAPs grow onions, cabbages, and tomatoes these are for commercial purposes. The PAPs also have planted trees that are used for building, firewood and for sale. There are also isolated indigenous trees. There are a few PAPs with fruit trees.

There is also livestock keeping among the PAPs in Bomet County. Livestock keeping is in small numbers and most of them are tethered within the individual farms. The average number of cows among the PAPs is 6, goats is 3, sheep is 2, and donkey is 1 while chicken is ten. The cattle are mainly kept for milk for household consumption, but the surplus is sold.

In Kyongong sub location the way leaves pass through land which is under artisan sand harvesting done manually. The land belongs to one family who harvest the sand and sell out to interested customers. Along the way leave some site are disused while others are active.



Crop farming



Sand harvesting in Kyongong

Plate 3-15: Some land use types in Bomet County

3.3.4.2 Demography

Bomet -Population

The population of Bomet County according to 2019 National and Housing census stood at 875,689 persons comprising of 434,287 males and 441,379 females as indicated in Table 3-12

Table 3-12: Population distribution in Bomet County

Sub-county	Male	Female	Intersex	Total
Bomet East	71,095	73,172	8	144,275

Chepalungu	79,921	84,912	4	164,837
Konoin	83,120	80,384	3	163,507
Sotik	112,369	115,482	4	227,855
Bomet Central	87,782	87,429	4	175,215
Total	434,287	441,379	23	875,689

Source: KNBS National and Housing census, 2019

The population was estimated to be growing at a rate of rate of 2.7% annually. The rapid population growth exerts pressure on the existing infrastructure and provision of services in the County, including pre-primary schools (ECD), primary, secondary, and tertiary institutions.

Results of the RAP study indicate that 248 households will be affected by the proposed transmission line in Bomet as indicated in Table 3-13

Table 3-13: Potentially affected populations by the proposed project.in Bomet County

Sub locations		Total households affected
1	Itembe	32
2	Kabisoge	20
3	Kyogong	35
4	Cheboin	8
5	Emitiot	65
6	Kongotik	19
7	Kiptulwa	30
8	Koibeiyon	39
Total		248

Source: KPLC RAP study, 2018

3.3.4.3 Ethnicity

Bomet county is mainly inhabited by the Kipsigis people who belong to the larger Kalenjin ethnic group. The Kipsigis are a Nilotic ethnic group of Kenya. However, in urban centres such as Bomet, Sotik and Kilgoris there are mixed tribes from all over Kenya but in small numbers. *In Bomet county the line passes through the rural setting of Bomet East and Bomet central sub-counties which are predominantly Kipsigis settlements.*

3.3.4.4 Economy and division of labour

Agriculture is the main economic activity in Bomet County with over 80% of the total population engaging in crop and livestock production or being employed on farms. Agriculture is the main source of livelihood and food security in the county and provides raw materials to agro-based industries and therefore stimulates multiplier effects in off-farm incomes and employment. Adult females provide the largest share of household labor for both crop and livestock production. Hired labor for livestock production is largely dominated by youth. Paid livestock related work is an important income source for both youth and their families. Male and youth headed households are more engaged in off farm and non-farm activities.

The county also has significant tourism development potential that has yet to be tapped into. Key areas of potential include nature-based tourism, agro tourism, sports tourism, and cultural tourism. Opportunities exist

to create demand led tourism by expanding the hospitality industry and undertaking aggressive marketing of the region to local and international markets.

In earlier times there was little division of labour based on age and sex. However, the division of labour has been increasing with emergence of formal employment and business opportunities. Today women do more cultivation if their husbands are engaged in formal and small-scale business activities. Children still herd cattle close to the homestead, as well as sheep and goats but only while out of school. Women also milk, cook, and supply water and firewood. The community prides itself of popular beverage called *Mursik* prepared by the women. This consists of fermented whole milk that has been stored in a special gourd, cleaned by special herbs that grow naturally. *There are three major economic activities in the project area, that is, along the way leave and they are; farming, employment and businesses. It was observed that more than half (62%) of the PAPs were involved in farming which includes livestock rearing and crop farming. This is partly because the project area is also in a rural setting and majority of the PAPs have low levels of education.*

3.3.4.5 Settlement Patterns and Housing

Bomet county has an even settlement distribution in the agricultural lands. Urban centers such as Bomet and Sotik are dictated by development plans and their peripheries have attracted densely populated patterns.

The area traversed by the transmission line is largely rural with moderately dense settlements as depicted in Plate 3-16



Plate 3-16: An overview of settlement patterns in Bomet County

The 2019 population and housing census classified housing by ownership, while considering the main walling, floor, and roofing materials. Under ownership, 85 percent of the county's population have their own houses compared to the national figure of 68 percent (CIDP, Bomet County, 2018-2022). Only 15 percent of the county population reside in rented houses compared to the national figure of 32 percent. About 65.1 percent of the residents of the county have used mud and wood as their main walling materials against a national figure of 36.7 percent. Only 4.2 percent used stone for walling. Under the main floor material, 75.5 percent of the County residents use earth against the national figure of 56.5 percent. Under the roofing materials, 72.2 percent of the houses are constructed using corrugated iron sheets against the national figure of 8 per cent.

The traditional housing for the Kipsigis are thatched, round shaped and mud-walled structures as shown in Plate 3-17. However, during the ESIA study, it was observed that most houses were semi-permanent with a few permanent houses along the proposed route. This is probably attributed to modernisation and globalization.



Plate 3-17: Typical housing structure for the Kipsigis

3.3.4.6 Trade and Industry

There are several major market centers in the county which include; Sotik, Silibwet, Sigor, Mulot and Chebunyo. Smaller markets such as Kapkwen, Mogogosiek, Siongiroi, Kaplong, Ndanai, Chebole and Longisa are famous for their open air markets and operate on specific days of the week. Youth farmers along Bomet-Longisa highway are known for fresh farm produce.

There is an industrial park in Bomet town which provides incubation opportunities to micro and small scale enterprises under Kenya Industrial Estate. The industrial park has three bakeries and two furniture workshops and a livestock meal plant. However, the County has proposed to establish another industrial park which will enhance manufacturing activities in the county.

The industrial base in the county is not well established yet the county is endowed with various agricultural raw materials which can be processed for value addition. The county has seven tea processing industries and one milk processing plant in Sotik. The county also has two modern maize milling plants in Bomet and there is a high potential for the development of other industries given the strong agricultural base of the county. In addition, there are three water bottling plants in Sotik, Bomet East and Konoin Sub-counties.

The main towns, shopping and market centres in the project area include Mulot, Longisa and Bomet (the county headquarters).

3.3.4.7 Water and sanitation

Access to safe and clean water is still low in the county. Access to piped water is currently at 25%. Average walking distance to the nearest water point in the county is about 1km. However, this distance varies with the season, source of water and area. During the dry seasons, the lower parts of the county namely, Chepalungu

and Bomet East sub-counties where the main source of water is dams and pans, the distance covered to the water points increases considerably to about 5 kms.

The management of water services in the county is done through delegated authority by Bomet Water Company Limited. Community water projects are also regulated by the Water Services Regulatory Board (WASREB). Most of the water supply schemes in the county are pumping systems and the cost of power is quite high. To cut down on the cost of operations in the schemes, there is need to develop gravity systems to eliminate the need for pumping. There is also needed to improve on water storage through the construction of dams and rainwater harvesting by roof catchment, especially by institutions such as schools and dispensaries.

The provision of sanitation is a key development intervention – without it, ill-health dominates a life without dignity. The wastewater collection system consists of approximately 2 kms of trunk sewer and approximately 56 manholes. Additionally, about 5kms of sewer network has been completed and now awaiting commissioning. There is still a need to lay an additional network of about 15 kms to cover the entire Bomet town and construct sewerage systems in other towns such as Sotik, Mogogosiek, Longisa and Mulot.

During the ESIA study, it was observed that 95% of the PAPs in the project area use pit latrines as the system for disposal of ablution waste.

3.3.4.8 Infrastructure

The county has a road network which is mainly gravel and earth surface. A small portion of the road network is made of bitumen. The total number of kilometers of road network in the county is 2,041 Kms out of which 237 Kms is under bitumen or is in the process of being upgraded to bitumen status and 1,804 Kms is under gravel and earth surface. The bitumen surface is only 11.6 per cent of the total road network in the County. The county has 69 Kms of class B6 road (A1 Kisii-Keroka-Sotik-Litein-Chemosit-A12 Kericho) and class B7 road (B6 Kaplong-Bomet-Narok-A8 Mai Mahiu) – Plate 3-10. The two roads are being maintained by Kenya National Highway Authority (KeNHA). Kenya Urban Roads Authority (KURA) and Kenya Rural Roads Authority (KeRRA) are in the process of upgrading some roads to paved status through the low volume seal technology.

Given the heavy rains across the county, road network particularly gravel and earth surface become impassable. There are no major bus and lorry parks existing but there is a modern park for mini-buses and public service vehicles. The Standard Gauge Railway (SGR) has been mapped to pass through the county with the planned terminus at Kapkwen. The county has an air strip located near Bomet town which needs repairs and expansion.



Plate 3-18: Bomet-Kisii main highway

In terms of ICT, the county has 15 main post offices and 12 sub-post offices. In addition, there are other courier services such as Wells Fargo and G4S with offices in Sotik and Bomet. The network coverage by GSM and 4G connectivity is close to 95 per cent of the county. The Wireless, Wi-Max and Wi-Fi are also available in the county.

The proposed transmission line does not traverse any flightpaths, however, before construction KCCA must issue clearance certificates for all tower locations. The main challenge on infrastructure for the proponent during construction will be accessibility as the project is in a rural setting predominantly served by earth – murrum roads. Therefore, the contractor will do feeder access road to tower locations.

3.3.4.9 Energy Access

The main sources of energy (for cooking and lighting) in the county are electricity and wood fuel with approximately 85 per cent of households in the county using wood fuel for cooking compared to 68 percent at the national level. Electricity coverage in the county is at 65 per cent with all the market centres and 85 per cent of learning institutions connected to the national grid as indicated in Figure 3-9. The current electrification level is at 23.6 percent of households and is expected to increase to 70% by the year 2020 through the Last Mile Programme (LMP) connectivity.

The use of solar and solar products has increased over the last five years due to the introduction of tailored solar products such as M-Kopa, D-Light and solar king. Solar Home systems (SHS) usage has also increased due to the current favorable tax regimes.

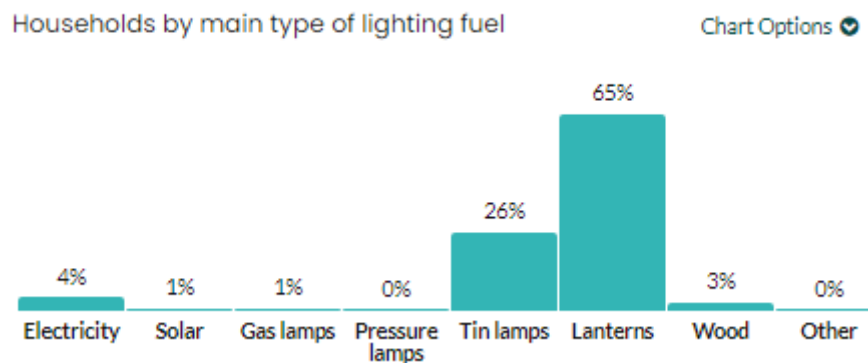


Figure 3-9 Source of lighting fuel in Bomet County

Source: KNBS,2019

Results of the RAP study, 2018 indicate that the main source of energy for lighting is solar for the households as reported by 74.6% of the respondents. This solar energy takes the form of small de-lite lamps as is commonly called in the area which is charged during the day and used at night. Electricity access is very low with only 9.5% of the PAPs while 15% of the PAPs use kerosene lamps for lighting. The main source of energy for cooking for the PAPs is firewood as reported by 87.8% with few PAPs using charcoal 6.8% and gas 5%.

Plate 3-17 shows the sources of energy for lighting utilized by the PAPs

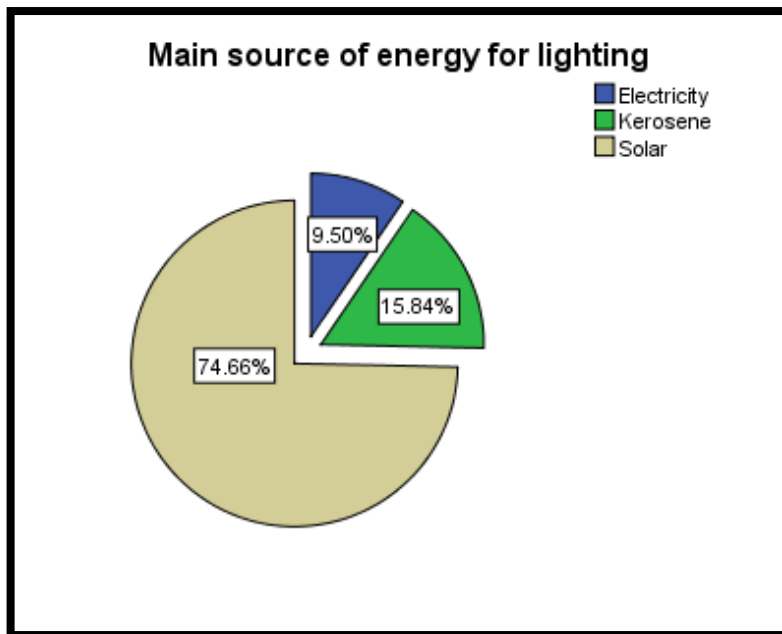


Plate 3-19: Source of energy utilized by PAPs

Source: KPLC RAP, 2018

3.3.4.10 Public Health

In Bomet County, the most common diseases (all ages) include respiratory system, skin diseases, malaria, diarrhoea, eye infections, arthritis, joint pains.

The County has five sub-counties with four tiers of care, including a county referral hospital, which is still a tier four hospital, three sub-county hospitals, 19 health centers, 107 dispensaries and 39 community units. The county also has one outreach support through the Beyond Zero mobile clinic and one community outreach supported by Tenwek Mission Hospital. Health workforce in Bomet County has not met the World Health Organization (WHO) doctor to patient ratio of 36:100,000, however an effort has been made by the county government to bridge the gap through the employment of more doctors. The county has 30 medical officers, 315 nurses and 527 technical officers.

There are two major hospitals in the project area of influence: Bomet Referral hospital (public) and Tenwek Mission Hospital (private) and r various smaller health facilities in urban centers.

3.3.4.11 Contagious Diseases (HIV/AIDS)

HIV/ AIDS is regarded as a national disaster and has negatively impacted on economic growth due to the reduced availability of human capital which is critical in economic growth and development.

The HIV prevalence in Bomet County stands at 5.8% compared to National level of 5.6%. There are 27,989 persons living with HIV while 46% of residents have not tested for HIV. *The project will take precautions not to exacerbate the situation including provision of VCT services and ccondoms to workers.*

Table 3-14 shows the HIV/AIDS prevalence rates in the county.

Table 3-14: HIV/AIDS prevalence rates in Bomet County

Particulars	Number/percentage
Total Population projection (2015)	824,347
HIV adult prevalence (overall)	5.8%
HIV Prevalence among women	8.2%
HIV Prevalence among men	4.9%
Number of adults living with HIV	24,400
Number of children living with HIV	3,589
Total number of people living with HIV	27,989
Percentage of people never tested for HIV by 2009	46%
Percentage of HIV-positive pregnant women who do not deliver in a health facility	84%
% HIV + pregnant mothers receiving preventive ARV's in the county	98.7%
Number of eligible HIV clients on ARV's in the county	11,212

Source: CIDP, Bomet County (2018 – 2022)

3.3.4.12 Education & Literacy levels

The National Education Sector Plan (NESP) captures the spirit of the Constitution of Kenya 2010 in which Articles 43 and 53 provide for education as a basic human right and guaranteed free and compulsory basic (pre-primary, primary and secondary) education to every eligible child.

Bomet county has 1,221 public Early Childhood Development Education Centers (ECDE) with 2,022 teachers employed by both the county government and School Boards of Management (BOMs). The private centers have 424 teachers and 350 centers managed by individuals' proprietors and faith-based organizations (FBOs). The enrolment as per the current statistics is 53,727 children in public centers and 12,981 children in private ECDE centers. Teacher-pupil ratio stands currently at 1:58 in public and 1:27 in the private centers. The transition and completion rates are at 89% and 95% respectively while retention rate stands at 80%.

The free primary education policy has substantially increased school enrollment rates. The success and sustainability depend on teachers' perception, motivation, and proper implementation of the policy in the classroom. As at 2007 and 2019 population and housing census, primary enrolment was 116,868 and 234,857 in Bomet county. There has been a growth in primary education enrolment.

According to Kenya National Survey for Persons with Disabilities (2008), approximately 1.2 million children in Kenya live with disability and 30% of this population cannot access education. Such exclusion from education further perpetuates the cycle of poverty and disability. In Bomet county special needs education is provided in special schools, integrated units and in inclusive settings in regular schools. St. Kizito Secondary School and Ndanai primary small home for physically impaired children have operational special needs facilities ranging from classrooms, resource room and dormitories. Establishment and operationalization of special needs facilities is ongoing in 3 special units in regular schools.

Secondary education in Bomet county has been through enormous growth and transformation in terms of quality. As of 2017 the county boasted of 271 secondary institutions with a population of 123,425 students compared to 52,251 in 2014.

The county government inherited 17 Vocational Training Centers (VTCs) from the national government which increased to 30 as of 2017. The enrollment increased over the years to 1,872 trainees. The VTCs are distributed

across the 5 sub counties i.e. Sotik has 8, Bomet East 4, Bomet Central 5, Cheplaungu 5 and Konoin 8. There are a total of 195 instructors in all the VTCs. The transition rate stands at 55 percent with completion rate at 65 percent. The retention rate is at 50 percent.

Some of the secondary schools within the project area of influence include Longisa Boys, Longisa mixed day, Kapkimolwa, Kyogong, Kongótik, Kakimirai, Saint Michaels and Itembe. The primary schools in the project area include Lekimbo, Kyogong, Jeremiah Memorial Christian Academy, Kapkimolwa, Kiptulwa, Kakimirai and Itembe.

The RAP survey results indicate that the education level among the heads of households in the project area is low. Almost half 44% had attained primary level education in various classes and a good number did not complete primary education. Those who have not been to any formal education institution accounted for 27% while 19% had attained secondary education with only 8.6% having gone through tertiary education. This shows that the level of education and much needed skills for formal employment in the project area is low.

3.3.4.13 Indigenous people and Vulnerable communities

The Luhya and Luo communities form the minority communities, and they live in isolation such as tea plantations mainly in Kitala location. The Ogiek form the minority and marginalized community and they live in pasture lands of areas like Kitala, Embomos, Kivimose, Chebugen, Bosto and Siomo locations, thus they have minimal interactions with the dominant communities.

Physical disability is the highest type of disability representing 43.5% followed by intellectually challenged at 11.8% while multiple forms of disability represent 6.8%. The visually impaired (low and totally blind) represent 8.2% while those with hearing impairment (including low hearing) represent 5.3%. Mental impairment includes those who are mentally challenged and those who are totally mad and they represent 8.8% of the total disabilities. More male (52.7 per cent) than female (47.3 per cent) experience physical disabilities while epileptics cases represent 6.1% and albinisms were less than 1%.

The population for those aged 65 years and above in 2009 was 22,792 persons. This aged population is projected to increase to 32,375 in 2022.

The vulnerable households were identified during the RAP study and are as outlined in table *Table 3-15*

Table 3-15: Vulnerable households in Bomet County

Vulnerable households	No of households affected
Women headed households	106
Elderly (65 years and above) both men and women	71
Children	1-was under care of guardians
Household with a person with special needs	24

Source: KPLC RAP, 2018.

3.3.4.14 Poverty, Gender and GBV

Poverty

The poverty rate in Bomet county stood at 32.8% as of 2016. In 2017, 48.8% of individuals were facing absolute poverty, 32.8% faced food poverty while 6.1% faced hardcore poverty. 47.9% of females and 49.7 percent of males faced absolute poverty.

The poverty line is a threshold below which people are deemed poor. Nationally, 45.2 percent of the population in general, and 50.5 percent in rural areas lives below the poverty line. In Bomet, the proportion of individuals below the poverty line stands higher at 51.3 percent respectively (KNBS and SID 2013). This calls for projects to increase household incomes and reduce poverty.

Gender and Gender Based Violence (GBV)

The guidelines provided in the Bomet County Gender blueprint provide guidance for Bomet County staff and partners on how to mainstream gender issues as part of the County's commitment to achieving gender equality and women's empowerment. It is important to incorporate gender in every aspect of the County processes such as procurement, employment, representation, and decision making at all levels to ensure equality, equity, inclusion, and non-discrimination, access to relevant holistic information and sustained quality.

The Gender Inequality Index (GII) reflects gender-based disadvantage in three dimensions, reproductive health, empowerment, and the labour market. The index shows the loss in potential human development due to inequality between female and male achievements in these dimensions. It varies between 0 when women and men fairs equally and 1, where one gender fairs poorly as possible in all measured dimensions. Kenya has an overall GII of 0.55 (<http://hdr.undp.org/>). This is, however, not equal everywhere as there are regional disparities with counties located in Arid and Semi Arid Lands (ASALs) having high Gender Inequality Indices.

Bomet has a gender inequality index of 0.62 against a national average of 0.55. This shows loss in potential human development due to inequality between female and male achievements. Improving equity in gender issues and reducing gender disparities will benefit all sectors and thus contribute to sustainable economic growth, poverty reduction and social injustices.

There was a total of 115 reported gender sexual based violence cases compared to 66 in 2016 in Bomet County according to Demographic Health Survey 2015. The most affected age group is between 18-49 years which comprises of the most economically productive members.

CHAPTER 4. RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Introduction

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Among the environmental problems are: loss of biodiversity and habitat, land degradation, land use conflicts, human animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment. In response the government through its various agencies have developed various statutes in a bid to avert environmental damage and promote sustainability. Most of the statutes are sector specific, covering issues such as land use, occupational health and safety, biodiversity protection, water quality, wildlife, public health, soil erosion, air quality among others. This section therefore presents the relevant national policy and legal framework relevant to this project. It also analyses international frameworks such as the AfDB environmental and social policies applicable to this project.

4.2 Environmental and Social Policy Framework

4.2.1 National Environment Policy, 2013

The Kenya government formulated a national Environmental policy in 2013 whose goal is better quality of life for present and future generations through sustainable management and use of the environment and natural resources. According to the said policy, Kenya has a wide variety of ecosystems namely mountains, forests, arid and semi-arid areas (ASALs), freshwater, wetlands, coastal and marine all offering many opportunities for sustainable human, social and economic development. These ecosystems are natural capitals which provide important services such as; regulatory services, provision services, cultural services and supporting services implying that the survival and socio-economic wellbeing of Kenyans is ultimately intertwined with the environment.

The policy comes in handy as it provides a framework to guide the country's efforts in addressing the ever-growing environmental issues and challenges such as: Environmental governance, Loss of biodiversity, valuation of environmental and natural resources, rehabilitation and restoration of environmentally degraded areas, urbanization, waste management and pollution, climate change, energy, security and disaster management, public participation, environmental education and awareness, data and information, poverty, chemicals management

One of the principles of the policy which this project must adhere to is that the right to development should be exercised taking into consideration sustainability, resource efficiency and economic, social, and environmental needs.

4.2.2 National Policy on Water Resources Management and Development - Sessional Paper Number 1 of 1999

This Sessional Paper aims at achieving sustainable development and management of the water sector by providing a framework in which the desired targets/goals are set, outlining the necessary measures to guide the entire range of actions and to synchronize all water related activities and actors. It underscores the principle and recognition of the fact that the private sector offers invaluable potential, which has not been fully harnessed to contribute to sustainable development of the water sector. The basic areas the Paper has addressed itself to include water resources management, water supply and sewerage development, institutional arrangement, and financing of the water sector. The following four specific policy objectives covering the four basic areas have been set to guide the sector activities in addressing the challenges in the sector: -

- (i) Preserve, conserve, and protect available water resources and allocate it in a sustainable, rational, and economical way.
- (ii) Supply water of good quality and in sufficient quantities to meet the various water needs, including poverty alleviation, while ensuring safe disposal of wastewater and environmental protection.
- (iii) Establish an efficient and effective institutional framework to achieve a systematic development and management of the water sector.
- (iv) Develop a sound and sustainable financing system for effective water resources management, water supply and sanitation development.

The proposed Narok-Bomet 132kV will refer to provisions in this policy for sustainable water resource management. KETRACO will ensure preservation, conservation, and protection of all existing water resources within the area of traverse. Monitoring and Evaluation will be done periodically to ensure this is adhered to.

4.2.3 The National Land Use Policy (NLUP) - Sessional Paper, No. 1 of 2017 2012

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

The Policy is cognizant of numerous factors that affect land use in Kenya which include geographic and ecological features, population distribution, social, historical, cultural, and economic factors. Other key factors are administrative, institutional and policy instruments, investment, urbanization, and land tenure.

Transport and infrastructure is recognized as one of the land use policy themes, recognizing the need to continuously develop and upgrade transport infrastructure in the country taking into account current and emerging trends in transportation. The resultant land use conflicts, land acquisition and environmental safety during the development and upgrading process calls for intervention through this Policy. Further the policy recognizes that most of the human settlement areas are not adequately provided with infrastructure such as safe water, sanitation, drainage, solid waste disposal services, security, recreation, education, and health facilities.

To address, emerging land acquisition and need for prudent land use, the project will acquire only what is needed for the development of the transmission line, minimizing impact to the extent possible. Further this project is in line with the policy which requires the need for development that takes into cognizance the provision of basic infrastructure and services.

4.2.4 The National Occupational Safety and Health Policy, 2012

The National Occupational Safety and Health Policy addresses the current challenges, gaps and future development of safety and health systems and programmes in the country. It is expected to promote basic principles of assessing occupational risks and/or hazards; combating hazards at source; and developing a national preventative safety and health culture that includes information, consultation, research, and training.

The Policy applies to all workplaces in all sectors of the economy and all forms of work guided by the existing laws on Occupational Safety and Health (OSH), Work Injury Benefits and other relevant regional and International Labour Standards without any exemption. The focus is prevention and control of work-related accidents and diseases, compensation and rehabilitation of workers injured in the course of work and those who contract occupational diseases.

There are anticipated hazards and risks during project implementation. KETRACO will ensure all construction works will adhere to the guidelines set out as well as implementing all mitigation plans in the Act to ensure there is no lost time injury or property damage throughout the project cycle.

4.2.5 National Gender and Development Policy, 2019

Despite a progressive Constitution that promotes gender equality and women's empowerment, gender inequality remains a key issue of concern in Kenya. The patriarchal social order supported by statutory, religious, and customary laws and practices; and the administrative and procedural mechanisms for accessing rights have continued to hamper the goal of attaining gender equality and women's empowerment. Progressive provisions in law have not delivered gender equality in practice raising the need to develop a policy that addresses the variety of manifestations of gender discrimination and inequality

A review of the National Policy on Gender and Development of 2000 was undertaken to align it to the new legal framework including the Constitution of Kenya. This Policy aims at achieving equality of opportunity and outcomes with respect to access to and control of national and county resources and services; and equality of treatment that meets the specific and distinct needs of different categories of women and men.

The development of this policy is influenced by international and national instruments for GEWE- (Gender Equality and Women's Empowerment) that emphasize gender mainstreaming as the key strategy for the achieving development. It is also informed by the constitutional dispensation and transformation, the socio-economic environment, and other national orientations.

All activities in the proposed project have envisaged the recommendations of this policy. There will be adequate supervision by Proponent to ensure no gender related violations are encountered during construction and operation, and that both genders are provided with equal opportunities to be engaged by the project e.g. through employment.

4.2.6 National policy for prevention and response to gender-based violence, 2014

Gender-Based Violence (GBV) occurs across all socio-economic and cultural backgrounds, and in many societies across the world. GBV is a symptom of underlying gender inequalities and power imbalances that transcend the bounds of geography, race, culture, class, and religion, touching virtually every community. It is often condoned by customs and reinforced by institutions. The Government recognizes that sustainable development cannot be achieved in an environment where gender-based violence is a daily occurrence.

The overall Goal of this National Policy is to accelerate efforts towards the elimination of all forms of GBV in Kenya. The forms of GBV are sexual violence, physical violence, emotional and psychological violence, harmful traditional practices, trafficking in persons and socio-economic violence. Each of the GBV forms has manifestations in several types.

The proponent will develop protocols to ensure compliance with GBV during the project life cycle. These will include a GBV specific grievance mechanism.

4.2.7 Kenya National Youth Policy 2006

The National Youth Policy comes in the face of a myriad of challenges facing the youth in Kenya. Although the number of organizations dealing with young people has increased over the years, the previous lack of a comprehensive policy makes it difficult for these groups to effectively address these challenges.

Kenyans in the age bracket 1- 30 years constitute 75% of the country's population, forming the largest source of human resource. However, they have remained on the periphery of the country's affairs and their status has not been accorded due recognition. They have been excluded from designing, planning, and implementing programmes and policies that affect them

The National Youth Policy recognizes that the youth are a key resource that can be tapped for the benefit of the whole country. Thus, the policy endeavors to address issues affecting young people by including broad-based strategies that would provide the youth meaningful opportunities to realize their potential. The policy provides a broad framework within which all stakeholders, including the private and civil society, will contribute to youth development. An implementation mechanism is inbuilt in the policy

The policy will guide the proponent and the contractor to ensure the pertinent youth issues on the ground especially equitable access to employment opportunities are adhered to during the project implementation.

4.2.8 National Energy Policy, 2018

The level and the intensity of energy use in a country is a key indicator of economic growth and development. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social economic pillar. Sustainable, affordable, and reliable energy for all citizens is a key factor in realization of the Vision. The overall objective of the energy policy is to ensure affordable, sustainable, adequate, competitive, secure, and reliable supply of energy at the least cost geared to meet national and county needs while protecting and conserving the environment. Specifically, these objectives are:

- Utilize energy as a tool to accelerate economic empowerment for the National and County Governments as well as urban and rural development.
- Improve access to affordable, competitive, and reliable energy services.
- Provide an environment conducive for the development and provision of energy services
- Prioritize and promote development of indigenous primary and secondary energy resources.
- Prioritize and promote the development of local technologies in energy development and delivery.
- Promote energy efficiency and conservation.
- Ensure that prudent environmental, social, health and safety considerations, as well as issues of climate change are factored in energy and petroleum sector developments.
- Foster international co-operation in energy trade, investments, and development.
- Promote and develop government owned agencies in the development of energy resources.

The proposed project has been designed to be in line in line with the principles of the energy policy in ensuring access to clean energy for all and KETRACO will ensure prudent environmental, social, health and safety considerations are factored in the development

4.2.9 National Forest Policy,2014

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. The Policy aim to enhance management of forest resources for conservation of soil, water biodiversity and environmental stability

The project does not traverse through any protected forest. The critical forest in the area is the Mau Forest which is approximately 12km off the transmission line route.

4.2.10 Kenya National Water Policy,2012

- The Policy is built on the premises of Integrated Water Resources Management (IWRM). The Policy aims at guiding the development of strategies for water management and utilization by water sector stakeholders.

- This policy recognizes the great expectation of population regarding access to freshwater supplies and use for domestic, livestock, agriculture, and other production purposes. The policy is compliant with Kenya 2010 and the Vision 2030 besides considering the targets of Sustainable Development Goals (SDGs).

The project proponent commits to ensure adequate protection of water resources such as Mara and Nyongores rivers for equal population access. Destruction of riparian vegetation will be minimized by designing the line to avoid running along rivers.

4.3 Institutional, regulatory and Legal Framework

The multi-faceted nature of the environment and the need to integrate environmental and social considerations in all development planning and activities calls for an analysis and reference to various legal and regulatory frameworks as outlined below.

4.3.1 The Constitution of Kenya, 2010:

The Constitution of Kenya promulgated in 2010 is the supreme law of the republic and binds all persons and all State organs at all levels of government. The Constitution provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn.

In relation to the environment, article 42 of chapter four, *The Bill of Rights*, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70. Chapter 5 of the document provides the main pillars on which the 77 environmental statutes are hinged.

Part 1 of the chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. Of core importance is the definition of private land as land within the project area is largely privately owned. The second part of this chapter directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment, thus;

"The state shall-

- *Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits.*
- *Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya.*
- *Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.*
- *Encourage public participation in the management, protection, and conservation of the environment.*
- *Protect genetic resources and biological diversity.*
- *Establish systems of environmental impact assessment, environmental audit, and monitoring of the environment.*
- *Eliminate processes and activities that are likely to endanger the environment; and*
- *Utilize the environment and natural resources for the benefit of the people of Kenya."*

There are further provisions on enforcement of environmental rights as well as establishment of legislation relating to the environment in accordance to the guidelines provided in this chapter.

In conformity with the Constitution of Kenya, 2010, KETRACO will ensure that the project is undertaken in an environmentally sound manner thus safeguarding the right of every individual to a clean and healthy environment through examination of various risks to the environment and people and proposing mitigation measures as outlined in the ESMP contained in this document.

4.3.2 The Environment Management and Co-ordination (Amendment) Act 1999

In Kenya, The Environmental Management and Co-ordination Act, No.8 of 1999 amended in 2015 and 2019 provides for the establishment of an appropriate legal and institutional framework for the management of the environment and associated matters.

This is an Act that provides for the establishment of an appropriate legal and institutional framework for the management of the environment and associated matters. Part II of the Environment Management & Coordination Act, 2016 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. To partly ensure this is achieved, Part VI of the Act directs that any new programme, activity, or operation should undergo an integrated environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate. Part VII in the same spirit calls for Environmental Audit and Monitoring to ascertain Environmental Quality are achieved as required in Part VIII of the act.

Further, EMCA mandates the National Environmental Management Authority (NEMA) to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment.

In Kenya, the Environmental Management and Coordination Amendment Act (EMCA) of 2019 is the main legislation that deals with ESIA studies. EMCA established various administrative bodies to deal with various issues. These include among others: National Environment Council (NEC) – Is the apex body which among other things is charged with the responsibility of developing the national environmental policy in Kenya and setting annual environmental goals and standards. Other institutions include The National Environmental Management Authority (NEMA) – National Environmental Complaints Committee, county environment committees and Standards and Enforcement Review Committee (SERC among others).

a) National Environment Management Authority (NEMA)

The objective and purpose for which NEMA was established is to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. However, NEMA's mandate is designated to the following committees:

b) County Environment Committees

According to EMCA (Amendment), 2015, every governor shall, by notice in the Gazette, constitute a County Environment Committee (CEC) of the County. The County Environment Committees are responsible for the proper management of the environment, development of county strategic environmental action plan, every five years including implementation of the plans among others.

c) National Environmental Complaints Committee

The Committee performs the following functions:

- 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 Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and exercise such powers as may be assigned to it by the Council.

d) National Environment Action Plan Committee

This Committee is responsible for the development of a 5-year Environment Action Plan among other things. The National Environment Action Plan shall:

- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.

- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.
- Set out operational guidelines for the planning and management of the environment and natural resources.
- Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist.
- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts.
- Propose guidelines for the integration of standards of environmental protection into development planning and management.
- Identify and recommend policy and legislative approaches for preventing, controlling, or mitigating specific as well as general diverse impacts on the environment.
- Prioritize areas of environmental research and outline methods of using such research findings.
- prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities.
- Be binding on all persons and all government departments, agencies, States Corporation, or other organ of government upon adoption by the national assembly.

e) Standards and Enforcement Review Committee

This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

f) National Environment Tribunal

This tribunal guides the handling of causes related to environmental offences in the Republic of Kenya.

g) National Environment Council (NEC)

EMCA 1999 No. 8 part III section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organizations, and such other organizations engaged in environmental protection programmes.

The Act has subsidiary regulations dealing with specific environmental issues/concerns. The regulations which are key to this project include.

- Impact assessment and audit regulations
- Water quality regulations
- Air quality standards
- Regulations for waste Management
- Regulations of toxic and hazardous materials
- Regulations of pesticides and toxic substances
- Regulations for noise
- Wetlands, Riverbanks, Lake Shores, and Sea Shore Management) Regulations
- Conservation of biological diversity
- Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations

4.3.3 EMCA Regulations

Under EMCA 1999, 2015 NEMA has developed regulations to establish guidelines for better management of the environment and promote sustainable development. To date, the regulations presented in the following sections have been gazetted. According to section 53 of EMCA, the proponent of a project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report to NEMA for approval before construction. The Environmental impact assessment shall be conducted in accordance with the environmental impact assessment regulations, guidelines and procedures issued under EMCA.

a) Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101

The Environmental Impact Assessment regulations require that a study be conducted in accordance with the issues and general guidelines spelt out in the Second and Third schedules of the Environmental Regulations (2003) amended in 2019 through legal notice 32. These include coverage of the issues on Schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on Schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures).

Further, the regulations state in Part 2 that an Environmental Impact Assessment study shall be conducted in accordance with the terms of reference developed. This section considers environmental, social, cultural, economic, and legal considerations, and shall specify:

- The nature of the project
- The location of the project including:
 - Proof of land ownership where applicable
 - The environmentally sensitive areas to be affected
 - Availability of supportive environmental management infrastructure
 - Conformity to land use plan and zonation plan
- Potential environmental impacts of the project and the mitigation measures to be taken during and after implementation of the project

The Proposed transmission line falls under the high-risk projects that should be subjected to ESIA according to the second schedule of EMCA 2019. The proponent has commissioned the Environmental Impact Assessment study in compliance with the Act and the subsequent regulations. The proponent has commissioned an Comprehensive Project Report (CPR) study for approval by NEMA prior to the construction of the proposed transmission line.

b) Environmental Management and Coordination (Water Quality) Regulation 2006

These regulations are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 74, September 2006. The regulation applies to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- Protection of sources of water for domestic use.
- Water for industrial use and effluent discharge.
- Water for agricultural use.

The regulations outline:

- Quality standards for various sources of domestic water.
- Quality monitoring for sources of domestic water.
- Standards for effluent discharge into the environment.
- Monitoring guide for discharge into the environment.
- Standards for effluent discharge into public sewers.

- Monitoring for discharge of treated effluent into the environment.

This Legal Notice on Water Quality provides that; every person shall refrain from any act which directly or indirectly causes or may cause immediate or subsequent water pollution, no person shall throw or cause to flow into or near a water resource any liquid solid or gaseous substance or deposit such substance in or near it as to cause pollution.

The project will adhere to this requirement by not disposing any waste into any water resources and will adhere to mitigation measures in ESMP for protection of water resources across the project phases. Such as ensuring water quality tests are done periodically for domestic water and having a licenced wastewater handler to dispose any wastewater as per NEMA requirements

c) **Environmental Management and Coordination (Waste Management) Regulation 2006**

These regulations are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69, September 2006. According to the regulation.

- no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.
- Any person whose activities generate waste shall collect, segregate, and dispose or cause to be disposed of such waste in the manner provided for under the Regulations.
- Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility.

These Regulations apply to all categories of waste as provided in the regulations. These include:

- Industrial wastes.
- Hazardous and toxic wastes.
- Pesticides and toxic substances.
- Biomedical wastes
- Radio-active substances.

These Regulations outline requirements for handling, storing, transporting, and treatment/disposal of all waste categories as provided therein.

The regulation provides that a waste generator shall use cleaner production methods, segregate waste generated, and the waste transporter should be licensed. The notice further states no person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by the National Environment Management Authority.

This subsidiary regulation will guide KETRACO in managing any hazardous material or waste. The project will not generate any hazardous substances directly into the environment. Any Hazardous substances encountered will further be handled, managed and disposed as per conditions set out. The Contractor MUST have a licenced hazardous waste handler to execute disposal.

d) **Environmental Management and Coordination, (Conservation of Biological Diversity) (BD) Regulations 2006**

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84, December 2006. These regulations apply to conservation of biodiversity which includes conservation of threatened species, inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties.

Additionally, these links provide for the local enforcement of the International Convention on Biological Diversity (CBD).

The proposed project will impact biodiversity through minimal vegetation clearance of the proposed route of the transmission line. As a control, outlined in the ESMP, the proponent will ensure conservation and protection of sensitive species by applying measures set out in the regulation including avoidance of sensitive protected areas. rehabilitation will also be done in any damaged ecosystem.

e) Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74, October 2006. These regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnership to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

This legislation gives caution to proponent and contractor on careless handling of fuels and possible consequences for failing to observe the set regulations. Any contractor under KETRACO handling fossil fuels must be licensed and adhere to the conditions therein.

f) Environmental Management and Coordination, (Wetlands, Riverbanks, Lake Shores, and Sea Shore Management) Regulations 2009

These regulations are described in Legal Notice No. 19 of the Kenya Gazette Supplement No. 9, February 2009. These regulations include management of wetlands, wetland resources, riverbanks, lake shores and seashores. Specific sections have requirements that apply to wetlands in Kenya either in private or public land.

The proposed project will not be carried out in a wetland and the design has ensured that the towers will not be sited at riverbanks.

g) Environmental Management and Coordination, (Noise and Excessive Vibration 4.3.10 Pollution) Regulations 2009

These regulations are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 21, May 2009. This regulation prohibits any person from making or causing to be made any loud, unreasonable, unnecessary, or unusual noise which annoys, disturbs, injures, or endangers the comfort, repose, health or safety of others and the environment. It also prohibits 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 centimeters per second beyond any source property boundary or 30 meters from any moving source.

Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

Rules 5 and 6 of the regulations define noise levels for various types of activities that generate noise. The first schedule to the regulations defines permissible noise levels and is reproduced below.

The regulation in addition specifies that a noise license will be required during the construction and operational phase of a project if such equipment that will produce noise during these two phases will be used.

There contractor under KETRACO will abide by the provisions of the noise regulations. And get all relevant required permits

Table 4-1: Permissible noise levels

ZONE		Sound Level limits(dBA) (leq, 14h)		Noise Rating Level (NR) (leq, 14h)	
		Day	Night	Day	Night
A.	Silent zone	40	35	30	25
B.	Place of worship	40	35	30	25
C.	Residential				
	: indoor	23	35	35	25
	: outdoor	50	35	40	25
D.	Mixed residential (with some commercial and places of entertainment)	40	35	50	25
E.	Commercial	60	35	55	25

This regulation guides on permissible noise levels during construction, operation, and decommissioning phases. The proponent will refer to this regulation to ensure noise levels are within permissible levels. This will include having low noise advanced machines, eliminating blasting and strict supervision of noisy activity.

4.3.4 Public Health Act (Cap. 242)

This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others.

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary, and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases. During the stakeholder engagement along the route of the proposed line public health and social issues were discussed extensively and the environmental social management plan (ESMP) advice all stakeholders on public health issues especially on prevention.

4.3.5 County Government Act, No.17 2012

This Act makes provisions for county governments' powers, functions, and responsibilities to deliver services and for connected purposes. Part VIII of the act on Citizen Participation (87) (b) emphasizes on the right of citizens to participate to any development projects prior to their implementation.

Section 135 (1) states that the Cabinet Secretary may make regulations for the better carrying out of the purposes and provisions of this Act and such Regulations may be made in respect of all county governments and further units of decentralization generally or for any class of county governments and further units of decentralization comply to the set regulations and by laws.

This is the primary law governing the development of counties and thereby is key in implementation of projects at the county level. In line with this act before implementation of projects consultation should be held at various levels including necessary approvals.

Consultations have taken place at various levels (national government level, county level and at the local level with the public) and will continue throughout the project period.

4.3.6 Water Act, 2016

The Act vests the water in the State and gives the provisions for the water management, including irrigation water, pollution, drainage, flood control and abstraction. It is the main legislation governing the use of water especially through permit system.

- The Water Act No. 43 of 2016 repealed the water Act 2002. The enactment of this law aimed at aligning national water management and water services provision with the requirements of the Constitution of Kenya 2010 particularly on the clauses devolving water and sanitation services to the county governments.
- The act highlights regulation of Water Rights and Works with Section of 36 of the act requiring a water permit be obtained for any use of water from a water resource, except as provided by section 37;
- Section 40 stipulates procedures for obtaining a water permit including subject of public consultation and, where applicable, of environmental impact assessment in accordance with the requirements of the Environmental Management and Coordination Act, 1999 (No. 8 of 1999).
- Section 55 highlights abstraction of ground water. The Fourth Schedule has effect with respect to the abstraction of ground water and respective works including application for a permit.
- Consequently, the new law retained some and established other new institutional arrangements including.
 - Ministry of Water and Irrigation as the sector coordinator,
 - Water Services Regulatory Board (WASREB) for regulation of water services' providers,
 - Water Resources Regulatory Authority (WRA formerly WRMA) for water resource use regulation,
 - National Water Harvesting and Storage Authority for major water infrastructural development,
 - Water Tribunal for dispute resolution,
 - Water Sector Trust Fund for water services development towards the un-served and poor segments of the society in peri-urban and rural areas,
 - Water Works Development Agencies to replace the Water Service Boards, and
 - Basin Water Resources Committees to replace Catchment Advisory Committees (CAACs)

The Act vests provision of water and sanitation services with the county governments through Water Services Providers (WSPs) whose operations must be in accordance with a Service Agreement entered between each WSP and WASREB. During the entire project lifecycle, regulations, and guidelines as per the Water Act provision will be considered.

All aspects applicable will be put in use. For water resource use especially abstraction, relevant permits will be acquired by Contractor All construction, operation and decommissioning phases will take caution to contain oil spills to prevent soil and water pollution. Additional quality checks must be done periodically to ensure the quality is within parameters. Also, water conservation strategies will be applicable e.g., recycling.

4.3.7 Energy Act of 2019

This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes.

- The energy Act aims to consolidate the laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery and commercial utilization of geothermal energy; regulation of midstream and downstream petroleum and coal activities; regulation, production, supply and use of electricity and other energy forms; and for connected purposes
- The Act establishes the Energy and Petroleum Regulatory Authority to ensure generation, importation, exportation, transmission, distribution, supply, and use of electrical energy except for licensing of nuclear facilities.
- Article 177 of the Act gives liability to the transmission licensee to make compensation to the owner or occupier of any land or the agents, workmen or servants of the owner or occupier of any land which is the subject of the provisions of this Act, for damage or loss caused by the exercise or use of any power or authority conferred by this Act or by any irregularity, trespass or other wrongful proceeding in the execution of this Act or by the loss or damage or breaking of any energy infrastructure or by reason of any defect in such infrastructure.
- Article 178 of the act gives provisions for installation of energy infrastructure along roads, and railways, government property, including forests, National parks, reserves, and heritage sites, for the purpose of the production, conveyance, and supply of energy.
- Article 179, gives the Cabinet Secretary compulsory acquisition of land for purposes of constructing, modifying, or operating any energy infrastructure or for incidental purposes where reasonable attempts to acquire the land had failed.
- Article 193, gives the County Governments power to ensure efficient use of energy and its conservation

The project proponent i.e KETRACO will be guided by this act in design and implementation of the proposed project

4.3.8 The Standards Act Cap 496

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

The proponent will ensure that commodities and codes of practice utilized in the proposed project adhere to the provisions of this Act.

All materials and spares used to construct the substation will comply with the standardized specifications and certification. The Quality control team will be required to do the statutory standards checks of all materials, equipment, technology, and procedure throughout the project including the contract award and procurement stage

4.3.9 Penal Code Act (Cap.63)

Section 191 of the penal code 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, dwelling or business premises in the neighborhood or those passing along public way, commits 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. All resources within project area will be protected through implementation of all set out Environmental and social Monitoring plan e.g., having spill containment bunds for any liquid waste generated and disposing as per NEMA regulations.

4.3.10 The Wildlife Conservation and Management Act, 2013

The Wildlife Conservation and Management Act 2013 became operational in January 2014. An Act sought to consolidate and amend the law relating to the protection, conservation, and management of wildlife in Kenya and for purposes connected therewith and incidental thereto.

The new law has one of its guiding principles the devolution of conservation and management of wildlife to landowners and managers in areas where wildlife occurs, through in particular the recognition of wildlife conservation as a form of land use, better access to benefits from wildlife conservation, and adherence to the principles of sustainable utilization.

Wildlife Conservancies are now recognized under the Law as 'land set aside by an individual landowner, body corporate, group of owners or a community for purposes of wildlife conservation'. Wildlife conservation and management is recognized as a form of land use that has equal recognition with other land use types such as agriculture.

The Transmission line has avoided crossing in the sensitive ecosystems i.e. Maasai Mara National Reserve and Private Ranches. However, consultations with relevant lead agencies e.g KWS will be done to ensure any flora and fauna in the dispersal areas is conserved.

4.3.11 The Forest Conservation and Management Act, 2016

The Act led to the establishment of Kenya Forest Service which is charged with management of forests in consultation with the forest owners. The body enforces the conditions and regulations pertaining to logging, charcoal making and other forest utilization activities.

To ensure community participation in forest management, the service collaborates with other organizations and communities in the management and conservation of forests and for the utilization of the biodiversity.

Section 46 (1) The Service shall only give its consent for Consent for quarrying. quarrying operations in a forest area where —

- (a) the area does not contain rare, threatened, or endangered species.
- (b) the forest does not have any cultural importance or contain sacred trees or groves.
- (c) an independent Environmental Impact Assessment or audit has been carried out.
- (d) the forest is not an important catchment area or source of springs.

The proposed project does not traverse through any gazetted forest nor any conservation area hence the Act will not be triggered but the proponent will minimize clearance of vegetation and trees and where unavoidable, the provisions of this act will be observed where applicable.as part of corporate social responsibility, the proponent will ensure reforestation programs are promoted.

4.3.12 Occupational Safety and Health Act, 2007

This is an Act of parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of the Act is to:

- Secure the safety, health, and welfare of persons at work.
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Act provides that before any premises are occupied, or used as a workplace, a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the

health, safety, and welfare for employees at workplaces. This shall be considered at the construction, implementation, and decommissioning phases of the project. The following are other provisions of the Act.

Health

All workplaces must be kept clean; a premise must not be overcrowded. The circulation of fresh air and secure adequate ventilation of workrooms. There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. There should also be sufficient and suitable sanitary conveniences separate for each sex, must be provided subject to conformity with any standards prescribed by rules. Food and drinks should not be partaken in dangerous places or workrooms. Provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving exposure to wet or to any injurious or offensive substances.

Safety

Fencing of premises and dangerous parts of other machinery is mandatory. Training and supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Floors, passages, gangways, stairs, and ladders must be soundly constructed and properly maintained, and handrails must be provided for stairs. Special precaution against gassing is laid down for work in confined spaces where persons can overcome by dangerous fumes. Air receivers and fittings must be of sound construction and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

Welfare

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all female workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting.

Every premise shall be provided with maintenance, readily accessible means for extinguishing fire and person trained in the correct use of such means shall be present during all working periods.

Regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed, and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible, within normal working hours.

The (OSH) Act provides for development and maintenance of an effective program of collection, compilation, and analysis of occupational safety data. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered.

The OSH Act, 2007 will guide the proponent in ensuring the occupational Health and Safety of workers and community PAPs is guaranteed. All control measures will be adhered to including Provision of PPE, and ensure contractor hires an EHS officer to enforce the ESMP provisions on safety on site, including registration of the project site with DOSH. Additionally, there Must be a Safety supervisor to ensure daily operations go on as per OSH Act 2007. For any high risk activity, a permit Must be issued after all checks.

4.3.13 Work Injury and Benefits Act, 2007

This Act provides for compensation to employees for work related injuries and disease contracted during 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 WIBA insurance must be Valid to cover all processes of work and all workers Must be Medically and physically fit. The statutory medical examinations will be carried out by a designated medical practitioner approved by DOSH. A certificate of fitness will be issue and this will also assist in prevention of disease spread on site and any unforeseen injuries or fatalities

The contractor will be required to have a valid WIBA insurance throughout the construction period, In addition, In case of any accidents or incidents during the project cycle, The handling of accidents will be stipulated in the emergency incident procedure plan to be developed by the contractor

4.3.14 The Radiation Protection Act (cap 243), 2014

This is an Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes. Since 1982, Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy, and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243) in November 1984 to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose.

The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed. The Act is administered by the Chief Radiation Protection Officer assisted by a Radiation Protection Board.

The proposed project will not emit/produce ionizing radiations. For any radioactive substance, it must be clearly marked and only handled by authorized personnel. A radiation permit must also be available and storage protocol be followed strictly

4.3.15 The Traffic Act Chapter 295 Laws of Kenya

This Act consolidates the law relating to traffic on all public roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users.

Many types of equipment and materials shall be transported through the roads to the proposed line route. Their registration and licensing will be required to follow the stipulated road regulations.

The Act also prohibits encroachment on and damage to roads including land reserved for roads.

A traffic management plan will be developed by the contractor to ensure strict adherence to the provisions of the Act. Liaison with Local enforcement officers will be done on a regular basis to avoid paralyzing transport by causing traffic snarl ups

4.3.16 The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)

Section 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.

The project design concept has left the required road reserves and relevant road widening surrenders.

This Act consolidates the law relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including land reserved for roads.

The proposed transmission line location complies with the provision of the Act. It is not on road reserve.

4.3.17 The Agriculture Act, Cap 318 of 1980 (revised 1986)

This Act has stated objectives to promote and sustain agricultural production, provide for conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with accepted practices of good land management and good husbandry.

Being a linear project, the proposed project has minimized impact on agricultural land significantly. In addition, after the construction of the proposed line, farming of short crops will continue the way leaves trace. Mitigation on land use are addressed in the ESMP.

4.3.18 National Museums and Heritage Act, 2006

The Act seeks 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 and the National Museums Act.

The Act requires that where a person discovers a monument or object of archaeological or paleontological interest, the person shall, within seven days, give notice thereof, indicating the precise site and circumstances of the discovery, to the National Museums, and in the case of an object, shall deliver the object to the National Museums or to the District Commissioner to keep it for any particular purpose or for any period. Subject to section 27, no person shall move a monument 'Or object of archaeological or paleontological interest from the place where it has been discovered otherwise than in such manner and to such place as may be allowed by an, exploration license, or by written permit from the Minister after consultation with the National Museums."

The project route has been designed deliberately to as no to interfere the cultural heritage and includes objects of archaeological or paleontological interest, objects of historical interest and protected objects. The Act will be triggered as a precaution and due process will be followed in case of chance find of cultural heritage along the proposed route. Chance Find procedures will be developed in this regard.

4.3.19 Land in the Kenyan Constitution 2010

The issue of land has informed major constitutional and administrative changes in the country, and it is this fact that necessitated its inclusion in the Constitution of Kenya (2010) with it being given prominence in an entire chapter.

Article 40 of the constitution is fundamental part of as far as the issue of land ownership is concerned. It guarantees the protection of the right to property; persons are entitled to acquire and own property of any description and in any part of the country¹⁶. It also delimits the powers of the legislature by prohibiting any legislation that would arbitrarily deprive a person of property of any description or of any interest in, or right over, any property of any description or to limit, or in any way restrict the enjoyment of any right under this Article¹⁷ based on any of the grounds specified or contemplated in Article 27 (4)¹⁸. This chapter therefore lays and important foundation for vesting of any rights attached to rights and the enjoyment of any such rights.

Chapter Five of the Constitution specifically addresses the land issue. Article 60 starts by outlining the principle of land policy. These policies are to be implemented by a national land policy that is to be developed and

reviewed regularly by the national government and then through legislation This is reflected in the Ministry of Lands Sessional Paper No. 3 of 2009 on National Land Policy as to the principles that guided the formulation of the Policy document. It should be noted, however, that the land policy document was enacted before the Constitution of Kenya (2010) and thus the guiding principles were included in the Constitution of Kenya (2010) to give them a legal force. Article 61(1) and (2) entrenches the fact that all land in Kenya belong to the people of Kenya and goes further to give a classification of Land as public, community and private. Public land under Article 62 is defined to include those from sub-Article (a) to (n). Both the Land Act and the Land Registration Act refers to the definition given under the Constitution of Kenya (2010) to be the one to apply in each of the respective statutes. Public land is to be vested in the County Government and to be administered by the National Land Commission. It shall not be disposed off except in an Act of Parliament. Such disposition can be done through conversion where public land can be converted to private land by alienation, for instance. The Act of Parliament mentioned in the Constitution of Kenya (2010) is seen to be the Land Act. Community Land as defined in Article 63(2) of the Constitution of Kenya (2010) cuts across the four legislations as the definition given the Constitution of Kenya (2010) is standard. It is therefore noteworthy that all the three land laws do not address the Community Land in depth for the Constitution provides that that Parliament shall enact legislation to give effect to the provision on community land which has not yet been fulfilled. The lacuna in this legislation may end up paralyzing any transactions concerning this though. Private land, defined under Article 64 of the Constitution of Kenya (2010), forms the bulk of most of the legislations on land and the administration and registration is by far the most addressed in each of them. The constitution 2010 has categorized land into three namely:

Public land

This is created under Article 62 of the constitution. Public land includes land previously held under the Government Lands Act; government forests, all minerals, lands transferred to the state by way of sale, reversion or surrender, land that is without claimants, continental shelf, and exclusive economic zones inter alia.

Section 42 of the Land Act gives the National Land Commission powers to on behalf of National and County governments allocate public by way of: public auction to the highest bidder, public notice of tenders, application confined to a targeted group of persons or groups, public drawing of lots, public requests for proposals, public exchanges of equal value.

Private Land

Established under Article 64. This includes any land that is vested in a natural or artificial person, and any other land declared through an Act of Parliament. However, the constitution limits the extent of landholding by non-citizens, including corporation. Non-citizens are barred from owning freehold land and can only own leasehold land with a maximum term of 99 years. The Constitution 2010 has emphatically stated that: freehold land cannot be owned by a non- citizen of Kenya; and a leasehold interest of over 99 years cannot be held by a non-Kenyan citizen. Thus, any freehold land owned by a non-Kenyan citizen is converted into a 99 year leasehold interest commencing from 27/8/2010 and any leasehold interest with an unexpired term of over 99 years is deemed to be converted into a 99 year leasehold interest commencing from 27/8/2010. However, no procedure is in place for conversion of freehold title to leasehold so, for example, if prior to the coming into effect of the new Constitution a non-Kenyan citizen owned freehold land and you conduct a land registry search today the result will still show the non-Kenyan citizen as owning the land on freehold tenure. The Constitution deems a body corporate/company is to be a Kenyan citizen only if it is fully owned by Kenyan citizens. Section 13(1) of the Land Act states: "Where any land reverts to the national or county government after expiry of the leasehold tenure the Commission shall offer to the immediate past holder of the leasehold interest pre-emptive rights to allocation of the land provided that such lessee is a Kenyan citizen and that the land is not required by the national or the county government for public purposes.

Section 12(6) of the Land Act states that on expiry or extinction of a lease granted to a non-citizen, reversion of interests or rights in or over land shall vest in the national or county government. Where any land reverts to the national or county governments after the expiry of the leasehold the commission shall offer to the immediate past holder of the leasehold interest.

Community land

Established under Article 63 of the constitution. Community land includes land currently under the Land (Group Representatives) Act; land currently classified as trust lands, community forests, land that is transferred to the community by any process of law, ancestral land and lands traditionally occupied by hunter-gather communities inter alia. Community land is a new category of land explicitly created by new constitution 2010. The term “community” would require a legal definition to allow transfer of land that is currently forest, protected areas or other public land to such communities. Ethnicity may determine the community land; however, Article 27 is prohibiting discrimination on the basis of ethnicity. Ancestral land too is not defined, nevertheless, it may be applied to any group or community which identifies itself as traditionally holding a specific area and which it has legal claim as its own.

The proposed transmission line will require way leaves acquisition from the legal owners of land. The legal process will be followed in conducting land searches to establish the legal owners of land. A RAP has been prepared to ensure due compensation for land to be acquired for the project implementation.

4.3.20 The Land Act 2012 and The Land Laws (Amendment) Act,2016

The guiding values and principles of land management and administration in this section bind all State organs, State officers, public officers, and all persons whenever any of them—

- (a) Enacts, applies, or interprets any provisions of this Act; and
- (b) Makes or implements public policy decisions.

In the discharge of their functions and exercise of their powers under this Act, the Commission and any State officer or public officer shall be guided by the following values and principles—

- a) Equitable access to land; security of land rights.
- b) Security of land rights.
- c) Sustainable and productive management of land resources.
- d) Transparent and cost-effective administration of land.
- e) Conservation and protection of ecologically sensitive areas.
- f) Elimination of gender discrimination in law, customs and practices related to land and property in land.
- g) Encouragement of communities to settle land disputes through recognized local community initiatives.
 - a. participation, accountability, and democratic decision making within communities, the public and the Government.
 - b. technical and financial sustainability.
- h) Affording equal opportunities to members of all ethnic groups.
- i) Non-discrimination and protection of the marginalized; and
- j) Democracy, inclusiveness, and participation of the people; and
- k) Alternative dispute resolution mechanisms in land dispute handling and management.

Section 110(1) of the Act provides that land may be acquired compulsorily under this if the commission certifies, in writing, that the land is required for public purposes, or the public as related to and necessary for fulfillment of the stated public purpose.

In such an acquisition, this Act, in section 111(1) provides that just compensation shall be paid promptly in full to all persons whose interests in the land have been determined.

The project Proponent will observe the provisions of the Act and will make just compensation for land and other properties within the land that will be damaged in the process of wayleave acquisition. A RAP has been prepared to ensure due compensation for land to be acquired for the project implementation.

4.3.21 The land and Environment Court Act 2011

This is an Act of Parliament intended to give effect of article 162(2) b of the constitution; to establish a superior Court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land and to make provision for its Jurisdiction functions and powers, and for connected purposes. The principal objective of this Act is to enable the Court to facilitate the just and expeditious, proportionate, and accessible resolution of disputes governed by this Act,

Section 13(2)(b) of the Act outlines that in exercise of jurisdiction under Article 163(2)(b) of the Constitution, the court shall have power to hear and determine disputes relating to environment and land, including disputes:

- Relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals, and other natural resources.
- Relating to compulsory acquisition of land.
- Relating to land administration and management.
- Relating to Public, Private and community land and contracts, chooses in action or other instruments granting any enforceable interests in land.

The project Proponent will observe the provisions of the Act. All complaints and cases related to land especially on the right of way will be escalated to the tribunal. However, before construction KETRACO will endeavor to ensure the acquired wayleave doesn't raise complaints and litigations

4.3.22 The National Land Commission Act 2012

The preamble to the National Land Commission Act states that the purpose of the Act is to make further provision as to the functions and powers of the National Land Commission, qualifications, and procedures for appointment to the Commission; to give effect to the objects and principles of devolved government in land administration and management, for connected purposes. Section 3 of the Act provides its object and purpose to include; the management and administration of land in accordance with the principles of land policy set out in Article 60 of the Constitution and the national land policy; operations, powers, responsibilities and additional functions of the Commission pursuant to Article 67 (3) of the Constitution; a legal framework for the identification and appointment of the chairperson, members and the secretary of the Commission pursuant to Article 250 (2) and (12) (a) of the Constitution; and for a linkage between the Commission, county governments and other institutions dealing with land and land related resources. Article 8 of the Land Act outlines the roles of the Commission.

One of the functions of the land commission is to manage public land on behalf of the national and county governments. NLC will facilitate KETRACO in acquisition of the wayleave corridor.

4.3.23 Physical and Land use Planning Act,2019

- The Physical and Land Use Planning Act, 2019 provides for the preparation and implementation of physical development plans.
- 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 includes process and

procedures for processing of easements and wayleaves; siting of base transmission station, power generation Plants, etc

- 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.

The proponent and contractors of the proposed transmission line and substation will 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.

4.3.24 Climate Change Act No.11,2016

- The Act 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.
- The Act should be applied for the development, management, implementation, and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya.
- The Act should be applied in all sectors of the economy by the national and county governments to—
 - Mainstream climate change responses into development planning, decision making and implementation.
 - Build resilience and enhance adaptive capacity to the impacts of climate change.
 - Mainstream the principle of sustainable development into the planning for and decision making on climate change response; and
 - Integrate climate change into the exercise of power and functions of all levels of governance, and to enhance cooperative climate

The proposed project will ensure that infrastructure design is climate-proof over its lifespan and undertaken as per provisions of the act specifically on planning and implementation stages.

4.3.25 National Gender and Equality Act,2011

- National Gender Equality Commission is a constitutional Commission established by an Act of Parliament in August 2011, as a successor commission to the Kenya National Human Rights and Equality Commission pursuant to Article 59 of the Constitution.
- NGENC derives its mandate from Articles 27, 43, and Chapter Fifteen of the Constitution; and section 8 of NGENC Act (Cap. 15) of 2011, with the objectives of promoting gender equality and freedom from discrimination.

KETRACO will ensure Gender mainstreaming in projects is done, ensuring that the concerns of women and men form an integral dimension of the project design, implementation, operation and the monitoring and evaluation, that women and men benefit equally, and that inequality is not perpetuated.

4.3.26 Protection of Traditional Knowledge and Cultural Expressions Act, 2016

- The Act of parliament provides a framework for the protection and promotion of traditional knowledge and cultural expressions which gives effect to Articles II, 40 and 69(L) (c) of the Constitution
- The Act requires a person who uses traditional knowledge or cultural expressions beyond its traditional context should indicate source of the knowledge or expression and where possible, the origin of the knowledge or expression, and use such knowledge or expression in a manner that respects the cultural values of the holders.

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- Article 2 of Act requires that traditional knowledge or cultural expressions shall not, without the prior and informed consultation of the owners, be used for-(a) the reproduction of the traditional knowledge or cultural expressions; (b) the publication of the traditional knowledge or cultural expressions.

Based on this the proponent will ensure provisions of the act such as free prior and informed consultation of the locals is undertaken. This will assist in ensuring the planning and implementation of the project will not negatively affect the cultural resources of Project affected persons and community at large

4.3.27 Security Laws (Amendment) Act 2014

- 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.
- 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

The project in collaboration with the state security apparatus will provide adequate support to enhance the security of persons involved in this project and the community at large, which will translate to provision of critical intelligence that will trigger a review of the existing security measures and tactics, among other advantages such as security expertise and artillery.

4.3.28 Prevention, Protection and Assistance to Internally Displaced Persons and Affected Communities Act, 2012.

- 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.
- 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 their rights and freedoms as set out in the Bill of Rights of the Constitution.
- The Government shall protect every human being against arbitrary displacement
- The Government shall put into place measures for assistance and protection needs of internally displaced persons about displaced communities with a special dependency on and attachment to their lands and the protection needs of women, children's persons with disabilities, the elderly and other persons with special needs
- 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.
- The procedure for resettlement of internally displaced persons and the standards applicable to such resettlement shall be as prescribed
-

Displaced persons and communities will be protected and assisted in line with the principles on internal displacement established by the Act. All procedures and actions are stipulated in the Resettlement Action Plan developed

4.3.29 The Civil Aviation Act Cap 394

Under this act, the Kenya Civil Aviation Authority (KCAA) must authorize and approve the height of transmission lines and masts when they are on or proximal to flight Paths so as to ensure the safety of flying aircraft.

Under Section 9 of this act, notwithstanding the provisions of any written law, or terms of any deed, grant, lease, or license concerning the use and occupation of land, the minister may, where he considers it to be necessary in the interests of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any structure above height specified in the order.

Failure to adhere to the provisions of this act, one commits an offence and upon conviction shall be liable to a fine not exceeding two million shillings or to imprisonment for a term not exceeding three years or to both.

The project has been designed to avoid flight paths and clearance for the same might be necessary.

4.3.30 HIV and AIDS Prevention and Control Act 2011

HIV/AIDS Prevalence in Kenya is a national disaster. This Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counseling, support, and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes The object and purpose of this Act is to:

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

The Proponent will ensure that HIV/AIDS awareness creation will be conducted on regular basis during project implementation. Condoms will be provided to prevent the spread of STDs.

4.3.31 Sexual Offences Act 2016

The Sexual Offences Act is an Act of Parliament to make provision about sexual offences, their definition, prevention, and the protection of all persons from harm from unlawful sexual acts, and for connected purposes.

In section 13, 14, and 15 ,17,18, the act explicitly outlines the offences related to children under age of 18years and prostitution prohibition.

There will be strict monitoring and supervision by the project through creation awareness and developing of strategies that will allow for grievance redress mechanism to ensure compliance with this Act.

4.3.32 Children's Act, 2022

The Children Act,2022 is a Kenyan law that addresses provision for parental responsibility, fostering, adoption, custody, maintenance, guardianship, care and protection of children; provision for the administration of

children's institutions; and giving effect to the principles of the Convention on the Rights of the Child and the African Charter on the Rights and Welfare of the Child and for connected purpose

Section 18 of the Act protects all children from any form of forced labor. Also, section 23 of this new act protects the children from any harmful cultural practices

The Act is very clear on the rights of children i.e. below 18 years. KETRACO will not allow any contractor to hire underage workers for this project. Verification of all workers age will be through provision of a national ID.

4.3.33 Labour Relations Act 2012

It is an Act of Parliament to consolidate the law relating to trade unions, employer organizations and trade disputes. It also provides for the registration, regulation, management and democratization of trade unions and employers' organizations. It safeguards the right of association, promotion of effective collective bargaining, orderly and expeditious dispute settlement while ensuring social justice and economic development.

The Act is divided into the following parts:

- Part 1- Preliminary part which provides for definition of terms.
- Part 2- Freedom of association.
- Part 3- Establishment of the registration of trade unions and employers' organizations.
- Part 4- Officials and members of Trade Unions and Employers' organizations.
- Part 5- Property, funds and accounts of trade unions, employers' organizations, and federations.
- Part 6- Trade union agency fees and employer's organization fees.
- Part 7- Recognition of trade unions and collective agreements.
- Part 8- Dispute Resolution.
- Part 9- Adjudication of disputes.
- Part 10- Strikes and lock outs.
- Part 11- Miscellaneous provisions

KETRACO, its contractors and associated vendors will strictly abide by all relevant sections stipulated in this act. Workers in the proposed project will be encouraged to use the CGRM in case of any welfare issues and sensitization on welfare will be done

4.3.34 Employment Act CAP 226

This Act establishes the minimum terms and conditions of employment. The Act sets forth the relationship between an employer and a worker. It defines the benefits, duties and obligations of the employer and the worker, which includes contract of service, prohibition against forced labour, discrimination in employment, sexual harassment, payment of wages, leave, termination, and living amenities

KETRACO shall ensure the contractor and their representatives fully abide by the provisions of this Act. All employed persons, whether on casual, contract or permanent terms will adhere to all protocols. Employers must also ensure they disseminate duties effectively under provisions of this act

4.3.35 Alcoholic Drinks Control Act, 2010.

- The Alcoholic Drinks Control Act is an act of Parliament to regulate the production, sale, and consumption of alcoholic drinks, to repeal the Chang'aa Prohibition Act, the Liquor Licensing Act and for connected purposes. The Act seeks to:

- To protect the health of individuals by providing a legal framework to control sale, production & consumption of alcoholic drinks
- To protect consumers of alcohol products from misleading inducements to use alcohol
- To protect young people (those below 18 years) by restricting their access to alcoholic products
- To educate the public on the dangers of alcohol use (economic, social & health)
- To protect the government by dealing with illicit trade
- To promote and provide for treatment & rehab programmed for the addicted
- To promote research and dissemination of information especially of health risks

The proposed project shall be in the forefront to ensure the public i.e., youth, women, elderly are informed and sensitized on the dangers of alcohol use (economic, social & health) impacts. No worker will be allowed to work while intoxicated. Alco blows will be used to detect alcoholism on individuals.

4.4 International Environmental Guidelines

Kenya is a signatory to many conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant international treaties and conventions include:

- **Vienna Convention for the Protection of the Ozone Layer.** Inter-governmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with The adoption of this convention to encourage Inter-governmental co-operation on research, systematic observation of the ozone layer, monitoring of CFC production and the exchange of information;
- **Montreal Protocol on Substances that Deplete the Ozone layer:** Adopted in September 1987 and intended to allow the revision of phase out schedules based on periodic scientific and technological assessment, the Protocol was adjusted to accelerate the phase out schedules and has since been amended to introduce other kinds of control measures and to add new controlled substances to the list.
- **The Basel Convention:** Sets an ultimate objective of stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system.
- **UNESCO Convention for the protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972):** This Convention aims to encourage the identification, protection, and preservation of Earth's cultural and natural heritage. It recognizes that nature and culture are complementary, and that cultural identity is strongly related to the natural environment in which it develops.
- **Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention):** The Convention was signed in Iran in 1971 and came into force in 1975. It represents the first attempt to establish a legal instrument providing comprehensive protection for a particular type of ecosystem. The Ramsar parties agree to implement their planning to promote conservation of the wetlands included in the list. There is no Ramsar site near the proposed site.
- **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):** This convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of international trade. CITES is an important line of defense against the threat posed to diversity by invasive species.
- **The Africa-Eurasia Migratory Water Bird Agreement (AEWA, 1995):** The goal of the agreement is to protect migratory waterfowl by ensuring that they are protected for the entire length of their migratory routes. The list of birds protected under the AEWA Convention covers 235 species of birds.
- **African Convention on Conservation of Nature and Natural Resources (1968):** This Convention of the African Union is ratified by 40 African countries, including Kenya. The fundamental principle requires contracting states to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the

best interests of the people.

4.5 Environmental Conventions and Treaties

World Commission on Environment and Development

The Commission commonly referred to as “the Bruntland Commission” focused on the environmental aspects of development the emphasis on sustainable development that produces no lasting damage to biosphere, and to ecosystems. In addition, environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. While social sustainable development 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.

Convention on Biological Diversity (1992)

This was ratified on 11th September 1994. Agenda 21 – a programme of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992. Principle No. 10 of the declaration underscore that environmental issues are best handled with participation of all concerned citizens at all the relevant levels. At the national level, everyone shall have appropriate access to information that is concerning environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy shall be provided. The foregoing discussion is relevant to the proposed development because EMCA demands that public must be involved before any development project that is likely to have adverse impacts to the environment is initiated by a proponent. The Act has further established Public Complaints Committee (PCC) where the issues raised by the public regarding any proposed development can be addressed.

Montreal Protocol, 1987

The Montreal Protocol on Substances that deplete the ozone layer (1987) was ratified on November 9, 1988. This treaty was designed to protect the ozone layer by phasing out the production of several substances believed to be responsible for ozone depletion.

United Nations Convention to combat Desertification (1994)

An agreement to combat desertification and mitigate the effects of drought through national action programs that incorporate long term strategies supported by international cooperation and partnership arrangements.

United Nations Framework Convention on Climate Change (1992)

International environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro in 1992. The treaty is aimed at reduced emissions of greenhouse gas to combat global warming

Bamako Convention (1991)

A treaty of African Nations prohibiting the import of any hazardous (including radioactive) wastes

Kyoto Protocol (2004)

Drawn up in 1997, pursuant to the objectives of the United Nations Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990; An amendment to the international treaty on climate change, assigning mandatory emission limitations for the reduction of greenhouse gas emissions to the signatory nations

4.6 Internationally Recognized Core Labour Standards in Kenya

Discrimination and Equal Remuneration:

Kenya has ratified Convention No. 100 on Equal Remuneration and Convention No. 111 on Discrimination (Employment and Occupation), both in 2001. The Constitution prohibits direct and indirect discrimination on grounds of sex and provides for fair remuneration to every worker. The Employment Bill provides for equal remuneration for men and women for work of equal value. However, many disparities between women and men in formal employment continue to exist. The Labour Institutions Bill as well as the Employment Bill define remuneration but only include remunerations in cash, not in kind, which is not in line with the Convention.

Child Labour:

Kenya has ratified Convention No. 138, the Minimum Age Convention in 1979 (with the minimum age stipulated as 16 years) and Convention No. 182, the Worst Forms of Child Labour Convention in 2001. The Employment Act prohibits the employment of children under 16 years of age in industrial undertakings. Amendments are being made to extend this minimum age to all sectors. The Children Act provides for free basic and compulsory education.

Forced Labour:

Kenya has ratified Convention No. 29, the Forced Labour Convention and Convention No. 105, the Abolition of Forced Labour, both in 1964. The Constitution prohibits slavery, servitude, forced and bonded labour, including by children.

Kenya has a duty under these multilateral agreements. The project should adhere to these strict guidelines and procedures to ensure the agreements are not violated.

4.7 African Development Bank Group's integrated Safeguards Systems policy Statement and Operational Safeguards (

Categorisation of Power Transmission lines

The African Development Bank has generally classified infrastructure projects as category 1 in its Environmental and Social Screening Checklist. These include:

- Water resource projects
- Large-scale thermal development or expansion
- Large-scale power transmission
- Large-scale urban water supply
- Large-scale urban sanitation
- Large-scale road and railway construction, upgrading or major rehabilitation
- Construction, major expansion or rehabilitation of ports, harbors, and coastal structures
- Construction, major expansion, or rehabilitation of airports
- Large-scale tourism development

Therefore, high voltage transmission lines like Narok – Bomet 132kV line fall under this category.

Characterisation and Environmental and Social requirements for category 1 projects:

Category 1 projects are likely to have detrimental site-specific environmental and / or social impacts that are less adverse and can be minimized by applying appropriate management and mitigation measures or incorporating internationally recognized design criteria and standards. These require an appropriate level of Environmental and Social Assessment (SESA for program operations or ESIA for investment projects) tailored to the expected environmental and social risk so that an adequate ESMP can be prepared in the case of an investment project or an Environmental and Social Management Framework (ESMF) can be designed and

implemented by the borrower in the case of program operations to manage the environmental and social risks of sub-projects in compliance with the Bank's safeguards.

The proposed project has been subjected to a full environmental and social impact assessment in compliance with the Bank's project screening criteria.

Table 4-2: A summary of the Bank's Operational Objectives (OS) and environmental and social triggers and client obligations

Standard	Provision/objective	Obligation/trigger mechanism
OS 1: Environmental and Social Assessment	<ul style="list-style-type: none"> • 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. • To avoid or if not possible minimize, mitigate, and compensate for adverse impacts on the environment and on affected communities. • To ensure that affected communities have timely access to information in suitable forms about Bank operations and are consulted meaningfully about issues that may affect them 	<p>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.</p> <p><i>The proposed project has been assigned Category 1 and this ESIA is prepared as a first step in meeting the requirements of the OS 1.</i></p>
OS 2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation	<ul style="list-style-type: none"> • To avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is unavoidable, exploring all viable project designs. • 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. • To set up a mechanism for monitoring the performance of involuntary resettlement programs in Bank operations and remedying problems as they arise to safeguard against ill-prepared and poorly implemented resettlement plans 	<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"> • Relocation or loss of shelter by the people residing in the project area of influence. • Loss of assets or restriction of access to assets including national parks, protected areas or natural resources; or • Loss of income sources or means of livelihood because of the project, whether the PAPs are required to move.

		<p><i>KETRACO has prepared a comprehensive RAP to provide framework for compensation and resettlement.</i></p>
<p>OS 3: Biodiversity and Ecosystem Services</p>	<ul style="list-style-type: none"> • To preserve biological diversity by avoiding, or if not possible, reducing and minimizing impacts on biodiversity. • In cases where some impacts are unavoidable, to endeavor to reinstate or restore biodiversity including, where required, the implementation of biodiversity offsets to achieve “not net loss but net gain” of biodiversity. • To protect natural, modified, and critical habitats; and • To sustain the availability and productivity of priority ecosystem services to maintain benefits to the affected communities and to sustain project performance. 	<p>This OS is triggered if a project is to be 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 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>
<p>OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency</p>	<ul style="list-style-type: none"> • 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 • To set a framework for efficiently utilizing all a project’s raw materials and natural resources especially focusing on energy and water. 	<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. Measures including proper and timely servcigin</i></p>

		<i>of machinery and vehicles will be put in place to check on pollution.</i>
OS 5: Labour Conditions, Health, and Safety	<ul style="list-style-type: none"> To protect the workers' rights and to establish, maintain, and improve the employee – employer relationship. To promote compliance with national legal requirements and provide due diligence in case national laws are silent or inconsistent with the OS; 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. To protect the workforce from inequality, social exclusion, child labour and forced labour; and To establish requirements to provide safe and healthy working conditions 	<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-ESMP) to ensure compliance with labour and occupational health and safety requirements. .</i></p>

4.8 KOREAN EXIM -ECDF Safeguard Policy

Korea Exim Bank is committed to ensuring the environmental and social sustainability of EDCF funded projects. The objectives of the EDCF safeguard policy are to:

- Avoid adverse impacts of project impacts on the environment and affected people when avoidance is not possible; and
- Minimize, mitigate and/ or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- Help the borrowers to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

The Narok-Bomet 132Kv is classified as a Category A (High Risk) project. "Category A" projects are those which have significant adverse environmental and social impacts and high risks that are irreversible, diverse, or unprecedented, which requires a full-scale ESIA to be carried out.

4.9 Administrative framework for the proposed project

The Project will be an Investment Finance operation processed under the African Development Bank Groups Integrated Safeguards System Policy statement and Operational Procedures. The Republic of Kenya will be the Borrower, and the Ministry of Energy and Petroleum (MoEP) will be the Executing Agency and beneficiary of the proposed loan. KETRACO will serve as the implementing agency.

4.9.1 Kenya Electricity Transmission Company- KETRACO

KETRACO was incorporated in 2008 through an Act of parliament to plan, design, construct, operate and maintain high voltage electricity transmission lines in Kenya. Since its establishment KETRACO has sought to resource itself and build the institutional capacity required to carry out its mandate. 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 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 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

KETRACO has established a dedicated Project Implementation Team (PIT) to implement the Project. 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.

The PIT will include a project engineer, three site managers, one civil engineer, one accountant, one procurement expert, one socio-economist and one environmentalist. The organogram for project Implementation team is shown below

KETRACO will always remain responsible for the overall performance of all ESMPs. KETRACO will also be responsible for the implementation of the ESMF, RPF and VMGF. 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.

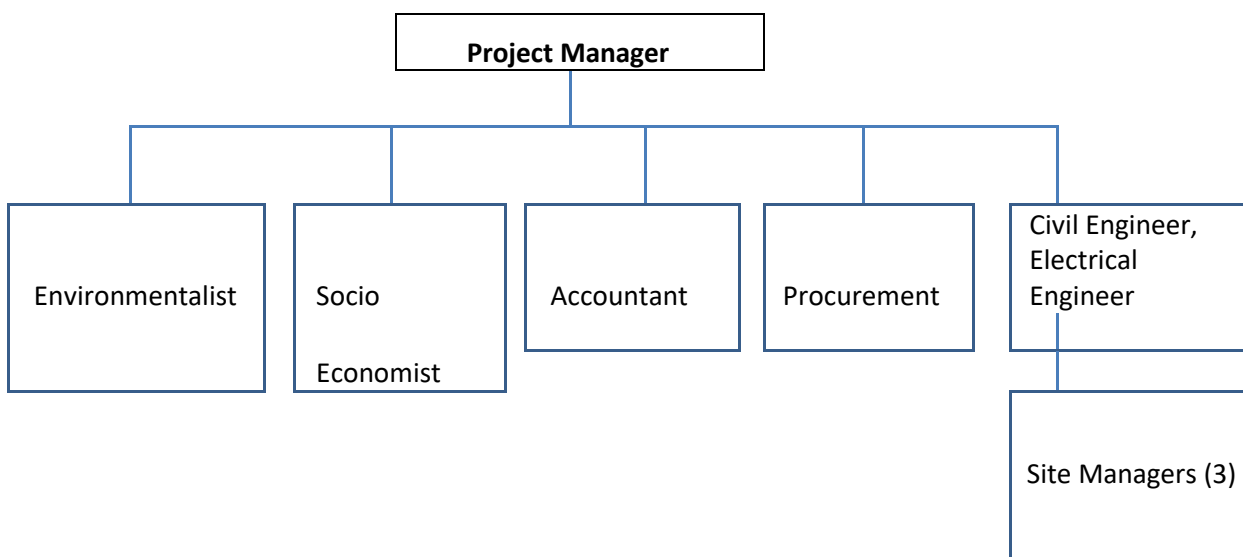


Figure 4-1: Organogram showing Project implementation Team Roles and Responsibilities of KETRACO ESS Unit

The Environmental and Social Safeguards division of KETRACO will monitor compliance of the project to applicable environmental and social standards. The unit will be responsible for;

- Timely preparation of TORs for the ESIA, ESMPs, RAPs SAs, VMGFs, RAPs as appropriate for review and clearance by the Bank;

- Timely preparation of environmental and social screening forms for all the sub-projects.
- Prior review and coordination for clearance of subproject ESIA and ESMPs by the Bank and NEMA.
- Monitoring of ESMP implementation, including monitoring of mitigation measures and monitoring of contractors environmental and social performance.
- Training of project staff, implementing partners, and contractors.
- Preparation of quarterly reports summarizing monitoring results, to be included in the Project's
- Quarterly Reports to the African Development Bank and NEMA Providing E&S monitoring oversight.
- Ensuring compliance to the WB safeguards standards and ESHS guidelines.
- Ensuring availability of adequate E&S resources to supervise and enforce compliance, Managing the Grievance redress mechanism
- Reviewing Contractor Management Plans (especially the Labor Management Plan) conduct independent E&S audits by appointing independent expert
- Hold responsibility to specialist studies required to examine wildlife crossings, and their locations, in consultation with the KWS.
- Hold responsibility to baseline studies for those areas that qualify as Critical Habitat
- Hold responsibility to ensure adequate consultation with vulnerable and marginalized groups.

KETRACO safety unit has developed tools and handbooks to guide contractors in safe work management. The safety unit role will be to carry out screening and background checks prior to the appointment of contractors to check previous safety records and performance. The safety unit will also support the E&S unit to carry out contractor inductions before commencement in relation to;

- Community health and safety to address social pathologies in communities affected by the project through promoting education and awareness programs for contractors.
- Practical construction measures e.g. batching, using fire extinguishers etc.
- Cultural sensitivity issues to address contractor behavior in relation to community resources and assets.

The KETRACO ESS 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 (ESMoP) 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.

4.9.2 KETRACO Resettlement Policy Framework (RPF)

The Resettlement Policy Framework (RPF) was prepared by the KETRACO to address the resettlement and compensation principles of the portion of the Kenya Electricity System Improvement Project (KESIP) where this proposed project falls. The aim of this RPF is to establish the resettlement and compensation principles, which include the process for undertaking socio-economic surveys and a census of the project affected persons (PAPs), a description of eligibility criteria for accessing compensation under the project, cut-off date for inclusion of PAPs in the Resettlement Action Plan or Abbreviated Resettlement Action Plan (RAP/ARAP), organizational arrangements for implementation of the RAP/ARAP (to be prepared in accordance with this RPF), and the design criteria to be applied to meet the needs of the people who may be affected by the various subprojects, whether or not PAPs have to physically move. The objective of this RPF is to establish the principles, procedures, entitlements and eligibility criteria, organizational arrangements, and provisions for monitoring and evaluation (M&E), the framework for stakeholder and PAPs participation, as well as the mechanisms for addressing grievances which will be applied to the proposed transmission project. It provides guidelines on how the project will avoid, manage, or mitigate all project related displacement risks. The RPF is a key guiding document for preparation of the RAP.

4.9.3 KETRACO Vulnerable and Marginalized Groups Framework (VMGF)

The Vulnerable and Marginalized Groups Framework (VMGF) describes the policy requirements and planning procedures that should be used during the preparation and implementation of the project components, especially those identified as occurring in areas where IPs/VMGs are present. The VMGF highlights the need for screening to be done to assess and confirm the presence of VMGs. VMGF highlights that a site-specific social assessment (SA) should be prepared that should inform the preparation of individual VMGPs as set out in the Framework and further public consultations and stakeholder engagements should be conducted. The VMGF by KETRACO is therefore a key guiding document for preparation of the social assessment and VMGPs if need arises

4.9.4 Contractors

Contractors will be expected to develop own ESMP which identifies his specific obligations and activities and correlates these with the work schedule. This should be approved by the KETRACO safeguards. The contractor should employ a qualified officer responsible for implementation of social/environmental requirements. This person will maintain regular contact with KETRACO's environment and social focal point.

It is also recommended that the contractor should establish and appoint an Environmental and Social (E&S) team prior to approval of the contract. The E&S team should be trained on implementation of contractors ESMP and ESMoP. The trained E&S team should be responsible for ensuring full implementation of the contractors ESMP and ESMoP.

4.9.5 The African Development Bank

The African Development Bank will lay the benchmarks for all environmental and social safeguard issues concerned with the development and implementation of the project. It will provide overall supervision, facilitation, and co-ordination of the project. It will also monitor funds and funds allocations, and project performance indicators. The African Development Bank will assess the implementation of the ESMP and recommend additional measures for strengthening the management framework and implementation performance, where need be. The reporting framework, screening procedures and preparation of management and mitigation plans shall be discussed and agreed by the Bank team and PIU during the early part of project implementation.

The African Development Bank Task Team will review site-specific safeguards instruments, for example, ESMPs, ESAs and RAPs to ensure that their scope and quality are satisfactory to the Bank as well as international best practices and Kenyan Law.

The African Development Bank will also monitor the implementation of the different prepared instruments through regular supervision missions (which will include an environmental and/or social specialist) during which document reviews, and site visits and spot-checks will be conducted as needed.

CHAPTER 5. STAKEHOLDER ENGAGEMENT

5.1 Introduction

Timely stakeholder inclusion and engagement is key as it results in enhanced project acceptance while providing opportunity for the stakeholders to make significant contribution to the project design and implementation. Stakeholders in this project are individuals or groups who will be affected or are likely to be affected by the project (project affected parties) and those that have interest in the project (interested parties).

Objectives of stakeholder engagement

- To assess the level of stakeholder interest and support for the project
- To enable stakeholder's views to be considered in project design and implementation
- To establish and maintain constructive relationships and means for effective and inclusive engagement with project affected parties on issues that could affect them
- To ensure appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely and accessible matter
- Reducing chances of conflict through early identification of contentious issues
- Providing an opportunity for stakeholders to influence the Project design and operational plan in a positive manner
- Obtaining local and traditional knowledge that may be useful to decision making including Indigenous Knowledge Systems (IKS)
- Increasing public confidence in the ESIA and RAP process
- Improving transparency and accountability of decision making
- Facilitating consideration of alternatives, mitigation measures and trade-offs (if any)
- Ensuring that important impacts are not overlooked, and benefits are maximized

5.2 Public participation

Public participation is an essential and legislative requirement for environmental authorization. The ESIA PIT undertook the stakeholder consultation (SC) for the proposed project in accordance with the requirements for the Study stipulated in the EMCA, 1999 and EIA/EA Regulations 2003.

The purpose of public participation is to identify stakeholders and to allow such parties the opportunity to provide input and comment on the project, including issues and alternatives that are to be investigated, thereby facilitating informed decision-making. In complying with the public participation process (PPP) for the study consultations were carried out to ensure that issues, concerns, and potential impacts identified are addressed fully. The objectives of public participation in an ESIA are to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them identify issues of concern and provide suggestions for enhanced benefits and alternatives.

The first step in the process of public participation process was stakeholder identification. The main aim was to determine all organizations and individuals who may be directly or indirectly (positively or negatively) affected by the proposed project. In the end, the stakeholders were grouped into two main categories depending on their various needs, interest, and potential influence to the project. These included:

- **Key Primary Stakeholders**-The directly affected by the project. These largely included the residents in four locations where the Transmission line traverses.
The transmission line will require way leave acquisition (trace of 30m) along the 81km stretch, therefore the affected persons include.

- Landowners
 - Owners of houses/structures/other assets
 - Farmers
 - Business owners
 - Tenants/Sharecroppers
 - Landless/wage laborers
 - Women and especially female heads of households
- **Secondary Stakeholders**-The indirectly affected by the project but influence development through project implementation. These included: - Relevant National Government Officials in Narok and Bomet counties, Ministry of Energy and its implementing agencies, County governments, Power consumers, financial partners, Community based organizations,

5.3 Stakeholder engagement schedule

Stakeholder engagement began early in the planning phases of the project. The implementing agency KETRACO wrote a letter to Bomet and Narok counties informing them about the project. Stakeholder consultations were undertaken during the month of 26th February 2018 to 23rd March 2018 by Kenya Power and by KETRACO in December 2021. During this time project information in terms of (design, route, positive impacts, negative impacts were discussed with various stakeholders. The stakeholders gave their views in to the project.

5.4 Approach used in carrying out the SC

The proponent in consultation with the team of experts informed the neighbors as well as the relevant authorities two weeks before consultations began. Owing to the different categories of the stakeholders, the ESIA team opted to employ various methods in engaging them. The methods included face to face discussions, focused group consultation as well as public meetings.

5.4.1 Meeting with officials of County and National Government

Since the project area falls under the jurisdictions of two counties the ESIA team visited the county governments of Bomet and Narok as well as national government administration and line Ministry officials to discuss the project and get their views on the project. Additionally, a project brief was also given to them for better understanding of the project and for record purposes. The project received support both from the county and national government who added that it of great importance to ensure that the public is widely consulted, and awareness created coupled with appropriate compensation for those to be affected by the proposed project. Attendance sheets for these meetings are attached as Annex 4 in this report.

The following officers were consulted:

1. County Commissioner, Narok County
2. Deputy County Commissioner, Narok South
3. Assistant County Commissioner, Ololunga
4. Bomet /Narok water and sewerage company
5. National Environment Management Authority, Narok & Bomet counties
6. Kenya Forest Service Officers -Ecosystems conservator (Narok and Bomet Counties)
7. Kenya Wildlife Service-Narok County
8. Public Health Department-Narok County
9. Ministry of Gender, Youth and Social services
10. Ministry of Agriculture and Livestock – Bomet and Narok counties
11. Directorate of Occupational Health and safety-Narok
12. Water, environment, and natural resources Directorate – Narok County
13. Water Resources Authority – Ewaso Ngiro Catchment (Narok Office)



Plate 5-1: Key informant stakeholder consultation in progress

5.4.2 Local community sensitization Meeting

Public consultations through barazas/public meetings were held within the sub locations where the proposed line will pass. There were 2 sets of community meetings. The initial Local community meetings were held in February and March 2018 by KPLC (see Annex 5). The subsequent most recent meetings were held in December 2021 by KETRACO after firming up the proposed route (see Annex 9). These meetings were organized through the office of the various chiefs and held within convenient venues within reach of the local community members. During the meetings the ESIA team explained the project in terms of route of the line, positive impacts, negative impacts, mitigation measures of the negative impacts and open forums for discussion. The message was also communicated in Kiswahili and using the local dialect i.e. Maasai and Kalenjin to ensure the information was well understood.

In 2018, KPLC held meetings in the following sublocations: in Ilmasharian, Olopito, Olorroito, Kotolian, Nkoban, Ololunga, Nkareta, Melelo, Ilmotiok (Narok county) and Kobeiyon, Kiptulwa, Kongotik, Emitiot, Cheboin, Kyongong, Kabisoge and Itembe (Bomet County).

In 2021 KETRACO held six (6) community sensitization meetings all in Narok County. These meetings which also doubled as RAP meetings targeting the Project Affected Persons (PAPs) attracted a cumulative total of 112 attendants along the proposed Narok-Bomet transmission line. The details are tabulated in the tables 5-1 and 5-2).

Table 5-1: Summary of meetings conducted in 2021 by KETRACO

Location Name	Date	Venue	Participants	Total Attendees		
				Male	Female	Total
Lower Melili	15/12/2021	Nchoe Farm in Olopito	PAPs Local Administration KETRACO PIT	13	4	17
Ololunga	15/12/2021	Hon.Nkoreita Farm-Naropil	PAPs Local Administration KETRACO PIT	7	1	8
Endonyio-Ngiro	16/12/2021	Olosiyoi Dispensary	PAPs Local Administration KETRACO PIT	17	2	19

Location Name	Date	Venue	Participants	Total Attendees		
Nkareta	17/12/2021	Nkareta community resource center	PAPs Local Administration KETRACO PIT	6	1	7
Ilmotyok	18/12/2021	Chebolet Farm, Aganga Village	PAPs Local Administration KETRACO PIT	31	9	40
Ilmotyok	18/12/2021	James Bett Farm, Oletepesi	PAPs Local Administration KETRACO PIT	17	4	21
Total						112

Table 5-2: Summary of meetings conducted in 2018 by KPLC

Location Name	Date	Venue	Participants	Total Attendees		
				Male	Female	Total
Ilmashariani	2/3/2018	Ilmashariani Chiefs office, Narok	PAPs Local Administration KPLC PIT	5	3	8
Kyogong	6/3/2018	Sanchora Shopping Center	PAPs Local Administration KPLC PIT	14	2	16
Itembe	7/3/2018	St. Peters Catholic Church, Kapkw en	PAPs Local Administration KPLC PIT	11	5	16
Nkareta	7/3/2018	Nkareta Olamutai barrier	PAPs Local Administration KPLC PIT	16	4	20
Kabsioge	8/3/2018	Kapsioge Primary School	PAPs Local Administration KPLC PIT	10	4	14
Olopito	9/3/2018	Olopito Village	PAPs Local Administration KPLC PIT	16	3	19
Kapkimolwa	13/3/2018	Koiben shopping center	PAPs Local Administration KPLC PIT	17	3	20
Oloroito	13/3/2018	Oloroito Village	PAPs Local Administration KPLC PIT	17	2	19
Ilmotyok	14/3/2018	Jamboruto Village	PAPs Local Administration KPLC PIT	15	8	23

Location Name	Date	Venue	Participants	Total Attendees		
Ololunga	14/3/2018	Ololunga Royal Church	PAPs Local Administration KPLC PIT	13	4	17
Kapkimolwa	15/3/2018	Kiptulwa shopping center	PAPs Local Administration KPLC PIT	11	3	14
Nkobon	15/3/2018	Kotolian Center	PAPs Local Administration KPLC PIT	13	5	18
Kombu	16/3/2018	Lebekwet Shopping C	PAPs Local Administration KPLC PIT	12	7	19
Ololunga	21/3/2018	Melelo Village	PAPs Local Administration KPLC PIT	17	4	21
Melelo	22/3/2018	Chebkwet Village	PAPs Local Administration KPLC PIT	21	6	27
Ilmotyok	23/3/2018	Olereut shopping center	PAPs Local Administration KPLC PIT	14	4	18
Total						289

5.4.3 Administration of questionnaires

The purpose for administering questionnaires was to identify the positive and negative impacts and subsequently gather proposals on the best practices to be adopted and mitigate the negative impacts respectively. The target population were project affected persons as well as key stakeholders. 159 questionnaires were administered in 2021 and 248 in 2018. This also helped in identifying any other miscellaneous issues, which may bring conflicts in case proposed transmission line and associated facilities implementation proceeded as planned. The filled stakeholder questionnaires are attached in Annex 7 and 8 of this report

5.5 Summarized Comments and Responses from the Stakeholders

During consultations the Scope of activities associated with the project were presented by ESIA experts to the stakeholders and community members. The audience was then asked to make suggestions, comments and ask questions for clarifications. All comments received on the consultation were incorporated into the Final Impact Assessment Report. The issues of concern from the meetings and discussions from stakeholders revolved on the issue of safety and compensation for losses to be incurred. Some of summarized comments received from PAPs and authorities regarding the proposed transmission power-line development from consultations in 2018 and 2021 have been summarized and included in the comments and response tables below.

5.5.1 Summarized stakeholder Perceived Benefits/positive Impacts

Stakeholders (both in 2018 and 2021 consultations) expressed varied opinions regarding what they perceived as the benefits accruing from the proposed project. These include the following:

- Reduction of frequent power blackouts
- Provision of reliable electricity for industrial, agricultural (farm mechanization) and domestic use
- Creation of employment opportunities
- Helps in mechanization i.e., use in fodder chopping harvesting and feed formulation
- Reliable and quick connections
- More supply to rural areas without overstretching the existing supply
- Reliable power will reduce over reliance on wood fuel thus conserving environment
- Improved livelihoods after compensation
- Opening of the area and new businesses
- Increased usage of clean energy

5.5.2 Summarized concerns raised in 2018 consultations

This was done by Kenya Power in March 2018. Results of the issues and/or perceived negative impacts raised, and appropriate mitigation measures are summarized in **Error! Reference source not found.**

Table 5-3: Summary of issues and concerns during 2018 consultations

Concern/Negative Impact	Suggested mitigation
Destruction of trees, crops and houses	The community was informed that PAPs would grow more trees especially at the periphery of their plots and in tandem to meeting the Ministry of Agriculture policy of ensuring 10% tree cover for each given parcel of land. Just compensation for destroyed trees, crops and houses (property) would be done
Electrocution and vandalism	The proponent would ensure the transmission line and Pylons were maintained in a good state of repair, with frequent monitoring and necessary corrective measures. It was agreed that no settlement or growing of trees within the Right of Way. Vandals were warned and the public encouraged in ensuring community policing.
Noise and dust:	It was agreed that the Proponent would sprinkle water where and when necessary to minimize dust pollution, and construction to be done during the day and to observe NEMA Noise regulations.
Soil Erosion	It was agreed that soil erosion that may arise during construction would need to be controlled. Vegetation disturbance will be avoided as much as possible as the

Concern/Negative Impact	Suggested mitigation
	contractor will use the access roads provided by the proponent.
Consultation and informing the affected persons	Further consultations/ meetings with specific Project affected persons will be carried out to brief the community on the next plan of action alongside taking census and other data to prepare a Resettlement Action Plan to guide compensation. This would be done through the office of the chief
Valuation of houses, trees and property	The proponent will undertake valuation of property as per the proponent's RPF. Trees will be valued using ministry of agriculture rates based on species and size.
Displacement of people Social impacts	<ul style="list-style-type: none"> The proponent will conduct social impact assessment prior to implementation of the project the proponent will upon completion of RAP study compensate PAPs in fair and timely manner. KETRACo shall hold capacity building sessions with PAPs to further guide them on responsible use of the compensation package.
Loss of Livelihoods	The proponent informed the community was informed that compensation to destroyed property would be done to the affected people
Misuse of compensation proceeds	Those to be affected were cautioned about misuse of compensation money and were encouraged to use the money appropriately. More education on this would be done by the proponent.
The wayleave will render some arable land unproductive thus reducing food security	The Proponent will compensate land acquired as a wayleave and educate PAPs on environmentally sound land reclamation practices
Increased accidents especially during construction phase	<ul style="list-style-type: none"> The proponent and the contractor will continually sensitize workers and the public on occupational health and safety The contractor shall place warning signs appropriately, visible, and legible to the locals. The Proponent to develop and implement a traffic management plan
Restricted choice of enterprises particularly commercial trees and domestic agro forestry	The proponent in conjunction with KFS to promote planting of shorter species of trees and other value chains
Electromagnetic effects of energized Transmission line	All possible EMF radiations from operation of substation and TL will be managed in accordance with OSHA, 2007
Obstruction of development and projects privately operated	The proponent to conduct proper and adequate compensation of any developments and displaced people and their daily activities
<ul style="list-style-type: none"> Spread of communicable diseases such as HIV/AIDS 	<ul style="list-style-type: none"> The Proponent in collaboration with chief/ village head men to educate the residents – hold Barraza's Contractor to mount HIV/AIDS education programmes to workers Contractor to provide condoms to employees
No employment of local people	<ul style="list-style-type: none"> Contractor to give priority to locals in access to casual jobs

Concern/Negative Impact	Suggested mitigation
	<ul style="list-style-type: none"> Contractor to work together with chiefs to ensure fairness and equity
Restriction of tree planting within the power line wayleave corridor	Planting of trees outside the wayleave corridor is encouraged as a safety measure
The project is dangerous because of its high voltage	Proponent to educate the community on the project to reassure the community and dispel the fears
May lead to electrocution of people and animals	<ul style="list-style-type: none"> The PAPs to report any incident which occur along the line The proponent will sensitize the PAPs regarding need to avoid construction of structures below the line
Social impacts-breakdown of families due to misunderstanding	Civil education to be done by the proponent especially to the affected people
Land disputes because of misunderstanding on the money	<ul style="list-style-type: none"> Sensitization on step-by-step compensation process to be done by the proponent PAPs are encouraged to cooperate with the KPLC team
Fire out brakes in case the high voltage lines brakes	<ul style="list-style-type: none"> Avoid tree planting within the wayleave corridor Regular tree maintenance by KPLC maintenance team

5.5.3 Summarized concerns raised in 2021 consultations

This was done by KETRACO in December 2021. Results of the issues and/or perceived negative impacts

Table 5-4: Summary of issues and concerns during 2021 consultations

Concern/Negative Impact	Suggested mitigation
Vegetation loss along the wayleave corridor will be massive	<ul style="list-style-type: none"> Compensatory tree planting outside the wayleave Have programmes of tree planting within the community by the proponent equivalent to area of wayleave The proponent to encourage PAPs to plant cover plants such as grass to further reap other benefits such as erosion control
Disruption of habitats	Contractor to minimize clearance as much as possible especially in protected ecosystems like community forests
Displacement of persons	The proponent will develop a Resettlement Action Plan (RAP) to guide compensation and resettlement
Relocation of native residents from their homes	<ul style="list-style-type: none"> The proponent to roll out civil education to the affected/displaced PAPs The proponent to encourage resettlement within the land if land sizes allow
Rain reduction, due to cutting of many trees along wayleave	The proponent will sensitize PAPs to plant trees outside wayleave
Land degradation and forest destruction Accidents and injuries during and after construction	<ul style="list-style-type: none"> Planting of ground cover grass by the proponent on excavated foundations The proponent to compensate PAPs on agricultural damage Proponent to Sensitize to community on safety procedures

Concern/Negative Impact	Suggested mitigation
Family conflicts in case of disagreements	Prior sensitization on the community by the proponent's environmental and social safeguards team.
Teenage pregnancies	<ul style="list-style-type: none"> • Counselling affected communities by the proponent • Sensitization on reproductive health and social interaction with project workers by the proponent and contractor
Effect on wildlife leading to loss of tourism	<ul style="list-style-type: none"> • The proponent to sensitize PAPs and encourage them to avoid settling in wildlife dispersal areas. • The proponent shall develop and implement strict code against consumption of game meat by workers
Increased Accidents	<ul style="list-style-type: none"> • The Proponent/contractor to develop and implement traffic code • The contractor shall regularly service and maintain construction vehicles, plant and machinery
Poor reception of telecoms infrastructure	the proponent to conduct awareness to dispel this fear
Relocation of schools potentially disrupting learning	The proponent shall route the transmission line to avoid schools and other social amenities such as hospitals, markets, churches, among others
Rain reduction, due to cutting of many trees a along wayleave	The Proponent to encourage community to plant trees in their farms
Noise during construction	the proponent/contractor shall provide strict daytime (6 a.m. to 6 p.m.) work schedules.
Dust during construction	Contractor to regularly suppress dust through water sprinkling
If the parcel is too small, the landowner will be disadvantaged	<ul style="list-style-type: none"> • The Government through the proponent will favorably compensate all affected persons • The proponent will consider land sizes vis-a-avis total on trace in computing the compensation package.
Electrocution	<ul style="list-style-type: none"> • Anti-climbing devices will be mounted on towers by the contractor • Substations will be fenced, guarded round the clock and access allowed only to authorized persons
Late payment of compensation	The proponent to ensure fair, just and timely compensation in accordance with laid down statutes

Note: The project enjoys support from all stakeholders provided mitigation measures are implemented.

5.5.4 Future Stakeholder Engagement

Public consultation on matters related to ESIA is a continuous process. The conclusion of this ESIA study does not preclude the need for future engagement and continued consultation and involvement of those affected by the project. A summarized stakeholders engagement plan (SEP) Table 5-5 has been prepared to support future engagements. It is expected that KETRACO will continue with this process, ensuring all future consultations are meaningful, conducted in good faith, and treated as a 2-way process with feedback on issues previously discussed provided. Several areas are considered for further consultations:

- Possibility for realignment to avoid cultural property, especially graves before, during and after the life of the project; Community preference on this is clear, but feedback is required.

- The preference for KETRACO to support community and environmental restoration projects and assurance of the same.
- Assurance that the current land occupiers will be compensated.

The project therefore seeks to engage its stakeholders throughout its project phases.

Table 5-5: Summarized stakeholder engagement plan for the project

Cluster	Level of influence	Stakeholder	Project phase	Method of consultation
One	Directly or indirectly affected by the project	<ul style="list-style-type: none"> ▪ Persons affected by the project ▪ Families of the PAPs ▪ Host community ▪ Squatters- not the legal landowners ▪ Asset owners 	All phases	Household socio-economic survey, Census and Asset Inventory Public meeting/Barraza
Two	Stakeholders who will participate in implementation of the project	<ul style="list-style-type: none"> ▪ Contractors ▪ Consultants ▪ Donors and Development Partners ▪ National Land Commission ▪ Energy sector players- Kenya Power, KenGen, REREC ▪ Community Liaison Officers ▪ Community resettlement committee (CRC) ▪ Ministry of Interior 	All phases	<ul style="list-style-type: none"> • Unstructured key informant's interviews through meetings and stakeholder forums • E-mails • Telephone
Three	Likely to influence and make decision on implementation of the project	<ul style="list-style-type: none"> ▪ Civil society ▪ Financiers ▪ Local opinion leaders ▪ Religious institutions ▪ Media 	All phases	<ul style="list-style-type: none"> • Unstructured key informant's interviews through meetings and stakeholder forums • E-mail • Telephone
Four	Stakeholders who are not affected by the Project development but may be interested in the project	Government stakeholders: Kenya Wildlife Service (KWS), NEMA, Kenya Civil Aviation Authority, Ministry of Lands, Finance/ The National Treasury, Ministry of Energy, Ministry of Environment & Natural Resources, Ministry of Energy, Ministry of Interior, Ministry of Planning and Devolution, Communications Authority, Kenya National Highways Authority (KeNHA), Kenya Rural Roads Authority (KeRRA), Water	All phases	<ul style="list-style-type: none"> • Unstructured key informant's interviews through visits • Stakeholder forums • E-mail • Telephone

Cluster	Level of influence	Stakeholder	Project phase	Method of consultation
		Resource Management Authority (WRMA), LAPSET, Kenya Forest Service (KFS), Kenya Police Regular and Administration, Ministry of Labor DOSHS, Ministry of Roads and Infrastructure, Ministry of Agriculture, Department of Resource Surveys and Remote Sensing (DRSRS), Kenya Pipeline Corporation, Ministry of Defense.		
		Local/County Government- Governors, Senators, Members of Parliament, Members of County Assembly-	All phases	
		<ul style="list-style-type: none"> ▪ Public Benefit Organizations (NGOs, CBOs, FBOs, PBOs): ▪ Elected/ nominated leaders 	All phases	
Five	Special interest group	<ul style="list-style-type: none"> ▪ Women ▪ Youth ▪ Single parent's families ▪ People Living with disability ▪ Vulnerable and marginalised communities 	All phases	<ul style="list-style-type: none"> • Household socio-economic survey, Census and Asset Inventory • Public meeting/Baraza • Free, prior and informed consent

Source: Adopted from KETRACO Resettlement Policy Framework (RPF), 2021

5.5.5 The grievance mechanism and resolution procedure

Grievance redress is a critical component of effective ESMP and project implementation. The purpose of Grievance Redress Mechanism (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 project personnel or channels 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.

The grievance mechanism and resolution procedure sets out a step-by-step approach of receiving, acknowledging, registering, investigating and addressing complaints and grievances from all stakeholders affected and interested in the project.

The procedure will be as shown in Figure 5-1 .

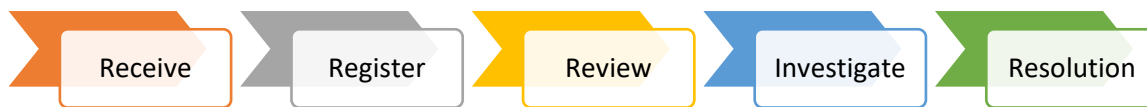


Figure 5-1: Grievance redress procedure

1. Receive

Grievances (and complaints) will be received through several channels that may include:

- a. Grievance hotline (to be provided and popularized once set up)
- b. Grievance email (dedicated email address to be provided and popularized once set up)
- c. KETRACO Communications office.
- d. KETRACO staff who hold responsibility for stakeholder engagement and who visit the communities within the project area of operations on a regular basis.
- e. Suggestion box strategically placed at various site premises

2. Register

The following procedure will be followed to register a grievance (or complaint) is presented:

- a) The KETRACO staff member/Contractor/Supervising Consultant receiving the grievance will carefully note and record the grievance (or complaint) onto the **Grievance Registration and Acknowledgement Form** when the complainant cannot do it by her/himself. If appropriate, the personnel registering the grievance could take pictures related to the issue to substantiate the claim. Also, where relevant GPS coordinates should be noted.
- b) Once completed, the staff member will read and explain what has been recorded to the grievant (or complainant) to confirm that the facts of his/her grievance (or complaint) are as written. If possible, grievances (or complaints) should be in writing. However, verbal grievances (complaints) should also be accepted especially in circumstances where written grievances may be a barrier for some individuals.
- c) Each grievant (complainant) receives a copy of the **Grievance Registration and Acknowledgement Form** (a copy of which should be also kept with the Company) which acknowledges that the grievance (complaint) has been received. The Acknowledgement Form has a reference number and includes a commitment from the Company to provide a response within a pre-specified time period (e.g. thirty (30) days) of logging the grievance. Duplicate booklets with pre-printed and numbered forms (using carbon copy paper) are often used for this purpose.
- d) If possible, grievances should be addressed immediately through a process of dialogue. If accepted the agreed resolution is documented on the **Resolution Form**.
- e) If further review is required, the KETRACO staff member/Contractor/Supervising Consultant describes the process and the timeline for further review to the grievant/complainant.

3. Review

- a) All forms must be handed over to the Grievance Officer within 24 hours of receipt of the complaint or grievance. The Grievance Officer will screen each form and determine if it is a grievance or a complaint.
- b) In the case of a complaint, where the complaint has not already been closed out by the recipient recording the grievance, the Grievance Officer will provide the complainant with a response from the Company.

- c) In the case of a grievance, the Grievance Officer will investigate the grievance to determine its validity and where appropriate ensure appropriate redress as part of the process of closing out the grievance. For grievances, the Grievance Officer will always provide a response as a matter of procedure.

Investigation

The Grievance Officer will determine how to investigate the grievance.

- a) The investigation should be started within 1-7 days after the grievance has been registered. The aims of the investigation are: (i) to determine the validity and veracity of the grievance; (ii) to verify the claims made by the Grievant, and evidence provided to substantiate the claims; (iii) to determine appropriate redress where required.
- b) Investigation should seek to investigate the event leading to the grievance and to verify the impact thereof. Investigation may involve visiting the location of the event leading to the grievance; photographs of the scene; engagement with other stakeholders in the field (i.e., triangulation) to confirm reliability of the account; etc.
- c) Potential redress options include an apology, compensation of the aggrieved or any other resolution option within the limits and capacity of the field staff and their local networks.
- d) If investigation and resolution cannot be achieved within 30 days, a letter will be sent to the Grievant informing them that their grievance is being investigated, setting out the reason for the delay and advising the Grievant of anticipated closure date.

4. Resolution & Closure

The Grievance Officer shall communicate the outcome of the review to the aggrieved person in writing (and/or verbally where literacy may be an issue) and through the **Grievance Resolution Form**. This response will be either: a) an outcome of the grievance review, or b) a notification that the company needs additional time to examine the issue further. The final grievance review outcome is communicated both through the **Grievance Resolution Form** as well as through a verbal explanation. The Grievance Officer makes two (2) copies of the form; one for the complainant and one signed by the complainant for the company records. The Grievance Officer will ask the complainant to sign the form at three places: one signature to acknowledge receipt, another signature to acknowledge satisfaction with the outcome, and another signature to acknowledge that the complainant has been respectfully informed about the outcome of the reviews and has no objections.

CHAPTER 6. ANALYSIS OF PROJECT ALTERNATIVES

6.1 Consideration of Project Alternatives

This chapter describes and examines the various alternatives available for the project. The following alternatives were identified and investigated during ESIA study. This section discusses the various alternatives considered to date for the proposed powerline development project, including the “no-go / do nothing” alternative. The alternative power supply options and powerline structure types and designs as well as alternative construction materials and technology are considered, while the alternative powerline corridor routes identified during the Scoping Phase of the ESIA are summarized. Lastly, the alternative powerline corridor routes are highlighted.

6.2 The ‘Do-nothing’ Option

The ‘Do nothing’ alternative in the context of this project implies that the power line would not be constructed. If the power line does not go ahead, the negative environmental impacts which have been identified would not occur. However, if the power line is not constructed and commissioned, 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 and would jeopardize 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. The existing powerline networks supplying the towns and villages between Narok and Bomet areas are highly constrained in terms of capacity and are unable to supply additional electrification load growth in the area. It is therefore imperative for KETRACO to establish a new 132kV network of powerlines in the area to cater for existing and projected electrification load.

Should the proposed development not be undertaken, 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. Therefore, the need for stable and reliable power supply to meet current and future demand will likely outweigh the potential negative impacts to the surrounding environment. It is thereby concluded that the ‘No-go’ option is not a viable or acceptable option and should therefore be discouraged.

6.3 Alternative Powerline Corridor Routes

The identification of potential corridor routes for the 132kV Narok-Bomet powerline involved site visits to the study area, preliminary site investigations and consultation with the specialists, KETRACO as well as IAPs. An overview and comparative assessment of the alternative powerline corridors identified for the proposed Narok-Bomet powerline is presented in the sections below.

6.3.1 Identification of Alternative Powerline Corridor Routes

In identifying a suitable corridor for the 132kV powerline adjoining the proposed Bomet Substation several suitability criteria were taken into consideration:

- **Topography** – consideration is given to the topography of potential corridors in an area, whereby flat or gently sloping topography is preferred. A gentle slope facilitates surface drainage and movement of vehicles and people on site during construction and maintenance operations. Steeper slopes inhibit movement, makes vehicle access problematic and increases the potential for environmental impacts

during construction as well as maintenance operations, e.g. steeper slopes have higher surface water flow rates and therefore higher erosive potential.

Topographical features, such as ridges or tree lines may also be used to hide the powerline causing a reduction in the visual impact on the surrounding landscape. It is preferable to avoid highpoints where possible, although the crossing of ridges and other highpoints is sometimes required.

- **Hydrology** – consideration is given to the proximity of potential corridors to adjacent water courses, possible river crossings and wetlands, as there may be potential impacts in terms of erosion and siltation of water courses should access roads need to be constructed over river crossings or in wetland areas.
- **Geology and Soils** – consideration is given to the soil type along potential corridors whereby stable soil and founding conditions are preferable. Less stable soils, i.e. shallow, dispersive soils and soils with poor drainage present an erosion hazard if not managed correctly, and also require the installment of additional, costly foundation infrastructure;
- **Flora and fauna** – a potential powerline corridor need to be assessed in terms of its ecological value at both a macro and micro scale i.e. within the corridor and the environment adjacent to it. Both a faunal and floral investigation may be required, with particular emphasis on ensuring the protection of endemic and red data species and their habitat, should they be present. In the case of powerline developments, particular emphasis is placed on the potential impacts on avifauna as they relate to potential bird-powerline collisions or electrocutions of birds on powerlines. An identified corridor in a sensitive habitat may be excluded from the list of potential corridors.
- **Access** – it is preferable that potential corridors are accessible from existing roads for construction and maintenance purposes to avoid creating new access roads to the powerline; and
- **Public acceptability** – public acceptance criteria relate to such issues as the possible adverse impact on public health, quality of life, and local land and property values.

6.3.2 Description of the Alternative Powerline Corridor Routes

Based on the suitability criteria outlined above, KETRACO-Environment & Social safeguards division has identified the potential corridor routes for the proposed 132kV powerline from the existing Narok 132/33kV transmission substation to the existing Bomet substation. All the routes are located within Narok and Bomet Counties but traverse largely private land.

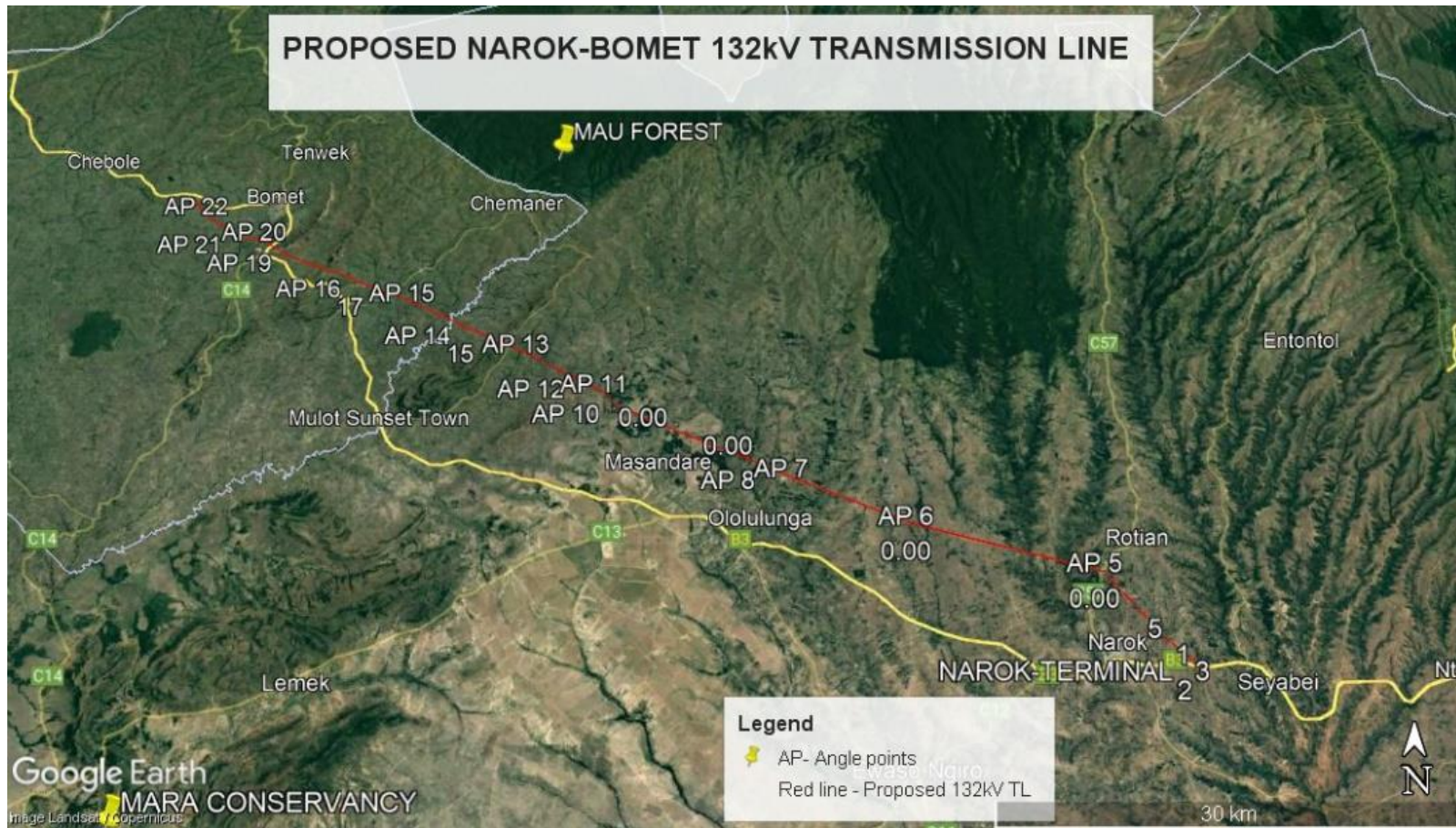


Figure 6-1: The preferred (Red line) and alternative (Yellow) routes of proposed TL

Each potential route will commence at the existing Narok substation Tee- off and route 1 will run towards Northwestern side of Narok-Nairobi Road and run on the right side of the Narok-Bomet highway up to kyogong where it crosses the road to the left while option 2 will cross the Narok-Nairobi road near the Narok substation and run south eastern wards on the left side of the Narok-Bomet road. The two potential corridor routes which were considered are relatively broad and should environmental authorization be granted for the project, KETRACO would subsequently be responsible for the location and survey of the powerline within the preferred corridor. A more detailed description of each of the identified corridor routes is presented below.

a) Alternative Powerline Corridor Route 1 (Preferred Route)

The proposed transmission line is 81km starting from Narok substation and terminates at Bomet 132/33kV substation. The line will start from Narok Olmasharian area and run straight on the Narok North Subcounty for some of the distance before crossing to Narok South before Ololunga and run for about 8kms before crossing to Narok West at Olereut area where it then crosses to Bomet County at Mara river to Bomet East, Kapkimolwa location, Koibeiyon sublocation and it crosses the valleys, ridges, hills and rivers as crosses to Bomet central and partly Chepolungu in Cheboin and Kyogong locations before termination in Itembe location in Bomet Central subcounty in bomet substation at sachangwan area . The proposed route was carefully selected to minimize interruption of human settlement, habitat, and social amenities. Associated ground structures will avoid sensitive habitats such as wetlands and riparian land.

b) Alternative Powerline Corridor Route 2

Powerline corridor route 2 follows the main Mai Mahiu-Narok Road in a southerly direction from existing Narok Substation. for approximately 500m. The route then veers off to the south-west following an existing wheat farm next to Narok town. The line follows the Narok-Bomet Line on the left site of the road. The line mainly traverses large scale wheat farms in Narok North, Narok South and Narok west along mara and Ngorengore locations where we have some tourist and large farm airstrips as well as mara National Reserve. It then crosses to Bomet east Kapliyo sublocation in Kiplabotwa location, Longisa area, Koitasilibwet in chebolungu subcounty crossing nearby an active quarry area before crossing chepkulo river towards Kabisoge and itembe locations before terminating at sachagwan in kapkwen area.

Table 6-1: Characteristics comparative analysis of the Alternative Power line Corridor Routes

	Route 1 (Northern Corridor)	Route 2 Southern Corridor
Length	Approximately 81km in length	Approximately 93km in length
Soils	Red loam soils	Volcanic soils
Topography	Flat and gentle slope	Moderately flat to sloppy
Population density	Subsistence homesteads and subsistence agricultural fields do occur intermittently along the proposed powerline route, with the Population density increasing along the Main Road. The powerline will be aligned to avoid all homesteads where possible.	Powerline corridor route 2 is the least densely populated route with little to no human habitation in the Narok Site along the far southern site sections of the route.
Vegetation	Vegetation along the route is less dense and is characterized by low scrub, with few tall trees. The vegetation along this route is disturbed due to subsistence farming/ livestock grazing, some large-scale wheat and maize farming and the presence of homesteads in the area.	Vegetation along the route ranges from sparse, lightly dense to very dense and is characterized by tall trees because it is located towards the Maasai Mara National Reserve

Hydrology	The route crosses a number of perennial tributaries like Simwaga and rivers like Amalo and nyogores 3 places. The route does t cross 2 major rivers / water bodies. The area is characterized by well drained soils.	The route crosses several perennial tributaries of the the Mara River in five places. The route also Mara River and other small water bodies. Several dams are located within the vicinity. The area is characterized by poorly drained soils. There are lots of wheat fields (large scale)
Access	Access from the existing roads is good due to less dense vegetation. The area is well served with road network. Less access will be constructed	Access from the existing roads ranges from good along the more southern sections of the route to poor along the northern sections. Access road are few hence more access will be need
Ownership	The route traverses mainly private owned land, located within the Narok and Bomet counties	The route traverses state land, part of Mara National Reserve and large scale private farms.

Table 6-2: Ranking of the Alternative Powerline Corridor Routes

Powerline Route	Advantages and Disadvantages
Alternative Route 1 - Preferred Route	<p>Advantages:</p> <ul style="list-style-type: none"> • Shorter route (81 km); • Harder, more stable soils. • Vegetation less dense along route and more disturbed, therefore less clearing required. • Good visibility and access to powerline from existing roads. • Existing roads in good condition. • Relatively straight route. • Very far from Maasai Mara Borderline (approximately 50 km). • Very far from Mau Forest Borderline • Ecological impact of developing route will be minimal. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Route traverse private farms or properties (the powerline will be aligned to avoid all homesteads where possible); • Route has the greatest number of tributary crossings (total of five crossings).
Alternative Route 2	<p>Advantages:</p> <ul style="list-style-type: none"> • Less human habitation along route • Route has less tributary crossings that alternative 1 (total of five crossings); • Route does traverse few private farms or property; <p>Disadvantages:</p> <ul style="list-style-type: none"> • Soils are poorly drained. • Loose soils which are more erodible • Areas of dense pristine vegetation along route with tall trees / significant amount of clearing required. • Access and visibility from existing roads poor in places. • Longest route. • Routes traverse private huge farms/land;

	<ul style="list-style-type: none"> • Traverse close to Maasai mara National Reserve • Ecological impact of developing route will be significant in certain areas. • Routes are less straight, requiring additional bends which increases the cost of construction. • The route has several airships for the large-scale farmers and also tourists
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6.3.3 Preferred Transmission line Corridor Route

Based on the information in Table 6-1 and Table 6-2, the following can be concluded:

- **Alternative route 1** is the **preferred route** for the proposed powerline as it will be the shortest, most cost-effective route and will have the least ecological impact on the surrounding area
- Alternative route 2 will be the costliest route to develop as it is the longest route, has very poorly structured soils and will require a significant amount of vegetation clearing. The route is characterized by several large and small-scale wheat and maize fields and Maasai Mara National Reserve. The development of this route will also have the greatest ecological impact since it is passing close and in the direction of Masai mara which is a protected ecosystem.

6.4 Power Transmission and Evacuation alternatives

6.4.1 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.

6.4.2 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
- More effective and cheaper maintenance costs over the lifetime of the power line

Overhead power lines have been determined to be the most feasible option for the Narok-Bomet 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.

6.5 Tower Design Alternatives

Various options in terms of tower types and designs for the Narok-Bomet line were investigated by KETRACO & KPLC. 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.

6.5.1 Alternative 1 (preferred alternative) – Steel Lattice Towers

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 woodpile structures

6.5.2 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

6.5.3 Alternative 3 – Wooden poles

Wooden pole structures are only used in extreme circumstances where a visual impact needs to be avoided. 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.

6.6 Analysis of Alternative Construction Materials and Technology

The proposed Transmission Line will be constructed using modern, locally, and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that guarantees efficient use of locally available materials will be encouraged to ensure reliability in supply with minimum power loss and good design to allow efficient transmission of power from Narok to Bomet.

The design of the transmission line will be easy to install and dismantle with minimum labour requirements and maintenance costs will be minimal.

CHAPTER 7. IDENTIFICATION AND ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

7.1 Introduction

This Section identifies and discusses both negative and positive impacts associated with the proposed construction of 132kV Narok-Bomet Transmission Line. The impacts are identified across the three phases namely: Construction Phase, Operational Phase and Decommissioning Phase.

Environmental and social impacts may result from the activities that are undertaken during the construction, operation and decommissioning of the powerline and these are discussed below.

7.2 Activities Undertaken during Construction and Operation

Land Survey, Tower setting out and Site / Way-leave Clearance

The presence of the surveying team may result in potential disturbance and /or intrusion of privacy to surrounding land users. The clearing of vegetation will also be required along the route/trace to enable the construction of the transmission line infrastructure.

Land survey is an essential component of the erection of the power line and involves the establishment of each tower position within the power line corridor whereby each position is marked with pegs. This could involve driving across previously un-accessed land and the accessing of agricultural properties located adjacent to tower positions. In some cases, it may be necessary for the surveyor to clear vegetation at the tower position and to cut/trim branches off trees or bushes which may pose obstruction along the route between adjacent tower positions. The power line wayleave and substation will need to be kept cleared of vegetation throughout the life of the line.

The primary impacts will therefore be potential loss of/damage to indigenous vegetation and fauna habitat and the associated encroachment of alien vegetation, potential erosion, dust pollution and intrusion of privacy to surrounding land users. Loss of vegetation will be minimal during setting out the towers lative as the proposed route for the power line is relatively open and free of obstructions.

Construction of Access Roads

The proposed transmission line does not run parallel to an existing road network. Consequently, temporary access tracks may need to be created during construction, of the power line route. The proposed transmission line is located adjacent to rural roads and is therefore easily accessible.

The primary impacts that may result from accessing the power line route/construction of temporary access tracks include the disturbance of fauna, loss of indigenous vegetation and the encroachment of alien vegetation, potential soil compaction and/or erosion, as well as potential noise and dust pollution and intrusion of privacy to surrounding land users.

Transportation of Equipment, Materials and Equipment to Site

The transportation of equipment, materials and personnel to the active construction area is required daily. Vehicle access within a short distance of the power-line route is generally available. The possibility exists, however, that vegetation clearing may be necessary in some instances to provide access to the construction sites.

The impacts associated with the transportation of equipment, materials and workers to the site include disturbance of fauna, the loss of indigenous vegetation and the encroachment of alien vegetation, potential soil compaction and/or erosion, as well as potential noise and dust pollution and intrusion of privacy to surrounding land-users.

Foundation Excavation

The work associated with the foundation excavation activities involves the presence of a group of labourers working in a relatively small area whereby a base is dug for the foundation of each steel lattice tower and associated infrastructure. The excavated material will be deposited next to the foundation holes and will remain there until backfilling is complete. Surplus soil that remains after backfilling is usually spread out evenly around the site. At sites where rock is encountered, air compressors and pneumatic jackhammers may be used to break up the rock.

Potential environmental impacts include disturbance to vegetation and fauna, soil erosion, siltation of adjacent watercourses, noise and dust pollution resulting from the use of the heavy machinery (if required), as well as injury to people/animals accessing foundation excavations and damage to structures/degradation of properties.

Casting of Foundations

When excavations are complete, each of the required foundations will be cast whereby concrete will be poured for the purpose of the foundation. On completion of the foundations, and once the site has been restored (as far as possible) to its original condition, tower erection and stringing may commence.

As vegetation and topsoil will be removed in order to excavate the foundations, some erosion / sedimentation of watercourses could occur during the course of backfilling and prior to the reestablishment of vegetation in the footprint area. However, this may only be a problem if excavation occurs on sensitive vegetation or on a sloped area. There may also be potential disruption to residents and/or damage to structures, fences and vegetation caused by heavy vehicles and from vibration when backfill is compacted which, in turn, may lead to noise and dust.

Tower Erection

This will involve the erection of the steel lattice towers. The erection of the tower structures may cause disruptions to residents; however, the towers are fully assembled before they are erected, decreasing the potential for falling objects to cause damage to property and injury to persons and animals.

Tower Dressing and Stringing of Conductors

Stringing involves the unspooling of the conductor from rolls and laying this out approximately where it is to be attached to the structures. The conductor is then elevated, attached, and tensioned before being secured at the next structure. This typically involves a team of labourers and vehicles moving between towers – route sites in as straight line as possible. This may cause noise and disruptions to residents near the construction activities.

Line Inspection and Maintenance

Line inspection is undertaken by KETRACO when construction is complete. Routine line inspections are undertaken at regular intervals which generally involve one or two people moving from tower to tower and making a visual examination, of the line from the ground. Line inspections are also undertaken after there has been a fault on the line to establish the fault location and to determine if any permanent damage has resulted from the fault. Actual repair and maintenance work carried out on overhead lines is generally infrequent and

minor in nature i.e., the replacement of a damaged insulator set or the *in-situ* repair of a damaged conductor. It is seldom necessary to lower conductors to the ground for repairs or to bring in stringing equipment, particularly on 132kV power lines.

7.3 Life of Operation

The power line will become a permanent feature of the landscape, visible from several vantage points, thereby having a potential visual impact/impact on aesthetics. The landscape is already crossed by existing power lines.

The proposed development of the power line over approximately 81kms could potentially impact on heritage resources present within the power line route. The presence of the power line also has the potential to impact on birds, either through collisions or by electrocution, particularly where power lines pass over rivers and drainage lines, which are natural flight paths for avifauna.

The impact of corona (low ‘buzzing’ or ‘crackling’ noise) from the power line has been considered as a potential impact. Corona can be caused by water droplets forming on a conductor resulting in the breakdown of air molecules perceived as the crackling noise. However, corona rings are used by KETRACO on conductors to stop this.

7.4 Impact Identification and Assessment

Several environmental impacts (positive and negative) associated with the proposed project were identified through public participation process and using experts’ judgment method. The following section highlights the impacts anticipated throughout the lifecycle of the proposed project. The associated impact assessment tables for each impact will be categorized according to project phases, prior to and post mitigation. Effects of activities are categorized as negative impact and or positive impact.

The summary of the main potential impacts of the proposed project are listed in **Error! Reference source not found.** and analyzed into different categories based on stakeholder’s views and perceptions as well as the consultant’s experience and trainings in undertaking ESIA of similar nature.

The project impacts are classified as positive or negative. However, the study goes further to categorize the impacts in terms of direct or indirect, temporary, or permanent, major, or minor.

7.5 Assessing significance of Impacts

The following criteria were used to assess the significance of potential impacts of the proposed project.

Table 7-1: Summary of magnitude of potential impacts

Severity of Impact	Rating
Negligible	1
Minor	2
Marginal	3
Significant	4
Catastrophic	5
Probability of Impact	Rating
Negligible	1
Highly unlikely	2
Likely	3
Highly likely	4
Catastrophic	5
Geographic Extent of Impact	Rating

<500M ²	1
500m ² -999m ²	2
1Km ² -10Km ²	3
11Km ² -100Km ²	4
>100Km ²	5
Duration of Impact	Rating
< 1month	1
1- 12 months	2
13-36 months	3
37-72 months	4
>72 months	5
Frequency/duration of activity	Rating
Annually or less	1
6 monthly/temporary	2
Monthly/infrequent	3
Weekly/life of operation	4
Daily / permanent	5
Frequency of impact Rating	Rating
<11 events/year	1
11-50 events/year	2
51-100 events/year	3
101-200 events/year	4
>200 events/year	5

Table 7-2: Consequence tabulation table (severity+ Geographic extent + Duration of the impact)

Consequence (Severity+ Geographic extent + Duration of the impact)															
Likelihood (Frequency of Activity+ frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
2	4	6	9	12	15	18	21	24	27	30	33	36	39	42	45
3	6	9	12	16	20	24	28	32	36	40	44	48	52	56	60
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64
5	10	15	20	24	28	32	36	40	45	50	55	60	65	70	75
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128
9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160

Table 7-3: Impacts Significance rating, value, and respective colour code

Significance rating	Value	Colour code	Negative impact Management Recommendation	Positive impact Management Recommendation

Very high	126-150		Propose mitigation measures	Maintain current management
High	100-120		Propose mitigation measures	Maintain current management
Medium high	77-105		Propose mitigation measures	Maintain current management
Low medium	52-75		Maintain current management	Improve current management
Low	20-50		Maintain current management	Improve current management
Very low	4-24		Maintain current management	Improve current management

7.6 Assessment of impacts

The key impacts identified for the proposed project are highlighted according to the relevant project phases. The Experts utilized precautionary principles to establish the significance of impacts and their management and mitigation. The following criteria was applied in rating/computing significance of impacts.

(a) Total Significance = Likelihood X Consequence

(b) Likelihood = Frequency + Probability

(c) Consequence = Extent + Duration + Severity

7.7 Positive Impacts of the Proposed Transmission Line

The positive impacts associated with the proposed 132kV transmission line project during construction, operation and decommissioning phases are discussed in the following sections.

a) Creation of employment opportunities

The proposed project will generate job opportunities (skilled and unskilled labour) during construction and operation phases. Different types and level of employment opportunities are anticipated during construction, operation and decommission. Though the approximate number of workers to be employed by the proposed project is not yet known, it will contribute to easing unemployment level in the affected counties. Creation of employment opportunities has both economic and social benefit. In the economic benefit, abundant unskilled labour will be used in economic production while socially these young and energetic otherwise unemployed people will be engaged in productive employment other than remaining idle. Employees with diverse skills are expected to work on the site during the construction period. There is also trickledown effect to the economy at large resulting from the employment opportunities as well as services provided through this project.

b) Provision of Market for Supply of Building Materials

The project will require supply of small quantities of building materials most of which can be sourced locally in Bomet / Narok towns like cement, concrete, and sand. This provides ready market for local enterprises with such materials.

c) Boosting of the informal sector

During the construction phase of the proposed Transmission Line, it is expected that the other businesses in the informal sector will flourish. These include activities such as hotel and accommodation, shops, artisan industries and food vending who will be benefiting directly from the construction, operational and decommissioning staff members who will be buying commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

d) Gains in the Local and National Economy

There will be gains in the local and national economy because of the construction of Narok-Bomet powerline through consumption of locally available materials including timber, glasses, metals, and cement among other construction materials. The consumption of these materials in addition to fuel oil and others will attract taxes including Value Added Tax (VAT) which will be payable to the government. The cost of the materials will be payable directly to the producers.

e) Accessibility

The development of an access road to the site will help nearby residents to have an easier accessibility to their premises.

f) Compatibility with existing and proposed land uses

As mentioned in the previous sections of this report, the proposed project site is located along Narok-Bomet stretch which is mainly dominated by maize and wheat farming in the Narok part. In the Bomet area, it is characterized by Maize, coffee, horticultural and other subsistence establishments. The line also runs parallel to the existing 33kV in some places in Bomet and Narok. There are also proposals to develop some light industries in Bomet town. Furthermore, the two towns are characterized by the existence of several communication masts. The proposed project is therefore compatible with the existing development as well as future land-uses. The proposed project will not conflict with the existing and perhaps future developments in the area. Farming can be done below the line for short season crops hence the project will not affect farming. Most of structures to be affected will be relocated within the vicinity hence no complete resettlement is anticipated.

g) Environmental Benefits

There will be reduction in environmental degradation due to use of steel towers/pylons instead of using wooden based poles. Furthermore, the presence of KETRACO with its well elaborate Corporate Social Responsibility (CSR) on environment conservation will help communities in improving farm forests participation in afforestation programs.

h) Local Benefits and Opportunities for Electricity Supply

Aspects and Impacts

The development of the powerline will result in the provision of an essential social service in providing electrification to many households. In addition, there are some opportunities for job creation in the local market during construction i.e., waste removal, catering, bush clearing and rehabilitation.

Construction Phase

Table 7-4 below summarizes and assesses the significance of the potential local benefits during the construction phase both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-4: Impact Significance Determination Rating for Local Benefits during the Construction Phase

Mitigation	Extent	Duration of impact	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	11Km ² -100Km ²	1 - 12 months	Minor	Daily	Likely	8	8	Low-medium
	4	2	2	5	3			64
Mitigation measures	<ul style="list-style-type: none"> Local labor will be sourced for the construction activities where possible. Construction will involve, wherever possible, labor-intensive methods and practices Construction personnel will undergo training in general construction procedures as well as policies and practices i.e., operational health and safety requirements, and should be provided with a general background in environmental matters and the importance of complying with the ESMP. 							
With mitigation	11Km ² -100Km ²	1 - 12 months	Marginal	Daily	Highly Likely	9	9	Medium High
	4	2	3	5	4			81

Operational Phase

Table 7-5 below assesses the potential operational related benefits and opportunities for electricity supply both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-5: Impact Significance Determination Rating for Opportunities ofr Electricity Supply during the Operational Phase.

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	11Km ² -100Km ²	>72 Months	Minor	Daily	Highly Likely	11	9	Medium High
	4	5	2	5	4			99
Mitigation measures	<ul style="list-style-type: none"> KETRACO should ensure sufficient budget is assigned for ongoing maintenance of the powerline infrastructure. Proper monitoring, evaluation, and audits to be done systematically to ensure implementation of all aspects go on as planned Adequate maintenance of infrastructure to enhance stability and reliability 							
With mitigation	>100Km ²	> 72 Months	Significant	Permanent	Highly likely	14	9	Very High
	5	5	4	5	4			126

The proposed powerline will contribute to electricity supply and infrastructure development in the Narok and Bomet counties and their environs, thereby supporting improved social services and improved basic living conditions for the residents of the area. The overall significance rating in terms of local benefits during the construction phase is considered Medium high (**positive**), while the overall significance rating in terms of local benefits and opportunities for electricity supply during the operational phase is considered **Very high (positive)**.

7.8 Negative Environmental impacts

The following are the potential impacts of the proposed project:

7.8.1 Impacts on Soils and Geology

Soil erosion impact from vegetation clearance

The building of foundations for transmission line towers can potentially exacerbate soil erosion. In addition to the loss of productive land due to soil erosion and land acquisition for tower construction, soils can be impacted because of disposal of waste materials, and compaction with heavy machinery used for the establishment of towers and the transmission line.

Vegetation clearance and foundation works would expose soils in the affected areas and leave them vulnerable to erosion by heavy rainfall and surface runoff.

Increased erosion potential and sedimentation

The proposed project site is covered with soils which can easily be eroded by storm water or overland flows. The situation could be compounded further by the steep topography of some sections of the proposed transmission route and site. It is anticipated that soil erosion will occur during site preparation especially during rainy conditions once the vegetation which binds this loose soil is stripped away. During operation phase, the risk of erosion is low.

Contamination of soil

The potential sources of soil contamination during construction phase are oil /fuel leaks or spills from machinery used in site preparation such as trucks used in transporting construction materials. Depending on the size and source of the spill, liquid and gaseous state, petroleum hydrocarbons may remain mobile for long periods of time, threatening to pollute groundwater.

During operation phase soil contamination is not anticipated because of the presence of the concrete paved surface which will prevent any potential contaminant from reaching the subsurface layers and is thus not assessed. During decommissioning phase, soil contamination could occur especially with the use of machinery in demolition of the facility.

Weakening of the geological stability

The site preparation activities particularly excavation and stripping will potentially weaken the geological stability of the site and consequently leading to land slipping/sliding. This is attested by the fact that some sections of the proposed transmission are on sloppy areas with sandy-loam soil deposits found at the site are vulnerable to slippage if not supported on all sides. Similar effects will be expected during decommissioning phase when the facilities at the site are demolished.

Effects on the geological stability are not anticipated during the operation phase because there will be no excavation or any activity that can interfere with subsurface layers and hence this is not assessed.

Aspects and Impacts

The development of the powerline will involve vegetation clearing leaving exposed soil surfaces which have the potential to erode easily if left uncovered. Excavated material will be deposited next to the foundation holes prior to backfilling, and surplus soil, after backfilling of foundation excavations, is usually spread out evenly around the construction site. If foundation excavations for the powerline towers occur on unstable

ground, along with the effects of vegetation clearing, erosion of topsoil by wind and water, as well as gully erosion, may occur until the area is re-vegetated.

The primary impact on soils is therefore the potential loss of soils / soil erosion.

Impact rating for soil and Geology during construction phase

Table 7-6 Table 7-6 below assesses the potential construction related impacts on soils both with and without Mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-6: Impact Significance Determination Rating for Impacts to Soils and Geology during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500M ²	1 - 12 months	Minor	Daily	Likely	5	8	Low
	1	2	2	5	3			40
Mitigation measures	<ul style="list-style-type: none"> • During the foundation excavations, it is recommended that excavated material is stockpiled a sufficient distance from the excavation. • Material to be backfilled will be compacted to limit the possibilities of erosion; Backfilling of foundations Will occur as quickly as possible; and • Unchanneled flow of water at the site during construction should be controlled to avoid soil erosion. • The contractor will ensure recovery of exposed soils with grass and other ground cover as soon as possible. • The project will ensure monitoring of areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled. • The contractor Will ensure that construction related impacts like erosion and cut slope destabilizing should be addressed through landscaping and grassing, carting away and proper disposal of construction materials in the various site works. • The contractor will ensure that recommended compaction of spoil areas is undertaken and effective drainage of spoil sites in order to avoid land instability in form of soil subsidence, slip and mass movement.; • The contractor will ensure landscaping of the completed site. • Areas compacted by vehicles during site preparation and construction should be scarified (ripped) by the contractor to allow penetration of plant roots and the re growth of the natural vegetation • The contractor will ensure wastewater generated is discharged or drained into approved drainage facilities • The contractor will ensure planting and irrigation of cut and fill slopes as well as installation of erosion control and drainage devices that comply with the requirements of Factories (Building Operations and Works of Engineering Construction) Rules 1984 							

	<ul style="list-style-type: none"> • Proper drainage channels and leveling especially of the access road to reduce run-off velocity and increase infiltration of rainwater into the soil. Proper compaction will also be done along the access road. • Within the project site, construction vehicles will be restricted to designated areas to avoid soil compaction, while any compacted areas will be ripped to reduce run-off. Caution will be required during construction at times of heavy rains. • Re-vegetation will be done in exposed areas around the site to mitigate erosion of soil by storm water runoff. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding Remarks

Due to the localized and small-scale effects of the excavation and the gentle slope of the land the overall significance of the construction related impacts on soils is **low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented.

7.8.2 Impacts on Flora and Fauna

Aspects and Impacts

The construction of the transmission line infrastructure will involve vegetation clearing at the transmission line wayleave and access road/from valuation data in the RAP studies done in 2021, Approximately 40,000 trees of different species will be cleared Exposed soil surfaces have the potential to erode easily if left uncovered which could lead to further loss of vegetation. Excavated material will be deposited next to excavations and will remain there until backfilling is complete. This will entail the temporary covering of surface vegetation and may lead to damage of vegetation if left covered for too long a period. Further vegetation / habitat loss may result due to the creation of temporary access routes during construction. The clearing of indigenous vegetation during construction may also result in the further encroachment of alien vegetation onto the site. There is also the potential for injury or death to animals accessing the site because of construction activities i.e., injury / death resulting from the operation of heavy machinery used to construct the transmission line facilities, falling into foundation excavations, etc.

The proposed route is characterized by several plant species which include indigenous trees like *Balanites aegyptiaca*, *Cordia monoica*, *Dovyalis Abyssinica*, *Bersama abyssinica*, *Rauvolfia caffra*, *Zanthoxylum chalybeum*, *Albizzia gummifera*, *Figus thorningii*, *Rubus volkensii*, *Rubus pinnatus*, *Rhoicissus revoilii*, *Croton macrostachyus*, exotic species including (mango tree) and *azidiracta indica* (neem tree), Eucalyptus, Cypress and gravellea mainly found along the entire route particularly in areas of higher rainfall while *Acacia Karkii*, Flat top acacia and lantana Camara on the lower side of the Route in Kobeiyon and Kiptulwa area. These plants will be removed during construction phase and consequently result in loss of their ecological as well as their other values; economic and medicinal. During operation plants along the wayleave will also be cleared. During decommissioning phase there will be no effect on the terrestrial ecology because the site would not have any vegetation, but the area will be rehabilitated to improve on the vegetative cover of the area. *Olea capensis*

The disturbance caused by construction can encourage these aggressive, invasive species to proliferate. Some exotic species, once introduced, have few local natural controls on their reproduction and easily spread due

to their invasive capability. Their spread can alter the ecology of a forest as they out-compete native species for sunlight and nutrients, further reducing suitable habitat and food sources for local wildlife.

Minor permanent loss of vegetation will occur due to the establishment of ROW and construction activities.

Table 7-7 below assesses the potential construction related impacts to flora and fauna both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table

Table 7-7: Impact Significance Determination Rating for Impacts to Fauna and Flora during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ² -999m ²	1 - 12 months	Significant	Daily	Likely	8	8	Low medium
	2	2	4	5	3			64
Mitigation measures	<ul style="list-style-type: none"> Vegetation removal will be kept to a minimum during construction of the substation and powerline / vegetation should be cleared only as and when required. Care will be taken to remove topsoil and then subsoil and to stockpile these separately to be replaced at a later stage to facilitate revegetation. The amount of time vegetation is covered by stockpiled material should be minimized. Temporary access routes to construction areas will be kept to a minimum. Re-vegetation using indigenous species and rehabilitation of areas temporarily cleared during construction will occur. Alien vegetation should be removed from site on completion of construction. Construction personnel will be properly trained to use equipment, particularly in terms of the dangers associated with the operation of heavy plant machinery; and Following completion or partial completion of construction activities, excavations will be barricaded to prevent injury to animals accessing the site. 							
With mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	6	Low
	1	2	3	4	2			36

Concluding remarks

Due to the localized and small-scale effects vegetation removal, the overall significance of the construction related impacts on fauna considered to be **low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented.

assesses the potential operational related impacts on flora and fauna both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-8: Impact Significance Determination Rating for Impacts Flora during the operation Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Monthly	Likely	6	6	Low-
	1	2	3	3	3			36
Mitigation measures	<ul style="list-style-type: none"> The on-going management of the power line will include the removal of alien vegetation that may have encroached onto the site. If herbicides will be required for the control of vegetation within the power line servitude, only trained personnel should handle and apply the herbicides and applications should not occur before or after rain periods. Alien plant areas will be monitored during operation and further spreading of alien vegetation should be controlled 							
With mitigation	500m ²	1 - 12 months	Minor	6 monthly	Highly unlikely	6	4	Very low
	1	2	2	2	2			24

Concluding remarks

The preferred route for the 132kV Narok-Bomet transmission line extends through a subsistence agricultural area and the vegetation will be disturbed due to the presence of livestock and homesteads. The route follows existing roads and tracks and therefore will not require the construction of long access roads. Due to the localized extent of the development and medium-scale nature of the development the overall significance of the construction related impacts on flora and fauna is medium **high** while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented.

7.8.3 Air quality

Decreased air quality due to dust emission

During construction phase, potential dust pollution will emanate from site preparation activities such as stripping and excavation particularly if it takes place during dry weather conditions. Dust emissions might impact on the visibility of the nearby roads consequently impacting on the traffic safety. Air emission from construction machinery, including dust, is regarded as a nuisance when it reduces visibility, soils private property, is aesthetically displeasing or affects palatability of grazing. This is expected during construction works. Dust will be generated from construction earthworks, transportation activities and aggregate mixing. Emission is not anticipated during operation phase because the site surface will be concrete paved and hence limited or no generation of dust. While during decommissioning phase, dust emission would be generated from debris and soil resulting from demolition process.

Fugitive emissions

During construction phases, fugitive emissions are expected from the diesel operated construction machinery and vehicles. Similar emissions to those for construction phase are expected during decommissioning phase. The emissions will be generated from the machinery used in demolition work.

Air Pollution from Incidents

Potential air pollution could occur because of fire or explosion incidents during operation phase. Such emissions will impact on the visibility hence impacting on the traffic safety on the nearby roads. The spatial extent of the impact will depend on the prevailing climatic conditions.

Proposed Mitigation Measures for Air Quality

7.8.4 Dust Emissions

- During construction, any stockpiles of earth will be enclosed /covered/watered during dry or windy conditions to reduce dust emissions.
- Construction trucks moving materials to site, delivering sand and cement to the site Will be covered to prevent material dust emissions into the surrounding areas.
- All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction.
- During construction, where necessary, sprinkle loose surface earth areas with water to keep dust levels down.
- Masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- Drivers of construction vehicles must be sensitized so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO_x, SO_x and suspended particulate matter.
- High levels of dust concentration resulting from demolition or dismantling works will be minimized as follows:
 - Watering all active demolition areas as and when necessary.
 - Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
 - Apply water when necessary or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.

Fugitive Emissions

- The Contractor shall ensure that the construction machinery and equipment are appropriate and fit to prevent fugitive emissions, as per national standards or international practices. The Proponent shall ensure the regular maintenance of this equipment.
- A maintenance plan for the construction machinery and vehicles shall be implemented to prevent excessive emissions during the construction phase of the project.
- Vehicle idling time shall be minimized
- Alternatively, fueled construction equipment shall be used where feasible
- Equipment shall be properly tuned and maintained
- Emissions of other contaminants (NO_x, CO₂, SO_x, and diesel related PM₁₀) that would occur from Vehicle exhaust emissions could be reduced by maintaining vehicles in good state of service, fuel and lubricants to be of standardized quality and sourced from approved suppliers.

This will also be achieved through proper planning of transportation of materials to be used during construction of the project to ensure that vehicle fills are increased to reduce the number of trips done or the number of vehicles on the road.

Table 7-9: Impact Significance Determination Rating for Air pollution during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -999m ²	1 - 12 months	Minor	Daily	Likely	6	8	Low
	2	2		5	3			48
Mitigation measures	<ul style="list-style-type: none"> • During construction, any stockpiles of earth will be enclosed /covered/watered during dry or windy conditions to reduce dust emissions. • Construction trucks moving materials to site, delivering sand and cement to the site will be covered to prevent material dust emissions into the surrounding areas. • All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. • During construction, where necessary, sprinkle loose surface earth areas with water to keep dust levels down. • Masks will be provided to all personnel in areas prone to dust emissions throughout the period of construction. • Drivers of construction vehicles must be sensitized so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered. • Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO_x, SO_x and suspended particulate matter • The Contractor will ensure that the construction machinery and equipment are appropriate and fit to prevent fugitive emissions, as per national standards or international practices. The Proponent shall ensure the regular maintenance of this equipment. • A maintenance plan for the construction machinery and vehicles shall be prepared and implemented to prevent excessive emissions during the construction phase of the project 							
With mitigation	500m ² -999m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

7.8.5 Pollution from Waste generation

Solid waste anticipated to be produced during site preparation, electromechanical and civil works include spoil from excavations, scrap metal, mortar, wood, paper, masonry chips and left-over food stuff. Effects of mismanaged waste include:

- Public nuisance due to littering or smell from rotting
- Creation of breeding grounds from vermin like rats and cockroaches
- Contamination of soils and water courses

Construction material waste will include:

- Earthworks

- Wastepaper
- Cuttings from vegetation
- Redundant sections of pre-stressed concrete
- Excavated soil

Several wastes will be generated throughout the project cycle. During construction phase, waste will be generated from construction activities, domestic waste from construction team, waste oil and lubricants, containers of used construction materials, parts generated from vehicle and machinery maintenance.

During operation phase, waste to be generated include domestic waste generated by the operation staff at transmission substation, components/parts of the facility's infrastructure being removed during replacement, vegetative wastes from ROW clearance during routine maintenance and redundant electronic equipment.

During decommissioning phase, the main waste generated will be demolished parts of the facility which include concrete boulders, scrap metals, plastics, and rubber among others.

Proposed Mitigation Measures

- The contractor will prepare and adhere to the site waste management plan
- KETRACO and Contractor should ensure that spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and the rehabilitation, in the correct order which they were removed that is topsoil last.
- The contractor will separate hazardous waste from non-hazardous. Hazardous wastes included waste contaminated with petroleum product. Waste should then be handled, collected, transported, and disposed according to the Environmental Management and coordination (waste management) regulations of 2006.
- KETRACO will ensure that waste is recycled and re-used where possible. Recycling bins for glass, metal, newspaper, plastic bottles, and other recyclable site solid wastes should be provided onsite and/or for the site curbside collection. Waste that cannot be re-used on site should be transported to the correct yard to be specified by KETRACO
- For waste handling the contractor will provide litter collection facilities such as bins
- The contractor will comply with the requirement of OSHA ACT 2007 and Building rules on storage of construction materials
- No burning of trash will be done on site.
- Any personal effects like food packaging will effectively be removed by the contractor to appropriate disposal points.
- Additional recommendations for minimization of solid waste during construction of the proposed Transmission Line between Narok-Bomet and substation include: -
 - Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time
 - Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
 - Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- Use of construction materials containing recycled content where possible and in accordance with accepted standards

Table 7-10: Impact Significance Determination Rating for Impacts on Solid waste generation during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Likely	6	8	Low Medium
	1	2	3	5	3			48
Mitigation measures	<ul style="list-style-type: none"> The contractor will prepare and adhere to the site waste management plan KETRACO and Contractor will ensure that spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and the rehabilitation, in the correct order which they were removed that is topsoil last. The contractor will separate hazardous waste from non- hazardous. Hazardous wastes included waste contaminated with petroleum product. Waste should then be handled, collected, transported, and disposed according to the Environmental Management and coordination (waste management) regulations of 2006. KETRACO will ensure that waste is recycled and re-used where possible. Recycling bins for glass, metal, newspaper, plastic bottles, and other recyclable site solid wastes should be provided onsite and/or for the site curbside collection. Waste that cannot be re-used on site should be transported to the correct yard to be specified by KETRACO For waste handling the contractor should provide litter collection facilities such as bins The contractor should comply with the requirement of OSHA ACT 2007 and Building rules on storage of construction materials No burning of trash will be done on site. Any personal effects like food packaging will effectively be removed by the contractor to appropriate disposal points. Contractor on site MUST have a NEMA licensed waste handler to always collect any waste residue and dispose effectively Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2		1	5			2

Concluding remarks

Due to the localized and small-scale effects of solid waste generation the overall significance of the construction related impacts from solid waste generation is **Low medium** while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented including implementation of pollution prevention and waste management plans by contractor supervised by KETRACO.

7.8.6 Impacts on Water Quality and Water Resources

The construction of towers may interfere with the natural drainage systems and modify flow of surface water, and these changes can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams and other drainage channels.

The proposed route traverses several water courses which are located at different distances from the proposed pylon sites ranging from 100m to about 300metres. These water courses have a potential to act as the final destination for the storm water and wastewater generated from the construction sites along the proposed transmission route. Effluent discharged from cement slag during substation and Transmission line foundation construction, can all pose pollution risks to streams intercepting the transmission line route. Although temporary in nature, these impacts can be ongoing if disused work sites are not rehabilitated, and adequate drainage works constructed to prevent erosion.

During construction phase there could be impacts on the quality of river's water due to soil erosion at the site. In addition, oil spills or leaks from the construction machinery and vehicles could be washed down to the rivers resulting in water pollution. Similar situation is expected during decommissioning phase when the facilities are removed from the site for other development.

During construction phase, soils which are potentially contaminated with fugitive oil spills from construction machinery and wash down by storm water may pollute the aquatic environment of the different water courses. Oils are known to have detrimental effects on the aquatic organisms such as fishes and ultimately on humans.

Whereas during operation phase, no effect is anticipated on the aquatic environment however in case of accidental spills from the transformers or septic Sewerage spills from the transmission substation it may contribute to increase in Biological Oxygen Demand (BOD) in aquatic environment. High BOD levels deplete dissolved oxygen in the water making it difficult for the aquatic organisms such as fish to survive. During decommissioning phase, potential impact on the Aquatic environment might be due to debris contaminated with fugitive oil spills from the demolition machinery that finally reaches the nearby rivers.



Plate 7-1: Sections of Amala River to be crossed by the line in Bomet and Narok border in Kapkimolwa and Ilmotiok areas

Aspects and Impacts

Exposed soil surfaces can erode easily through the action of both wind and water which in turn can lead to the siltation / sedimentation of down slope watercourses. Although the use of cement on-site will be minimal (i.e., for the casting of foundations for the powerline), inappropriate use and / or storage of concrete on-site can also result in the pollution of nearby watercourses. Seepage from spilled fuels and oils and leaking plant machinery can also negatively impact on adjacent surface water courses which could lead to the potential contamination of groundwater.

Impacts on water quality during operation of the transmission are not anticipated but water use will follow guidelines in the water Act,2006

Construction Phase

Table 7-11 below assesses the potential construction related impacts on water quality both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-11: Impact rating for water quality during construction phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -999m ²	1 – 12 months	Minor	Daily	Highly unlikely	6	7	Low
	2	2	2	5	2			42
Mitigation measures	<ul style="list-style-type: none"> • Unchanneled flow of water at the site during construction will be controlled to avoid soil erosion. • Storage areas that contain hazardous substances will be bunded with an approved impermeable liner and size of storage areas should be kept to a minimal working area to prevent seepage into the ground and water sources. • The excavation and use of rubbish pits during construction should be strictly prohibited. A waste disposal area will be designated within the active construction area, and this should be equipped with suitable containers i.e. skips or bins of sufficient capacity and designed to contain and prevent refuse from being blown by wind, thereby preventing the potential pollution of surface water and surrounding areas by litter; • Care will be taken during concrete pouring activities to ensure there is no pollution of surface water and the surrounding areas during the undertaking of this activity. • Vehicles and equipment should not be washed, serviced, or re-fueled on-site, but taken to a relevant workshop or service station to prevent potential contamination of surface water and surrounding areas by these pollutants; and • Areas contaminated by spilled concrete and / or fuels and oils leaking from vehicles and machinery should be cleaned immediately. • Siting of towers away from drainage lines and floodways can also minimize interference to natural drainage systems. • Limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass. 							

	<ul style="list-style-type: none"> Remedial measures shall be implemented by the Contractor in the event of erosion resulting in the sedimentation of surrounding areas after due consideration of the costs and benefits of such removal activity. Infrastructure shall be designed to ensure that contaminated run-off does not reach watercourses. In the event of an oil spill the procedures contained in the emergency response plan will come into effect. A surface monitoring system, including flows and water quality, shall be established, and implemented for the duration of the operation of the facility. Vehicle maintenance and service should be done away from project site in approved garages or service stations to avoid any possible oil and fuel spills that could contaminate soils and possibly ground water quality. Construction materials containing fine particles e.g., aggregates will be stored in an enclosure away from water bodies to ensure that sediment laden water does not drain into nearby water courses. Ensure that potential sources of petro-chemical pollution are handled in such a way to reduce chances of spills and leaks. Train work crews in safe handling of petro-chemicals. Minimize soil sedimentation by developing sediment control mechanism. Contractor to make suitable arrangements for water requirements and to provide alternative supply to any users affected by contractor's abstraction of local water source. 							
With mitigation	500m ² -999m ²	1 – 12 months	Negligible	Daily	Negligible	6	6	Low
	2	2	1	5	1			36

Concluding Remarks

As the construction activities are largely confined within right of way and will occur on a once-off basis over a short duration, and due to the localized area of impact, the overall significance of the construction related impacts on water quality is **low**, provided the necessary mitigation / management measures are implemented.

7.8.7 Noise and vibration

Aspects and Impacts

Noise resulting from access road and transmission line construction may disturb neighboring communities and local fauna. This impact will be of a temporary nature only and can be minimized by adopting appropriate mitigation measures including maintaining equipment and vehicles to manufacturer's standards and limiting operating times to daylight hours.

During construction of the proposed project, several machineries such as excavator and graders mixers among others will be utilized. These machineries and construction vehicles will generate noise of varying magnitudes. From the prediction of the specialist study on ambient noise quality measurements, the traffic noise that will be emitted by traffic accessing the proposed project site during construction, operational and decommissioning phases is expected to have an adverse impact on ambient noise. The level of traffic noise will increase depending on the traffic volume. General guide indicates that an increase of 20% in traffic volume approximates to a noise level increase of around 1 dB, while a doubling of traffic volume results in a noise level increase of about 3 dB. It is however, worth noting that the level of noise is attenuated with increase in

distance from the source and thus the sites/objects in close proximity to the source will receive more noise in comparison to those at remote location.

During operation phase noise generation will come from corona effects especially when loading is high. The amount of noise will depend on the power load and the technology used during construction. Power lines may have noise impacts in the form of corona (low 'buzzing' or 'crackling' noise). Corona can be caused by water droplets forming on a conductor and causing the breakdown of air molecules perceived as the crackling noise. Noise impacts during construction of the powerline are not considered to be significant enough to warrant a formal assessment.

As will be the case with the construction phase, the sources of noise during decommissioning phase, will be mainly machinery and vehicles used in demolition of the facility and removing the materials from the site.

Construction Phase

Table 7-12 below assesses the potential construction related noise impacts both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-12: Impact Significance Determination Rating for Noise Related Impacts during the construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 -12 months	Marginal	Daily	Likely	6	8	Low
	1	2	3	5	3			48
Mitigation measures	<ul style="list-style-type: none"> Used of noise-suppression techniques to minimize the impact of temporary construction noise at the project site. Install portable barriers to shield compressors and other small stationary equipment where necessary. Use equipment designed with noise control elements. Co-ordinate with relevant agencies regarding all construction. Limit vehicles to a minimum idling time and observe a common-sense approach to vehicle use and encourage drivers to switch off vehicle engines whenever possible. Set and observe speed limits and avoid raving of Engines Control the project area to avoid unnecessary access by idlers The Contractor shall ensure that construction activities are limited to working hours (i.e., between 8am and 5pm daily) from Monday to Saturday, or as required in terms of legislation and/or negotiated with local landowners. Contactor 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 centimeters per second beyond any source property boundary or 30 metres from any moving source. Noise generating equipment will be designed to control and dampen noise emissions and will be located at a distance far enough from the nearest noise sensitive development, to ensure that the increase in ambient noise level will comply with NEMA standards. Landowners, residents and public shall be able to register their complaints and concerns about noise through complaints register set up prior to the commencement of construction activities (See communication and information programme). These public complaints should be responded to as a matter of urgency and where possible measures must be taken to minimize the noise levels Compliance with the recently issued Noise and Vibration Regulations of 2009 is expected at all the phases of the project. With Modern Technology Transmission Line produce insignificant noise during their operation from the corona. The best mitigation measure for the proposed Transmission Line is to use modern technology 							

	and for the authorities to ensure no illegal squatting/ encroachment and settlement along the project area.							
	<ul style="list-style-type: none"> Construction works to be undertaken between 8 and 5pm 							
With mitigation	<500m ²	1 - 12 months	minor	Daily	Highly unlikely	5	7	Low
	1	2	2	5	2			35

Concluding remarks

Noise generation will not be continuous. Due to the localized and small-scale effects of noise generation the overall significance of the construction related impacts from is considered to be **Low**, while the operational related impact is considered to be **low**, provided the necessary mitigation / management measures are implemented

Operational Phase

Table 7-13 below assesses the potential operational related noise impacts both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-13: Impact Significance Determination Rating for Noise Related Impacts during the Operational Phase

Mitigation	Extent	Duration	Severity	Frequen cy of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low
	2							42
Mitigation measures	<ul style="list-style-type: none"> Corona rings may be used to prevent corona if found necessary. Stabilizing voltages during peak to reduce overload that creates noise Spacing on conductors adequate to avoid collision causing sparks and noise Mechanical Maintenance to be done during the day with technicians having appropriate PPEs (ear protection) Measuring of levels especially during audits o ensure they are within permissible levels 							
With mitigation	<500m ²	1 - 12 months	Negligibl e	Daily	Highly unlikely	4	7	Low
	2							28

Concluding remarks

As corona is generally insignificant in 132kV transmission line and impact is largely confined within the wayleave corridor, , the overall significance of the operational related impacts is considered to be low because no settlements are allowed within the corridor.

7.8.8 Visual Intrusion and aesthetic impacts

Impact on the visual landscape and Aesthetic

The overall aesthetic effect of a transmission line is likely to be negative to most people especially where proposed line would cross natural landscapes. The tall steel lattice structures may seem out of proportion and not compatible with rural and agricultural landscapes or wetlands. Some people may find transmission lines bordering their property particularly disruptive to scenic views. Some people, however, do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain our everyday lives and activities. To others, the transmission lines may be viewed in a positive light because it represents economic development. Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight)
- The activity of the viewer (living in the area, driving through or sightseeing)
- The background, or context, of the transmission line, such as whether the line stands out or blends in

A transmission line can affect aesthetics by:

- Removing a resource, such as clearing fences that provide visual relief in a flat landscape.
- Degrading the surrounding environment (intruding on the view of landscape)
- Enhancing a resource (evoking an image of economic strength in a developing business or industrial area)

Aspects and Impacts

Noise pollution may occur because of the operation of mechanical machinery on-site during construction and the coming and going of vehicles, particularly large trucks may be a source of disturbance, especially to the

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m2-999m2	1 - 12 months	Minor	Daily	Likely	6	7	Low
	2	2	2	5	3			42
Mitigation measures	<ul style="list-style-type: none"> • Review the visual intrusiveness of the current tower design and consider engaging local industrial designers to generate a functional, aesthetic and environmentally friendly tower design. • Where possible, straight-line runs are maximized so that the need for angle towers, which have a more negative visual impact due to their heavier construction, is minimized. • Where possible the proposed transmission line route will be located adjacent to, and parallel to an existing 132kV and 66kV line. This limits effects to an already disturbed area, rather than creating a new, discrete second corridor and impact zone. • Where possible the proposed transmission route will be located adjacent to already existing high – impact visual features, such as forests or cliff. • Where two lines are parallel, new towers will be constructed adjacent to existing towers, when possible, to minimize visual ‘clutter’; • Existing tracks will be used for construction and maintenance operations as much as possible. • All temporary construction works such as burrow pits and contractors’ yards will be restored upon completion • In terms of nuisance factors affecting neighboring residents, particularly noise, the construction programme will only be determined closer to the time of construction but should be undertaken in negotiation with surrounding land users, where practical; • Surrounding land users should be informed of the intention to undertake construction activities timeously; and 							
With mitigation	500m2-999m2	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

immediate neighbors of the powerline route. Excavated surfaces will be exposed to winds which may generate dust and further erode unvegetated surfaces on-site. The presence of heavy machinery, as well as several construction personnel working on the site/route will have a temporary impact on the aesthetics of the site and surrounding area.

As the proposed and powerline will become a permanent feature of the landscape, it is likely to have a long-term visual impact on the surrounding area.

The primary impacts on aesthetics during construction and operation are:

- Dust and noise; and
- Impact on the visual quality of the landscape.

Because the powerline and substation will become a permanent feature of the landscape the duration of impacts will be long-term. However, as the proposed powerline route and substation site is located within an area of agricultural land mainly with subsistence crops, it is anticipated that the proposed development will not contribute to the devaluation of adjacent properties to a significant extent.

Construction Phase

Table 7-14 below assesses the potential construction related impacts on aesthetics both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-14: Impact Significance Determination Rating for Impacts on Aesthetics and visual intrusion during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m2-999m2	One month to one year	minor	Daily	Likely	6	7	Low
	2	2	2	5	3			42
Mitigation measures	<ul style="list-style-type: none"> • Review the visual intrusiveness of the current tower design and consider engaging local industrial designers to generate a functional, aesthetic and environmentally friendly tower design. • Where possible, straight-line runs are maximized so that the need for angle towers, which have a more negative visual impact due to their heavier construction, is minimized. • Where possible the proposed transmission line route will be located adjacent to, and parallel to an existing 132kV and 66kV line. This limits effects to an already disturbed area, rather than creating a new, discrete second corridor and impact zone. • Where possible the proposed transmission route will be located adjacent to already existing high-impact visual features, such as forests or cliff. • Where two lines are parallel, new towers will be constructed adjacent to existing towers, when possible to minimize visual 'clutter'; • Existing tracks will be used for construction and maintenance operations as much as possible. • All temporary construction works such as burrow pits and contractors' yards will be restored upon completion • In terms of nuisance factors affecting neighboring residents, particularly noise, the construction programme will only be determined closer to the time of construction but should be undertaken in negotiation with surrounding land users, where practical. • Surrounding land users should be informed of the intention to undertake construction activities timeously; and 							

With mitigation	500m ² -999m ²	One month to one year	negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding remarks

Due to the localised and small-scale effects of aesthetics the overall significance of the construction related impacts from aesthetics is **low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented.

Operational Phase

Table 7-15 below assesses the potential operational related impacts on aesthetics both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-15: Impact Significance Determination Rating for Impacts on Aesthetics and visual intrusion during the Operational Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -999m ²	>72 months	Marginal	Permanent	Highly likely	9	9	Low medium
	2	5	3	5	4			64
Mitigation measures	<ul style="list-style-type: none"> The powerline will be a permanent feature of the landscape. The available topography (ridges or tree lines) should be used to naturally screen the infrastructure thereby reducing the visual impact of the development. Painting of towers to camouflage with the local environment 							
With mitigation	500m ² -999m ²	>72 months	Minor	Permanent	Highly unlikely	6	7	Low
	2	2	2	5	2			42

Concluding remarks

The impacts as they relate to aesthetics are primarily associated with the operation of the power line, due to the short duration of the construction period. However, as the proposed powerline route are located within an area which largely subsistence agricultural land, the overall significance of the construction related impacts on aesthetics is **low**, while the operational related impact is also considered to be **low**, provided the necessary mitigation /management measures are implemented.

7.8.9 Land take

Land affected by the construction and operation of the proposed transmission lines falls into three categories:

- Wayleave and right of way
- Temporary land-take for construction purposes.

a). Way-Weave and right of way

The wayleave is recognized as the safety corridor outside of which negative impacts from transmission lines are assumed to be negligible. The width of the corridor depends on the line voltage. The Kenyan standard is a 30m wide corridor for a 132kV double circuit transmission line. In total, approximately 600 acres of land will be required for the project.

Titles for the way-leave land will not be transferred from the present landowners; this land will remain their property. This land is, however, subject to the following restrictions:

- No construction is allowed in the Corridor; and
- All vegetation is to be kept below 6ft height (1.8m).

In the wayleave outside of the 5m Right of Way, cultivation or other uses of land may continue provided the above –mentioned restrictions are complied with by the owner and the occupants of the land. KETRACO is also required to provide the landowners with 3-day notice prior to maintenance works

Land-take for construction purposes

During construction, some areas may have to be temporarily occupied by the contractors in charge of the transmission lines construction and for storage of materials. As previously mentioned, no contractors camp will be set up for this project. Instead, unskilled labour will be sourced from areas in which the transmission line will traverse. Skilled labor, which is anticipated to be small, will be absorbed by the nearest urban/settlement areas. Owners and occupants will be compensated against the loss of crops if any and will receive rent from the contractors for temporary occupation. There will be no transfer of rights in this case.



Plate 7-2: Overview of land to be traversed by powerline wayleave

Perceived loss of Economic Value of Land

Over most of its length, the transmission line will follow where KETRACO operated transmission line are not present but will be totally virgin areas without transmission infrastructure. In most situations, it is not anticipated that access to this strip should be hindered, as on both sides of it is land that is not taken permanently, but only encumbered by restrictions on building and tall/fast growing trees. However, it is possible that in a limited number of specific field configurations (particularly if a residential structure is in this strip), access may be hindered or a loss in value may be experienced. In line with usual practice on similar projects (transmission lines, pipelines, etc); these cases will be considered on a case-by-case basis for potential compensation.

Concerns were raised during public consultation that despite the way-leave titles remaining with the present owners, the restrictions placed on use of these sections of land literally renders them useless. It is recommended that KETRACO sensitize the community on alternative uses of wayleaves and design them to reduce adverse effects on land.

Proposed Mitigation Measures

The following measures will be used to minimize the land take impacts of the transmission line project.

- Community sensitization by KETRACO on alternative land uses of wayleaves, and design themes to reduce the effect of land take by the transmission line project.
- KETRACO to follow way-leave rules and provide 3-day notice prior to way-leave maintenance works
- KETRACO will be required to enter an agreement/arrangement with community regarding way-leave acquisition and alternative afforestation/reforestation
- Compensation against loss and damage to crops when land will be temporarily acquired for construction purposes.

Table 7-16: Impact Significance Determination Rating for Impacts to Land take during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	>72 months	Marginal	Daily	Highly likely	9	9	Medium high
	1	5	3	5	4			81
Mitigation measures	<ul style="list-style-type: none"> • Community sensitization & consultation by KETRACO on alternative land uses of wayleaves, and design themes to reduce the effect of land take by the transmission line project. • Rerouting of the proposed route to avoid crossing through settlements • KETRACO to follow way-leave rules and provide 3-day notice prior to way-leave maintenance works • KETRACO will be required to enter an agreement/arrangement with community regarding way-leave acquisition and alternative afforestation/reforestation • Compensation against land loss, structures damage to crops/trees when land will be temporarily acquired for construction purposes. • Develop and implement a Resettlement Action Plan(RAP) 							
With mitigation	<500m ²	>72 months	Negligible	Daily	Highly unlikely	7	7	Low
	1	5	1	5	2			49

Concluding remarks

Loss of economic value of land is real, however its limited/restricted use. Due to the localized effects of limited use the overall significance of the construction related impacts from solid water generation is **medium high**,

while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented effectively

7.8.10 Fire Hazards

If the underlying ROW is left unchecked or slash from routine maintenance is left to accumulate within the ROW boundaries, sufficient fuel can accumulate that may promote forest fires

Proposed Mitigation Measures

- Monitoring ROW vegetation according to fire risks
- Removing blow-down and other high hazards fuel accumulations
- Timely thinning, slashing and other maintenance activities to avoid forest fire seasons
- Disposal of maintenance slash in an environmentally acceptable manner, e.g. composting of vegetation
- Establishing series of fuel/fire breaks of less flammable materials or cleared land to slow progress of fires and allow firefighting access.

Table 7-17: Impact Significance Determination Rating for Impacts on fire Hazards during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Likely	6	8	Low
	1	2	3	5	3			48
Mitigation measures	<ul style="list-style-type: none"> • Monitoring ROW vegetation according to fire risks • Removing blow-down and other high hazards fuel accumulations • Timely thinning, slashing and other maintenance activities to avoid forest fire seasons • Disposal of maintenance slash in an environmentally acceptable manner, e.g., composting of vegetation • Establishing series of fuel/fire breaks of less flammable materials or cleared land to slow progress of fires and allow firefighting access. • Sensitizing community of fire hazards and prevention • Training of Staff and personnel on fire fighting • Having portable firefighting equipment in case of fire • Prepare a fire prevention and fire emergency plan as a part of the Environmental Plan to be submitted to KETRACO 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding remarks

Fire occurrence are rare occurrence. Due to the localized and small-scale effects of fire hazard the overall significance of the construction related impacts from fire generation is **low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented

7.8.11 Impacts on archaeological, Cultural and Historic sites

During the survey and data reviewed on Narok and Bomet Counties it was found out that no archaeological site has been identified.

Where the transmission line is anticipated to pass through homesteads, and the arrangement of the homes is affected, an effort should be made to ensure there is no split in the household. Research has shown that there is a special arrangement of houses in a homestead within each of the Kenyan communities. Affecting this arrangement could have adverse effects on the socio-cultural status of the family.

Between Narok and Bomet, possibility of the power line passing through major cultural sites has not been identified. Indeed, most of the areas the line is proposed to pass through in Narok side are sparsely populated, and mainly composed of wheat and maize fields and substance crops while in Bomet is a little bit densely populated. This is therefore not foreseen as major challenge. Any chance finding of such sites will be reported to National Museum of Kenya.

Construction Phase

Table 7-18 below assesses the potential construction related impacts on heritage / archaeological resources both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-18: Impact Significance Determination Rating for Impacts on Heritage / Archaeological Resources during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Minor	Daily	Highly unlikely	5	7	Low
	1	2	2	5	2			35
Mitigation measures	<ul style="list-style-type: none"> • Diversion of the Right of Way for the proposed transmission line, to minimize the impacts of these sites if they are present. • Selective tower placement to span archaeological site • Follow laid down procedures for chance find and protection of Archaeological sites and contact with the National Museums of Kenya (NMK). • Once the exact alignment of the powerline has been determined and the tower sites surveyed and cleared, an archaeologist must be appointed to undertake a 'walk-down' of the powerline route, as the area can only be considered surveyed properly when covered by foot. The same should be undertaken for the construction of access road sites; • The construction team should be made aware that archaeological material (e.g. remains of dwellings, pottery, gravel, etc.) is often located below ground level. Should any archaeological sites be accidentally unearthed during construction, NMK should be alerted immediately and construction activities in that specific area must be halted instantly; and • Special care should be taken in areas in close vicinity to water (e.g. pans, rivers) as human beings often settled close to water resources. 							

	<ul style="list-style-type: none"> Chance Find Procedures to be prepared 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding Remarks

As no known archaeological sites have been recorded for the study area, and no sites were identified during the Impact Assessment study, the overall significance of the construction related impacts on heritage / archaeology is **low**, provided the necessary mitigation / management measures are implemented.

7.8.12 Impacts of construction material sourcing (e.g. quarrying)

Earth materials needed for construction (e.g., concrete, sand, aggregate) is anticipated to be obtained from quarry and mining operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages, and promotes environmental degradation at the illegal quarry sites and causes medium to long term negative impacts at source, including landslides.

Proposed Mitigation Measures

- Construction contract should stipulate that the contractor sources materials from an approved site
- The tender documents should specify required standards and certification for procurement for all materials and appliances.
- The sources of all construction materials should be from approved sources; for example, hardcore for building should be obtained from bona fide commercial quarries.
- Building materials such as sand, ballast and hard core will be sourced from NEMA approved sites.
- Proponent and Contractor will ensure accurate budgeting and estimation of actual construction requirement to ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage, or loss (through run-off, wind, etc. of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.
- In addition to the above measures, the proponent shall consider reuse of construction materials and use of recycled building materials.

Table 7-19: Impact Significance Determination Rating for Impacts on material sourcing during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	1km ² -10km ²	1 - 12 months	Minor	Daily	Likely	7	8	Low-medium
	3	2	2	5	3			56

Mitigation measures	<ul style="list-style-type: none"> Construction contract will stipulate that the contractor sources materials from an approved site The tender documents will specify required standards and certification for procurement for all materials and appliances. The sources of all construction materials will be from approved sources; for example, hardcore for building should be obtained from bona fide commercial quarries. Building materials such as sand, ballast and hard core will be sourced from NEMA licensed and approved sites. Proponent and Contractor will ensure accurate budgeting and estimation of actual construction requirement to ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage, or loss (through run-off, wind, etc) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials. In addition to the above measures, the proponent shall consider reuse of construction materials and use of recycled building materials. No abstraction of raw materials in prohibited or protected areas 							
With mitigation	1km ² -10km ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding Remarks

Due to the localized and small-scale effects of material sourcing the overall significance of the construction related impacts from material sourcing is considered to be **low**, while the operational related impact is considered to be **low**, provided the necessary mitigation / management measures are implemented. The process is outlined in the ESMP

7.8.13 Hazardous materials

Hazardous materials in this sector include insulating oil/gases (e.g., polychlorinated Biphenals (PCB) and Sulphur Hexafluoride (SF6), and fuels.

Liquid petroleum fuels for vehicles and other equipment may be used and stored at transmission and distribution projects. Polychlorinated Biphenyls (PCB) were widely used as dielectric fluid to provide electrical insulation, although their use has been largely discontinued due to potential harmful effects on human health and the environment.

Spilled chemicals can contaminate soil as well as pollute water resources. Hazardous and flammable substances (e.g., Diesel oil, paints, thinner, solvents etc) when improperly stored and handled on site become potential health hazard for construction workers. It is anticipated that the refueling and maintenance of large vehicles will not take place on the construction site.

During the construction period for the proposed line project, oil spills may result from construction site equipment and storage.

Proposed Mitigation Measures

- The contractor should ensure that the employees on site are aware of the company procedures of dealing with spills and leaks from oil storage tanks for the construction machinery through induction and safety training
- In case of spillage the contractor should isolate the source of oil spill and contain the spillage using sandbags, sawdust, absorbent materials and/or other materials approved by KETRACO
- All vehicles and equipment should be kept in good working order, serviced regularly, and stored in an area approved by KETRACO.
- The contractor should also provide security to guard against vandalism when the site is unattended.
- The contractor should have assembled and clearly list the relevant emergency telephone contact numbers for staff, and brief staff on the procedures.
- Appropriate training for the handling and use of fuels and hazardous material as necessary. This includes providing spill response and contingency plans
- Taking extreme care when transferring chemicals and fuel from storage vessels to equipment and machinery
- Storage of all chemicals within the bunded areas clearly labeled detailing the nature and quantity of chemicals within individual containers.
- Immediate cleaning of chemical or fuel spills. The spilt liquid and clean up material should be removed, treated, and transported to an appropriate site licensed for its disposal.
-

Impacts of fuel and chemical storage

Spilled chemicals and hazardous and flammable substances (e.g.) diesel and oil for construction vehicles and machinery may contaminate soil as well as pollute in shore waters. It is anticipated that refueling and maintenance of large vehicles will take place at designated garages and petrol stations and that, correspondingly, there will be no storage of fuel and lubricants on the site.

Proposed Mitigation Measures

- The contractor should ensure that the employees on site are aware of the company procedures for dealing with spills and leaks of fuel and oils for the construction machinery through induction and safety training
- In case of spillage the contractor should isolate the source of the oil spill and contain the spillage using sandbags, sawdust, absorbent material and/ or other materials approved by KETRACO.
- The contractor should ensure that there is always a supply of absorbent material such as saw dust onsite during construction, readily available to absorbent/ breakdown spill from machinery or oil spillage
- All vehicles and equipment should be kept in good working order, serviced regularly, and stored in an area approved by KETRACO.

Table 7-20: Impact Significance Determination Rating for Impacts on hazardous materials during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low

	1	2	3	5	2			42
Mitigation measures	<ul style="list-style-type: none"> The contractor should ensure that the employees on site are aware of the company procedures of dealing with spills and leaks from oil storage tanks for the construction machinery through induction and safety training In case of spillage the contractor should isolate the source of oil spill and contain the spillage using sandbags, sawdust, absorbent materials and/or other materials approved by KETRACO All hazardous materials must have MSDS Manuals and trained hazardous handlers individuals in the team All vehicles and equipment should be kept in good working order, serviced regularly and stored in an area approved by KETRACO. The contractor should also provide security to guard against vandalism when the site is unattended. The contractor should have assembled and clearly list the relevant emergency telephone contact numbers for staff, and brief staff on the procedures. Appropriate training for the handling and use of fuels and hazardous material as necessary. This includes providing spill response and contingency plans Taking extreme care when transferring chemicals and fuel from storage vessels to equipment and machinery Storage of all chemicals within the bunded areas clearly labeled detailing the nature and quantity of chemicals within individual containers. Immediate cleaning of chemical or fuel spills. The spilt liquid and clean up material should be removed, treated, and transported to an appropriate site licensed for its disposal 							
With mitigation	>500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding remarks

Hazardous material generation will be limited. Due to the small-scale effects of hazardous material the overall significance of the construction related impacts from any hazardous material expected is **low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented

7.8.14 Avifauna Impacts

Once established, the transmission line may cause increased risk of collision of birds in flight, however this risk is expected to be minimal since the route does not pass through any known migratory bird routes. Most of the birds in the larger Narok and Bomet area have been classified as non-threatened as per National Museum of Kenya report. Some of this bird includes Little Grebe; Pink –backed Peligan, hornbills, Long Tail Cormorant, Cattle Egret, Common Squacco Heron, Marabou Stork, Sacred Ibis, Great Sparrow Hawk, Lizard Buzzard, Long –Crested Eagle, Lanner falcon, ruff, Red-fronted Parrot, cranes, and Ring –Necked Dove. The findings of the study revealed that the most significant impact of the line will be potential collisions of birds with the electrical conductors as the proposed route passes through areas with streams, rivers, wheat fields and grassland, which are generally preferred sites for birds. Other than these water bodies, the general area is very flat and there are no obvious flight paths for birds. The open patches of grassland will however attract species such as storks

and ground hornbills, which could be at risk collisions resulting to loss of biodiversity. There are no important bird areas along the route of traverse and no confirmed migration routes.

Sensitive areas present within the study area include streams, water courses and open grasslands and care should be taken in and around these areas to minimize the disturbance of avifauna.

Impacts on Avifauna

Aspects and Impacts

Powerlines have the potential to impact on birds, either through collisions or by electrocution, particularly where powerlines pass over rivers and drainage lines, which are natural flight paths for avifauna, and through the destruction of important avifaunal habitat.

The findings of the study revealed that the proposed construction and operation of the powerline may result in the collision of birds with the powerline, the destruction of avifaunal habitat and the disturbance of avifauna. Avifaunal electrocutions are not anticipated with the Narok-Bomet powerline as the tower structures that KETRACO has proposed using for the line are deemed safe for avifauna and most of the birds in the area are not raptors and are mainly low flyers.

Construction Phase

Table 7-21 below assesses the potential construction related impacts on avifauna both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-21: Impact Significance Determination Rating for Impacts on Avifauna during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -999m ²	1 - 12 months	Marginal	Daily	Highly unlikely	7	7	Low
	2	2	3	5	2			49
Mitigation measures	<ul style="list-style-type: none"> Identify locations as far away as possible from any significant bird breeding or staging areas Consider migratory bird routes when planning the route of the proposed transmission line Locate the proposed transmission line adjacent to prevailing natural obstacles such as trees or cliffs to prevent them from perching on the line Sensitive areas such as the streams, rivers and grasslands should be avoided during the construction phase where possible to limit the impact on avifauna. If these areas are accessed, particular care should be taken to limit impacts; and assess the electrocution threat posed to avifauna from the new tower structures 							
With mitigation	500m ² -999m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding Remarks

The proposed transmission line does not fall within bird migratory routes. The predominant birds in the area are largely resident, low flying with small wingspan. e.g quelea birds, hence, will not be affected by the

existence of the transmission line. Due to the localized and small-scale effects especially in the dispersal area the overall significance of the construction related impacts on avifauna is medium low, while the operational related impact is low, provided the necessary mitigation / management measures are implemented

Operational Phase

Table7-22 below assesses the potential operational related impacts on avifauna both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table7-22: Impact Significance Determination Rating for Impacts on Avifauna during the Operational Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -999m ²	>72months	Marginal	Daily	Likely	10	8	Medium high
	2	5	3	5	3			80
Mitigation measures	<ul style="list-style-type: none"> • Sensitive areas such as the streams, rivers and grasslands should be avoided during the construction phase where possible to limit the impact on avifauna. If these areas are accessed, • particular care should be taken to limit impacts. • assess the electrocution threat posed to avifauna from the new tower structures; and • Use bird warning devices on transmission lines • Dress existing and proposed transmission lines with conspicuous bird warning devices, where necessary, such as areas where bird migratory routes cannot be avoided 							
With mitigation	500m ² -999m ²	>72months	Negligible	Daily	Highly unlikely	8	7	Low
	2	5	1	5	2			56

Concluding remarks

The proposed transmission line does not fall within bird migratory routes. The predominant birds in the area are largely resident, low flying with small wingspan. e.g quelea birds, hence, will not be affected by the existence of the transmission line. Due to the localized and small-scale effects especially in the dispersal area the overall significance of the construction related impacts on avifauna is medium low, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented

7.8.15 Impacts on Aviation

The combination of the height of transmission towers and the electricity carried by transmission lines can pose potential risk through collisions and electrocutions.

Also, towers and transmission lines can disrupt airplane flight paths in and near airports and endanger low-flying aircraft, such as those used in agricultural management activities. In Narok where the line construction will start, has some airstrips used by large scale wheat and maize farmers but none is located a long or in proximity to the powerline. They are located towards the Maasai Mara national park while in Bomet there is only one Airstrip which is being upgraded in Kapkwen area and the line has totally avoided the area, but in general the starting point for this transmission line is located in mostly remote area far from major town and the line does not pass through any urban areas and neither does it pass through any known airport/ airstrip in the area of traverse so safety impacts will be minimal for this route.

Proposed Mitigation Measures

- Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers
- Dress existing and proposed transmission lines with conspicuous aviation warning devices, where necessary, such as areas where aircraft flight path cannot be avoided
- Consider aircraft flight route when locating the proposed transmission line
- Proponent must get approval from KCCA by issue of approval certificate

Table 7-23: **Impact Significance Determination Rating for Impacts on Aviation during the Construction Phase**

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	1Km ² -10Km ²	1 - 12 months	Marginal	Daily	Highly unlikely	8	7	Low medium
	3	2	3	5	2			56
Mitigation measures	<ul style="list-style-type: none"> • Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers • Dress existing and proposed transmission lines with conspicuous aviation warning devices, where necessary, such as areas where aircraft flight path cannot be avoided • Consider aircraft flight route when locating the proposed transmission line • Proponent must get approval from KCCA by issue of an approval certificate 							
With mitigation	1km ² -10km ²	1 - 12 months	Negligible	Daily	Highly unlikely	6	7	Low
	3	2	1	5	2			42

Concluding remarks

Under aviation impacts, KCCA has already done approval after confirming all aspects especially tower heights. Before impact mitigation, the impact was low but still after additional controls are implemented the rating will still be low.

7.9 Negative Social Impacts

7.9.1 Physical Displacement of People and Loss of Livelihood

Physical displacement of people implies that the affected persons will need to move their houses and structures from the ROW and wayleave i.e., project area. Most of the household will be relocated within the same land hence not many will be physically displaced and resettled to far off places. In the event the land left after Wayleave acquisition is economically not viable then the proponent will be compensated for the total parcel of land.

The preliminary data from the RAP census and socio-economic surveys and asset inventory shows that approximately 481 households will be affected species will be cleared. Various structures ranging from houses, stores and granaries and domestic animal pens will be affected the real number and type of structures to affected is fully captured in the KETRACO 2021, Resettlement Action Plan (RAP) that will accompany this ESIA

Table 7-24: Potentially affected persons along the proposed Transmission Line

		Total households/institutions affected	Total population
BOMET COUNTY			
Sub locations			
1	Itembe	32	
2	Kabisoge	20	
3	Kyogong	35	
4	Cheboin	8	
5	Emitiot	65	
6	Kongotik	19	
7	Kiptulwa	30	
8	Koibeiyon	39	
Total		248	
NAROK COUNTY			
Sub locations			
1	Nkobon	18	
2	Nkareta	12	
3	Olopito	Nil	
4	Ololunga	20	

5	Ilmashariani	2	
6	Ilmotiook	106	
7	Melelo	63	
8	Melelo	30	
Total		106	
Total Households/Institutions			
Households		354	



Plate 7-3: *Some of the houses, Trees and crops to be affected by transmission line along the project area in Bomet*

Table 7-25 assesses the potential impacts on Physical displacement of people **both** with and without mitigation measures during the Pre-Construction Phase. The recommended mitigation measures are similarly summarized in the table.

Table 7-25: Impact Significance Determination Rating for Impacts on Physical Displacement of People during the Pre-Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	>72months	Marginal	Permanent	Highly Likely	9	9	Medium High
	1	5	3	5	4			81
Mitigation measures	<ul style="list-style-type: none"> Preparation of a resettlement action plan to guide compensation, relocation, and resettlement Resettlement and compensation of PAPs will be carried out in compliance with the Kenyan legislation, and AFDB safeguard standards Valuation for land, assets and structures will be done using prevailing market rates and disturbance allowance 							

	<ul style="list-style-type: none"> Physically or economically displaced people will be offered an option between either cash or a full compensation or replacement of residential houses and affected structures. Experience in Kenya has shown that cash compensation, although very sought after by many households' heads, could be detrimental in the medium term, to other household members, particularly women and children; the project will make every effort to sensitize the affected on wise use of the compensation package. Most PAPs derive their livelihood from agriculture. Where farmers are physically or economically displaced, by the virtue of their land being rendered economically unviable they will be advised to buy land within the locality. The resettlement implementation and outcomes will be monitored and evaluated as part of a transparent process 							
With mitigation	<500m2	>72 months	minor	Once	Highly unlikely	8	6	Low
	1	5	2	4	2			48

Concluding Remarks

Since the area is not densely populated the numbers of those to be physically displaced is minimized to the extent possible. In most places where the line will take large land area, it is anticipated that they will relocate their residence and other structures to the remaining part of their plot with self-relocation with proper compensation from KETRACO. Subsequently and as resettlement is a one-off process, the overall significance of the impacts related physical displacement of people is considered to be **Low medium**, provided the necessary mitigation / management measures are implemented.

7.9.2 Traffic congestion / Road Wear/Tear

Transportation and Traffic Safety

Aspects and Impacts

The existing roads will be used to gain access to the substation site and powerline route. These roads are in relatively good condition and are frequently utilized by private vehicles. However, the frequent passage of light and heavy vehicles accessing the substation site and powerline route while construction is in progress may generate noise as well as cause damage to existing roads, traffic congestion and potential injury to vehicles and pedestrians.

The primary impacts related to traffic during construction are:

- Damage / deterioration of roads.
- Congestion of vehicular traffic; and
- Vehicular and pedestrian safety.

Such impacts are associated with construction of the substation and powerline and are not anticipated during the operational phase.

Increased Traffic

There will be temporary minor disruptions to traffic movement, and increased safety concerns of local inhabitants and workers during construction of the transmission line because of increased traffic movements, particularly from large construction/transport trucks.

Accidents because of increased traffic

During construction phase, the construction vehicles used in transportation of materials and workers will contribute to increase in traffic on the nearby roads. Because of traffic jam some motorists might be tempted

to break the traffic rules and in the process cause accidents. While during operation phase, no traffic impacts are anticipated.

Damage to roads and transport infrastructure

Damage to the nearby roads is likely during construction phase due to movement of heavy machinery, equipment, and components into the project site and out after completion of construction work.

Construction Phase

Table 7-26 below assesses the potential construction related impacts on transportation and traffic safety both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-26: Impact Significance Determination Rating for Transportation and Traffic

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	500m ² -100m ²	1 - 12 months	Minor	Daily	Highly unlikely	6	7	Low
	2	2	2	5	2			42
Mitigation measures	<ul style="list-style-type: none"> Contractor to prepare and implement a Traffic Management Plan. KETRACO and contractor should choose traffic routes to reduce the impact in the neighborhood avoiding, as far as practical any sensitive areas The contractor should ensure due regard of drivers to traffic regulations and always insist that courtesy be shown to other road users Where traffic is anticipated, the contractor in close consultation with KETRACO should ensure: <ul style="list-style-type: none"> Effecting of traffic routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood. Choice of routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood Employment of a road safety coordinator to oversee implementation of the traffic controls Regular maintenance of delivery and dispatch trucks. Wherever possible, use should be made of the existing roads and existing tracks during construction. If damage occurs to roads or properties, it should be repaired when the work is finished. Personnel driving construction vehicles will be required to adhere to speed limits and all other applicable road rules to ensure vehicle and pedestrian safety. All vehicles to be in good working order, particularly as there are many pedestrians and animals in the area; and A safe sight distance should be always maintained by cutting grass or other vegetation on either side of the access road/s to the substation site. 							
With mitigation	500m ² -999m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low

	2	2	1	5	2			35
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Concluding Remarks

Due to the short duration and small scale of the construction activities, the overall significance of the construction related impacts on transportation and traffic safety is **low**, provided the necessary mitigation / management measures are implemented.

7.9.3 Occupational Health and safety Impacts

The development of the proposed facility will involve several activities that pose potential health and safety risks to the workers which include, excavation, stripping, tower foundations, backfilling stringing of conductors among others. Risk of accidents and incidents will be heightened with the construction activities. Construction workers will be in direct contact with heavy machinery and equipment. These operations require the use of hoists, heavy duty equipment, machinery, and vehicles. Apart from the regular training on health and safety, staff working along the transmission line should be sensitized on the work within the varying ecological and social areas traversed.

Health, safety, and security are important aspects through all the stages of the proposed project. Occupational health and Safety hazards specific to electric power transmission and distribution projects primarily include:

- Live power lines.
- Working at Heights
- Community health and Safety.
- Contagious diseases e.g., COVID 19

The potential occupational health and safety impacts during operation phase include injuries to workers from routine monitoring and maintenance and deaths and injuries from major disasters caused by third parties.

During decommissioning, the potential H&S risks include injuries occasioned by dismantling of the facility.

In addition, there are covid related risks at construction sites. Coronavirus disease (COVID-19) is a highly infectious disease caused by the SARS-CoV-2 virus. As the Covid-19 pandemic persists around the world, its effects continue to have far reached implications on global healthcare systems, businesses, economies, and public sector service delivery. In Kenya, the government introduced various restrictions of movement measures, as well as certain fiscal measures to curb the spread of the disease and minimize its impact on individuals, businesses, and the economy. The construction industry plays significant roles in the country's economic development and growth. There would be a domino impact on the economy if any construction projects are being delayed thus there's need to implement controls and adaptation strategies.

Live power lines

Workers may be exposed to occupational hazards from contact with live power lines during maintenance and operation activities. Prevention and control measures associated with live power lines include:

- Only allowing trained and certified workers to install, maintain, or repair electrical equipment.
- Deactivating and properly grounding live power lines before work is performed on, or in proximity, to the lines.
- Ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. Qualified or trained employees working on transmission or distribution systems should be able to achieve the following:
 - Distinguish live parts from other parts of the electrical system

- Determine the voltage of live parts
- Understand the minimum approach distances outlined for specific live line voltages
- Ensure proper use of special safety equipment and procedures when working near exposed energized or conductive parts of an electrical system.
- Workers should not approach an exposed energized or conductive part even if properly trained unless
 - The worker is properly insulated from the energized parts of an electrical system
 - The worker is properly insulated from the worker and any other conductive object; (Live-line work) or,
 - The energized part is properly insulated from the worker
- Where maintenance and operation is required within minimum setback distances, specific training, safety measures, personnel safety devices, and other precautions should be defined in a health and safety plan.
- Workers not directly associated with power transmission and distribution activities who are operating around power lines and power substations should adhere to local legislation, standards and guidelines relating to minimum approach distances for excavations, tools, vehicles, pruning and other activities
- Minimum hot stick distances may only be reduced provided that the distance remaining is greater than the distance between the energized part and a grounded surface.

Working at height on poles and structures

Workers may be exposed to occupational hazards when working at elevation during construction, maintenance, and operation activities. Prevention and control measures for working at height include.

- Testing structures for integrity prior to undertaking work
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures, inspection, maintenance and replacement of fall protection equipment and rescue of fall –arrested workers among others.
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 meters above working surface, but sometimes extended to 7 meters depending on activity) the fall protection system should be appropriate for the tower structure and necessary movements including ascent, descent and moving from point to point.
- Installation of fixtures on tower components to facilitate the use of fall protection systems
- Provision of an adequate work-positioning device system for workers. Connectors on positioning systems should be compatible with the tower components to which they are attached.
- Hoisting equipment should be properly rated and maintained and hoist operators properly trained
- Safety belts should be of not less than 16 millimeters (5.8 inch) two –in –one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident.
- When operating power tools at height, workers should use a second (back up) safety strap
- Signs and other obstructions should be removed from poles or structures prior to undertaking work
- An approved tool bag should be used for raising or lowering tools or material to workers on structures

Covid Related Impacts

Mitigation against Covid19

Eliminating and minimizing exposure of to COVID-19, the following should be undertaken:

- Develop and communicate to all employees (skilled, semi-skilled and 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.

- Sensitize all workers (skilled, semi-skilled and unskilled) on COVID-19 risk mitigation measures with sufficient information to keep them and local community safe.
- Establish prevention and mitigation measures against COVID-19 and arrangements for dealing with suspected and confirmed COVID-19 cases for all workers. The measures should include but not limited to;
 - ✓ Infection control plans,
 - ✓ Ensuring social distancing of not less 1.5 meters between employees (skilled, semi-skilled and unskilled) in all directions,
 - ✓ Hygiene promotion through suitable hand sanitizing facility or handwashing soap and water
 - ✓ Strict and proper use of face masks throughout all working hours and public places.
 - ✓ Implement Ministry of Health guidelines for staff safety and health, including daily temperature checks for everyone in the workplace
 - ✓ Increase frequency of cleaning commonly touched surfaces / objects

Occupational Health and Safety Impacts

Aspects and Impacts

The health and safety of construction personnel may be placed at risk because of the use of heavy machinery to construct the required powerline infrastructure and workers working at height been at risk of fall.

The primary impacts on health and safety during construction are therefore Injury to people resulting from the use of machinery and equipment

Such impacts are associated with construction of the powerline and are not anticipated during the operational phase.

Construction Phase

Error! Reference source not found. Table 7-27 below assesses the potential construction related impacts on health and safety both with and without mitigation measures. The recommended mitigation measures are similarly summarized in the table.

Table 7-27: Impact Significance Determination Rating for Health and Safety Related Impacts during the Construction Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low
	1	2	3	5	2			42
Mitigation measures	<ul style="list-style-type: none"> • The contractor should ensure registration of all the construction works by the Director, Directorate of Occupational Health, and Safety Services (DOHSS) in compliance with the Buildings and Construction Engineering Rules, 1984. • The contractor should contract a qualified health and safety advisor to conduct training and monitoring of construction works. • The contractor must ensure establishment of a health and safety committee for the project as per the Health and Safety Committee Rules 2004 of the OSHA, 2007 Act. • The contractor should ensure provision of appropriate personal Protective equipment for staff 							

	<ul style="list-style-type: none"> • KETRACO should ensure that the contractor is instructed in the use of all materials that may have negative environment (including health) effects. • KETRACO will ensure that if any materials or substance is used that is at any point in the future deemed to be deleterious to health, and then it must be replaced with acceptable alternative. • The contractor must adhere to safety regulations outlined in the local government adoptive by laws, and the Building Operations and works of engineering construction. • To reduce the workers accidents and hazards during the construction phase of the proposed transmission line, the contractor and proponent are expected to adhere to the provisions of the Occupational Safety and Health Act, 2007 and its subsidiary legislation. • It is the responsibility of the project proponent and contractor to provide a safe and healthy environment for construction workers as outlined in the ESMP. • A Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees. • Proper safety shoes and gumboots to avoid trips, slips and falls. Eyes on the job for maximum concentration • Construction personnel should be properly trained to use equipment, particularly in terms of the dangers associated with the operation of heavy plant machinery. • 24-hour security should be provided on site during the construction period; and • Access to the site by unauthorized personnel during the undertaking of construction activities should be prohibited. 							
With mitigation	<500m2	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding Remarks

Due to the small-scale of the construction activities the overall significance of the impacts relating to health and safety during the construction phase, provided the necessary mitigation / management measures are implemented is **low**.

7.9.4 Community health and safety

Community health and safety impacts during the construction/operation and decommissioning of transmission and distribution power lines are common and include dust, noise, and vibration from construction vehicles transit. The operation of live power distribution line and substations may generate the following impacts:

- Electrocutation
- Electromagnetic interference
- Noise and ozone
- Tower vandalism
- Aircraft navigation safety

Electrocutation

Hazards directly related to power transmission occur because of electrocutation from direct contact with high voltage electricity or from contact with tools, vehicles, ladders, or other devices that are in contact with high voltage electricity. Recommended techniques to prevent these hazards include:

- Use of signs, barriers (e.g.) use of steel posts surrounding transmission towers, particularly in urban areas) and education/public outreach to prevent public contact with potentially dangerous equipment
- Grounding conducting objects (e.g. fences or other metallic structure) installed near power lines to prevent shock

Electromagnetic interference

The corona of overhead transmission line conductors and high frequency currents of overhead transmission lines may result in the creation of radio noise. Typically, transmission line rights of way and conductor bundles are created to ensure radio reception at the outside limits remains normal. Periods of rain, sleet or freezing rain sharply increases streaming corona on conductors and may affect radio reception in residential areas near transmission lines.

Noise and ozone

Noise in the form of buzzing or humming can often be heard around transformers or high voltage power lines producing corona. Ozone a colorless gas can also be produced. Neither the noise nor ozone produced by power distribution lines or transformers carries any known health risk

The acoustic noise produced by transmission line is greater with high voltage power lines (400-800kV). Noise from transmission lines reaches its maximum during periods of precipitation including rain, sleet, snow, or hail or as the result of fog. The sound of rain typically masks the increase in noise produced by the transmission lines but during other forms of precipitation (e.g., snow and sleet) and fog, the noise from overhead power lines can be troubling to nearby residents.

Measures to mitigate this impact may be addressed during project planning stage to locate rights of way away from human receptors to the extent possible. The lines will also be transposed at least three lines to mitigate the effect.

Tower vandalism

Tower vandalism poses risk of accidents by electrocution. Proposed mitigation measures include Community sensitization on the need to keep the towers untouched due to the associated risks

- Use of single unit towers instead of currently used lattice composite towers
- KETRACO to consider bolting and welding assembled tower parts
- Engaging the community in policing of the towers

Air navigation safety

If power transmission towers are located near an airport or known flight paths can impact aircraft safety directly thorough collision or indirectly through radar interference. Aircraft collision impacts may be mitigated by

- Avoiding the siting of transmission lines and towers close to airports and outside of known flight path envelopes
- Consultation with regulatory air traffic authorities or national safety regulations and
- Use of underground cables when installation is required in flight sensitive areas.
- Approval from KCCA must be obtained before project proceeds

Community Health and Safety Impacts

Aspects and Impacts

There may be injury to people / animals accessing the site i.e. falling into foundation excavations. In addition, there is the potential for loitering and / or attempted theft of construction machinery and equipment present onsite during the construction period

Table 7-28: Impact Significance Determination Rating for Impacts to Community Health and Safety in the Construction and Operation Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ² - 999m ²	1 - 12 months	Marginal	Daily	Highly unlikely	7	7	Low
	2	2	3	5	2			49
Mitigation measures	<ul style="list-style-type: none"> • Reduce Perceived EMF impacts during design • The proposed line will be constructed to safe standards to ensure the height and way leave trace protects the public from any adverse effects of electric power and electromagnetic frequencies. • A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. • The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. • KETRACO policy of keeping the residence away from the wayleave will also minimize exposure of the public to EMFs. • On HIV/AIDS, the contractor should install billboards written in English, Kiswahili and local language to warn and educate the public on HIV/AIDS along active construction sites. • Develop and communicate to all employees (skilled, semi-skilled and 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. • Sensitize all workers (skilled, semi-skilled and unskilled) on COVID-19 risk mitigation measures with sufficient information to keep them and local community safe. • Establish prevention and mitigation measures against COVID-19 and arrangements for dealing with suspected and confirmed COVID-19 cases. The measures should include but not limited to. <ul style="list-style-type: none"> • Infection control plans, • Ensuring social distancing of not less 1.5 meters between employees in all directions, • Hygiene promotion through suitable hand sanitizing facility or handwashing soap and water • Strict and proper use of face masks throughout all working hours and public places. • Routing or siting Transmission line is to avoid or minimize exposure to the public and where it is unavoidable all resettlements within the wayleave will be relocated. • 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 • A Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees. • Construction personnel should be properly trained to use equipment, particularly in terms of the dangers associated with the operation of heavy plant machinery. • 24-hour security should be provided on site during the construction period; and • Access to the site by unauthorized personnel during the undertaking of construction activities should be prohibited. • As part of the C-ESMP, contractor to develop and monitor implementation of a Community Health and Safety Management Plan (CHSMP) which will include the following measures: <ul style="list-style-type: none"> ▪ Keep construction site cordoned off from the public and employ full time security guard. Signs are put up around work fronts and construction sites advising people of the risks associated with trespass. 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. 							

	<ul style="list-style-type: none"> ▪ Adequate collection and storage of waste on site and safe transport to the disposal sites and disposal methods at designated area shall be provided in addition cover for refuse containers so that waste does not become source of diseases. ▪ Contractor will provide access to health care for those injured by its activities. ▪ Provision of protective condoms in worker's sanitation facilities. ▪ Provision of Voluntary Counselling and Testing (VCT) services <ul style="list-style-type: none"> • 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 on symptoms of communicable diseases of concern and STDs. • Ensure all the COVID-19 protocols by the Ministry of Health are adhered to including social distancing, use of masks, hand washing, and use of sanitizers and vaccination of workers • 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. • Implement a Community Grievance Mechanism. • 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. Institute a compensation mechanism for animals knocked by contractor or sub-contractor/supplier vehicles • An Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals to be prepared to deal with any emerging issues e.g., accidents involving the community. 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding Remarks

The transmission line avoids dense settlements, urban areas hence minimum interaction between project activities and residents. Subsequently, the overall significance of the construction related impacts of community Health and safety is **Low**, while the operational related impact is **low**, provided the necessary mitigation / management measures are implemented including implementation of Contractor Health and safety plan.

7.9.5 Influx of People and related Social Vices

Temporary influx of skilled and unskilled labour during construction of transmission lines and their interaction with locals can cause tensions over services, cultural differences etc. as well as opportunities for the spread of socially communicable diseases such as HIV/AIDS. These affects can be managed by appropriate ongoing consultation and sensitization with local communities throughout project construction as well as informing workers on local cultural sensitivities and health matters.

Table 7-29: Impact Significance Determination Rating for Impacts to influx of people and related social vices during construction

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
	500m ² -999m ²	1 - 12 months	Marginal	Daily	Likely	7	8	Low medium

Without mitigation	2	2	3	5	3			56
Mitigation measures	<ul style="list-style-type: none"> Contractors, subcontractors, and all project staff to behave in a culturally appropriate manner. Establish a local recruitment policy to engage local population for all unskilled labour Provision of workers camps to alleviate pressure on existing community housing infrastructure and basic services viz., food, water, and sanitation The contractor and proponent to establish a code of conduct and ensure workers conduct at site adheres to set rules and regulations Ensure induction of all immigrant workers to abide by the code of conduct and respect the community cultural norms and values Civic and health education on HIV/AIDS and STIs Ensure an adequate and accessible provision of condoms to workers both male and female. Elderly and social protection officers can be used to uphold moral standards and dignity in the affected community Establish Grievance Redress Committee (GRC) and have in place the elderly to liaise and identify such situation and address them before escalating to pressing social problems Implement the stakeholder's engagement plan (SEP) to ensure effective communication with the host community. Adhere to and implement the HIV and AIDS Prevention and Control Act, 2006 and the Sexual Offences Act, 2006 and its amendment 2012 							
With mitigation	500m ² -999m ²	1 - 12 months	Negligible	Daily	Highly unlikely	5	7	Low
	2	2	1	5	2			35

Concluding Remarks

The proposed project especially during project construction will have various experts, skilled and unskilled labour and this might pose behavioral challenge especially on worker interaction. Though there is minimal anticipation of new workers, majority of workers will be from local areas. The negative impact of these vises has been analyzed in the above table. After mitigation anticipated result will be Low

7.9.6 Gender Based Violence & Sexual exploitation and Abuse (SEA)

High risk /Category 1 projects with a large influx of workers may increase the demand for sex work—even increase the risk for trafficking of women for the purposes of sex work—or the risk of forced early marriage in a community where marriage to an employed man is seen as the best livelihood strategy for an adolescent girl.

During the public consultation process, the residents and mainly female participants were worried that the construction phase would result to influx of workers from other regions hence increase occurrences 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. The men 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. A key informant noted that the most fundamental cause of GBV is the traditional belief in the area about men's dominance over women

Mitigation against SEA,SH,GBV:

- Develop and implement a SEA action plan with an Accountability and Response Framework as part of the C-ESMP. The SEA action plan will include how the project will ensure necessary steps are in place for:
 - ✓ Management and Coordination: including integration of SEA in job descriptions, employments contracts, performance appraisal systems, etc.; development of contract policies related to SEA, including whistle blower protection and investigation and disciplinary procedures; training for all project management; management of coordination mechanism for case oversight, investigations and disciplinary procedures; supervision of dedicated PSEA focal points in the project and trained community liaison officers.
 - ✓ Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of PSEA awareness-raising in all community engagement activities; community-level IEC materials; regular community outreach to women and girls about social risks and their PSEA-related rights.
- In addition, Undertake social risk assessment of community-level risks.
- Assess capacity and availability of quality, safe and ethical services for survivors.
- Review ability of the client to respond to SEA/SH risks.
- Rate project for overall risk using several Bank tools including the SEA/SH Risk Assessment Tool.
- Establish procedures to review and update risk assessments during project implementation.
- Based on risks identified, identify the corresponding mitigation measures, and implement actions suggested to mitigate project-related risk of GBV in the project area.
- Monitor the effectiveness of the mitigation measures and adapt as appropriate.
- Provide essential services for survivors.
- Report case through the GRM as appropriate keeping survivor information confidential and anonymous.
- Document and close cases brought through the GRM.

Table 7-30: Impact significance determination rating on Gender based Violence (GBV) during construction and operation Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low
	1	2	3	5	2			42
Mitigation measures	<ul style="list-style-type: none"> • Undertake social risk assessment of community-level risks. • Develop and implement a SEA action plan with an Accountability and Response Framework • Assess capacity and availability of quality, safe and ethical services for survivors. • Review ability of the client to respond to SEA/SH risks. • Rate project for overall risk using several Bank tools including the SEA/SH Risk Assessment Tool. • Establish procedures to review and update risk assessments during project implementation. • Based on risks identified, identify the corresponding mitigation measures, and implement actions suggested to mitigate project-related risk of GBV in the project area. • Monitor the effectiveness of the mitigation measures and adapt as appropriate. 							

	<ul style="list-style-type: none"> • Provide essential services for survivors. • Report case through the GM as appropriate keeping survivor information confidential and anonymous. • Document and close cases brought through the GM. 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding Remarks.

GBV is strictly prohibited under the Law. The potential GBV related impacts are likely to be localized and of small-scale effects. Coupled with proposed mitigation measures which include but not limited to regular sensitization, the impact significance has been rated low.

7.9.7 Sexual harassment (SH)

Sexual harassment is a form of Gender based violence. SH occurs between personnel/staff and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The workers interaction during project implementation, company, subcontractor, or employees may experience unwelcome sexual advances or requests for sexual favors or acts of a sexual nature that are offensive and humiliating among the same company’s employees.

Mitigation against sexual Harassment

- Ensure clear human resources policy against sexual harassment that is aligned with national law.
- Integrate provisions related to sexual harassment in the employee code of conduct and have the Code of Conduct signed by all employees. A key element of the CoC is the sanctions that may be applied if an employee is confirmed as a SEA/SH perpetrator
- Have a robust complaints and grievance handling system. Ensure appointment of human resources personnel to manage reports of sexual harassment according to policy
- The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse
- The contractor will implement provisions that ensure that gender-based violence at the community level is not triggered by the Project, including:
 - ✓ Effective and on-going community engagement and consultation, particularly with women and girls.
 - ✓ Review of specific project components that are known to heighten GBV risk at the community level, e.g., compensation schemes; employment schemes for women; etc.
- Have separate, safe and easily accessible facilities for women and men working on the site. Locker rooms and/or latrines should be in separate areas, well-lit and include the ability to be locked from the inside.
- Visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where SEA/SH is prohibited.
- As appropriate, ensure public spaces around the project grounds are well-lit.
- Enhance security on site with guards and CCTV Cameras
- Train all Teams in Sexual Harassment prohibition at work

Table 7-31: Impact significance rating on Sexual Harassment During construction and operation Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low
	1	2	3	5	2			42
Mitigation measures	<ul style="list-style-type: none"> • Ensure clear human resources policy against sexual harassment that is aligned with national law. • Integrate provisions related to sexual harassment in the employee code of conduct and have the Code of Conduct signed by all employees • Have separate, safe and easily accessible facilities for women and men working on the site. Locker rooms and/or latrines should be in separate areas, well-lit and include the ability to be locked from the inside. • Visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where SEA/SH is prohibited. • As appropriate, ensure public spaces around the project grounds are well-lit. • Enhance security on site with guards and CCTV Cameras • Train all Teams in Sexual Harassment prohibition at work 							
With mitigation	<500m ²	1 - 12 months	Negligible	Daily	Highly unlikely	4	6	Very Low
	1	2	1	5	2			24

Concluding remarks

There might be risks of sexual harassment within project workers and community. Proper community sensitization, worker training and induction on SH will be done periodically. After implementation of controls throughout construction phase, SEA is **Low**, while the operational related impacts are also considered to be **Very low**, Monitoring will be done frequently in liaison with administrative organs to ensure the impact is negligible always

7.9.8 Child Labour/Exploitation

In remote Locations where the poverty index is high, there is a likelihood of using cheap labour from underage children in project related activities. Child Labour is prohibited under Children's Act and ILO.

Mitigation against child labour:

The following should be undertaken to protect the rights of children and elimination child labour and forced labour: The following should be undertaken to protect the rights of children and elimination of forced labour:

- No employment for anyone under the age of 18
- All persons seeking employment (contractor, subcontractor) should be required to provide a national identity card.
- The client and contractor should not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty.

- Implement a labour management plan –to promote fair and equitable labour practices during the COVID 19 pandemic including the project cycle for the fair treatment, protection of workers’ rights, non-discrimination, and equal opportunity of workers
- Implement a local recruitment plan - to create opportunities for local employment and to adopt a fair and consistent approach to the recruitment, assessment, and selection of local employees during the COVID 19 pandemic including the project cycle.
- Adopt and implement a Grievances Redress Mechanism to receive and address grievances from host community during the COVID 19 pandemic including the project cycle.

Table 7-32: Impact significance rating on Forced labour During construction and operation Phase

Mitigation	Extent	Duration	Severity	Frequency of activity	Probability of impact	Consequences	Likelihood	Significance
Without mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	6	7	Low
	1	2	3	5	2			42
Mitigation measures	<ul style="list-style-type: none"> ▪ No employment for anyone under the age of 18 ▪ All persons seeking employment (contractor, subcontractor) should be required to provide a national identity card. ▪ The client and contractor should not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. ▪ Implement a labour management plan –to promote fair and equitable labour practices during the COVID 19 pandemic including the project cycle for the fair treatment, protection of workers’ rights, non-discrimination, and equal opportunity of workers ▪ Implement a local recruitment plan - to create opportunities for local employment and to adopt a fair and consistent approach to the recruitment, assessment, and selection of local employees during the COVID 19 pandemic including the project cycle. ▪ Adopt and implement a Grievances Redress Mechanism to receive and address grievances on child labour 							
With mitigation	<500m ²	1 - 12 months	Marginal	Daily	Highly unlikely	4	7	Low
	1	2	1	5	2			28

Concluding Remarks

From impact analysis on child labor and exploitation, the initial impact before mitigation is expected to be medium low since there is processes of onboarding human laboring underage child will be allowed to be employed or engaged in any project activities. The community has also ben sensitized against engaging children in any form of exploitation either directly or indirectly. The cumulative impact significance is there for low

7.9.9 Impacts on Public Health

This section examines the concerns for public health related to HIV/AIDS and other communicable and sexually transmitted diseases (STDs), and exposure to electric and magnetic fields (EMFs)

a). HIV/ AIDS

HIV/AIDS has been declared a national disaster. It has been observed that construction works, and projects are a conduit for transmission of the disease through sexual interactions between project staff and local communities. The ESIA team has educated the public on this matter and the education will continue throughout the project period.

The contractor will transport workers to active construction sites each day from the nearest urban centers, such as Narok, Ololunga, Mulot and Bomet. No camps will be used that might attract concentration of prostitutes. The contractor will, as part of each workers initial orientation and ongoing education, provide public education information about HIV/AIDS transmission and prevention measures. Condoms should be made available to project workers at no cost by the contractor if need be.

The contractor should install billboards written in English, Kiswahili and local language to warn and educate the public on HIV/AIDs along active construction sites.

b). Electric and magnetic fields

Health concerns over exposure to EMF are often raised when a new transmission line is proposed. Exposure to electric and magnetic fields caused by transmission lines has been studied since the late 1970s. These fields occur whenever electricity is used. The magnetic field is created when an electric current flow through a device including the electric wiring in a home. Every day we are exposed to many common sources of EMF from vacuum cleaners, microwaves, computers, and fluorescent lights.

As per the design, the contractor will calculate the EMF levels to be generated by the various components of the project. Design changes will be made to ensure levels for the proposed project will be well below the range suggested by guidelines and well within the range of EMF generated by other common sources.

Proposed Mitigation and Monitoring Activities

Magnetic fields can be measured with gauss meter. The size of the magnetic field cannot be predicted from the line voltage but is related to the current flow. A 66kV line can have a higher magnetic field than a 132kV line. Magnetic fields quickly dissipate with distance from the transmission line.

- The proposed line will be constructed to safe standards to ensure the height and way leave trace protects the public from any adverse effects of electric power and electromagnetic frequencies.
- A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field.
- The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits.
- KETRACO policy of keeping the residence away from the wayleave will also minimize exposure of the public to EMFs.
- EMF levels are not expected to change with time, so further monitoring is not planned
- Electric utility workers have a higher exposure to EMF than the public due to working in proximity to electric power lines. Occupational EMF exposure should be prevented or minimized through the preparation and implementation of the EMF safety program including the following components:
 - Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities
 - Training of workers in identification of occupational EMF levels and hazards

- Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers. Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the Institute of Electrical and Electronics Engineers (IEEE).

7.10 Mitigation against Lack of Capacity

- KETRACO to ensure Contractors maximize on capacity enhancement and transfer of knowledge and skills to local employees, through on-the-job trainings to the extent possible. This can be attained through ensuring contractors adopt, develop and implement a Local Recruitment Plan and Labour Management Plan as part of C-ESMP a Local Recruitment Plan. The Labour Management Plan will ensure promotion of fair and equitable labour practices for the fair treatment, non-discrimination, and equal opportunity of workers.
- Semi-skilled labour should be sourced from within and where un-available outside the project area, as such, the local Narok and Bomet Counties people will learn new skills from the transferred skills and knowledge
- KETRACO environmental and social safeguards departments to conduct to undertake training and build the capacity of the contractor to implement both the ESMP and ESMnP. This should include project staff and implementing partners.
- As part of health and safety implementation KETRACO should ensure training is conducted on;
 - Regular fire safety trainings /fire drills for employees and contractors
 - The personnel involved in the handling of hazardous waste including fuel and used oil should undergo specific training in hazardous material handling procedures and fuel / lubricant and used oil handling procedures.
 - Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures.
 - Training workers in the identification of occupational EMF levels and hazards.
 - Training workers in the use of the available information (such as MSDSs), safe work practices, and appropriate use of PPE.
 - Set up a health and safety committee and undertake training
- KETRACO to ensure contractor develops appropriate training, awareness content and implement awareness sessions for communities and workers on HIV/AIDs and other STDs, as well as GBV-SEA and sexual harassment at workplaces.
- KETRACO to ensure the contractor provides mandatory trainings regarding GBV -SEA/SH to all project workers including temporary and casual workers.
- KETRACO to ensure the contractor provides training and awareness raising on the code of conduct for the workforce about refraining from unacceptable conduct toward local community members, specifically women

7.11 Occupational incidents and emergency situations Management

The contractor should submit method statements covering the procedures for the main activities which could generate emergency situations through accidents or neglect of responsibilities.

These situations include, but not limited to:

- Accidents at the workplace
- Accidental fires
- Accidental leaks and spillages
- Vehicle and plant accidents
- Environmental sustainability

Proposed Mitigation Measures

- The contractor should undertake an initial awareness training session prior to any work commencing onsite, where the target audience is all the project personnel. The training should include but not be limited to the following:
 - Basic awareness and understanding of the key environmental features of the work site and environs
 - Understanding the importance of and the reasons why the environment must be protected.
 - Ways to minimize identified environmental Impacts
 - Relevant requirements of the Environmental Management Plan (EMP) and Waste Management Plan (WMP) provided in this report.
 - Health risks pertinent to the site, including prevention of communication diseases.
 - Prevention and handling of fire.
 - An environmental restoration plan should be developed for the line project
- The contractor should conduct environmental awareness training in liaison with KETRACO.
- KETRACO and the contractor must ensure that site staff found to be involved in incidences of theft or pose other security risks to the local community are to be dismissed and reported to the authorities

7.12 Cumulative Impacts

Cumulative impacts are impacting that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past present or reasonably foreseeable future activities.

This section provides a description and analysis of the potential cumulative effects of the 132kV Narok -Bomet power line project and considers the effects of any such changes on the biophysical environment and socioeconomic conditions. The cumulative impacts will be mitigated through the following:

- Make deliberate efforts to reduce or prevent emission of greenhouse gases throughout the project that can cumulatively exacerbate climate change impacts. This can be attained by adopting new technologies and renewable energies including use of low and zero carbon emitting project machinery, vehicles, and equipment.
- Ensure the project route is retained as it or any designs alterations avoids towns and market centers.
- Ensure construction including RoW clearing and maintenance works are scheduled to avoid rainy seasons.
- KETRACO to ensure regional mitigation or offset management engagement strategies such as regional liaising with other government line agencies including County Government and local community to participate in tree replanting program activities (plant in alternative public places such as schools, water towers in Kenya, promotion of livelihood restoration activities such as agroforestry to PAPs)
- Adaptive management approaches to project mitigation including: using existing utility transport corridors for transmission and distribution as much as possible to reduce on habitat alteration; undertaking selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the wayleave; installing transmission lines above existing vegetation to avoid land clearing; re-vegetation of disturbed areas with native plant species; reduce proliferation of the invasive species through active periodic way leave management
- Ensure adequate project impacts monitoring to assess efficacy of management efforts.

Cumulative Impact Analysis

For the most part, cumulative impacts or aspects thereof are too uncertain to be quantifiable, due to mainly lack of data availability and accuracy. This is particularly true of cumulative impacts arising from potential or future projects, the design or details of which may not be finalized or available and the direct and indirect impacts of which have not yet been assessed. Given the limited detail available regarding such future

developments, the analysis that follows is necessarily of a generic nature and focuses on key issues and sensitivities for the project and how these might be influenced by cumulative impacts with other activities. In most cases, only qualitative assessments of cumulative impacts are possible, i.e. they are not formally rated.

Cumulative Biophysical Impact

The potential cumulative impact associated with the Narok-Bomet powerline is the potential loss of biodiversity through a decrease in vegetation and faunal habitat. A decrease in avifauna because of the operation of the facility may also occur. The clearing of natural vegetation is occurring at an increasing rate within some flats area because of human population growth and development. The clearing of indigenous vegetation is resulting in a decrease in biodiversity and suitable habitat for fauna. The development of the 132kV double circuit powerline will exacerbate the loss of biodiversity through the direct loss of natural vegetation within the powerline wayleave, as well as indirectly through enabling the further construction of the ring feed powerlines and providing an additional supply of electricity to the area which may facilitate further development initiatives. However, with the implementation of the proposed mitigation recommendations the cumulative impact on biophysical environment will be low

Cumulative Socio-Economic Impact

The proposed powerline development has the potential for positive cumulative socioeconomic impacts. The construction of the Narok-Bomet powerline will provide an additional supply of electricity to the Bomet/Narok/Sotik areas. This dedicated, additional supply of electricity will enable many previously un-serviced households to receive electricity, thereby improving the standard of living for the people within the surrounding rural area. The power outages, which are currently occurring in the area on a relatively frequent basis, will also decrease accordingly.

Summary of the identified impacts in terms of Significance of the Proposed Project are presented in Table 7-34. **Error! Reference source not found.** while the summary of impacts in terms of whether they are positive or negative; direct or indirect; major or Minor and Temporary or permanent are presented in table

Table 7-33: *Presents a Summary of Significance of the Identified Impacts of the Proposed Project*

Significance of Impacts

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Soil and Geology						
Increase in erosion potential and sedimentation	Medium negative impact	low negative impact	Not anticipated	Not anticipated	Low negative impact	Low negative impact
Contamination of soil	low negative	low negative	Not anticipated	Not anticipated	Low negative	Low negative

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
	impact	impact			impact	impact
Weakening of the geological stability	low negative impact	Very low negative impact	Not anticipated	Not anticipated	Low negative impact	Low negative impact
Ecology						
Impact on terrestrial ecology	High negative impact	Low medium negative impact	Low negative impact	Low negative impact	Not anticipated	Not anticipated
Forest and vegetation clearance	High negative impact	Low Medium negative impact	Low negative impact	Low negative impact	Not anticipated	Not anticipated
Impact on Aquatic environment	Low negative impact	Low negative impact	Not anticipated	Not anticipated	Low negative impact	Low negative impact
Air quality						
Decrease air quality due to dust	Low negative impact	low medium negative impact	Not anticipated	Not anticipated	Low negative impact	Low negative impact
Fugitive emissions	Low negative impact	Low negative impact	Not anticipated	Not anticipated	Low negative impact	Low negative impact
Air pollution from incidents	Not anticipated	Not anticipated	Low negative impact	Low negative impact	Not anticipated	Not anticipated
Waste generation						
Pollution from waste generation	Low medium negative impact	Low negative impact	low negative impact	Low negative impact	Low negative impact	Low negative impact
Water quality						
Decreased water quality	Low negative impact	Low negative impact	Low negative impact	Low negative impact	Low negative impact	Low negative impact
Noise and vibration						
Deterioration in ambient noise quality	Low negative impact	Low negative impact	Not anticipated	Not anticipated	low negative impact	low negative impact
Visual impacts						
Impact on visual landscape	Low	Low	Low	Low	Not anticipated	Not anticipated
Socio-economic						

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Creation of employment	Low positive impact	High positive	Low positive impact	Medium high positive impact	Not anticipated	Not anticipated
Gains in the Local and National Economy	Low positive impact	High positive	Medium Low positive impact	Medium high positive impact	Medium negative Impact	Low Negative Impact
Provision of Market for Supply of Building Materials	Low positive impact-Direct - minor	Low positive impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Informal Sectors Benefits	Low positive Impact-Direct & Minor	Low positive impact-Direct & minor	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Loss of livelihood	Medium negative impact	low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Land take	Medium negative impact	low Negative	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Influx of people	Low negative impact	Low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Physical displacement of people	Medium negative impact	low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Traffic impacts						
Accidents because of increased traffic	Low medium negative impact	Low negative impact	Low negative impact	Low negative impact	Not anticipated	Not anticipated
Damage to roads and transport infrastructure	low negative impact	low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Health and Safety						
Occupational Health and safety	Low negative impact	Low negative impact	Low negative impact	Low negative impact	Low negative impact	Low negative impact
Community health & safety	Not anticipated	Not anticipated	Low	Low	Not anticipated	Not anticipated

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
			negative impact	negative impact		
Electromagnetic Fields	Not anticipated	Not anticipated	Low negative impact	Low negative impact	Not anticipated	Not anticipated
HIV & AIDS	Low negative impact	Low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
Impacts on Wetlands	Low negative impact	Low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
GBV & Sexual exploitation and abuse	Low negative impact	Low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
Child Exploitation	Low negative impact	Low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
Lack of Capacity	Medium Low negative impact	Low Negative	Low negative	Not anticipated	Low negative impact	Low Negative
Archeological, Cultural & historic	Low negative impact	low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
Visual intrusion	Low negative	low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative
Avifauna Effects	Not anticipated	Not anticipated	Low negative impact	low Negative	Not anticipated	Not anticipated
Aviation impacts	Not anticipated	Not anticipated	Low negative impact	low Negative	Not anticipated	Not anticipated
Hazardous Materials	Low negative impact	low Negative	Not anticipated	Not anticipated	Low negative impact	Low Negative

Table 7-34: Summary of Project Potential Impacts in all aspects

Environmental & Social Impact	Positive/ Negative	Direct / Indirect	Temporary / Permanent	Major / Minor	Occurrence		
					Construction	Operation	Decommissioning
Employment Opportunities	Positive	Direct & Indirect	Permanent /Temporary	Major	√	√	√
Gains in the Local and National Economy	Positive	Direct	Permanent	Major	√	√	x
Provision of Market for Supply of Building Materials	Positive	Direct	Temporary	Major	√	x	x
Informal Sectors Benefits	Positive	Direct & Indirect	Temporary	Minor	√	x	√
Increase in electricity supply	Positive	Direct	Permanent	Major	x	√	x
Visual and aesthetic impacts	Negative	Direct	Permanent	Major	√	√	x
Land Take	Negative	direct	Permanent	Major	√	√	x
Impacts of terrestrial ecology (on farm private forest) Destruction of existing vegetation)	Negative	Direct	Permanent	Major	√	√	√
Impacts on Wetlands	Negative	Direct	Temporary	Minor	√	-	√
Public health (Possible Exposure of Workers to Diseases)	Negative	Direct	Permanent	Major	√	√	√
Social impacts	Negative	Direct	Permanent	Major	√	-	-
Generation of Exhaust Emissions	Negative	Direct	Temporary	Minor	√	x	√
Dust Emissions	Negative	Direct	Temporary	Minor	√	x	√
Water quality	Negative	Direct	Temporary	Minor	√	x	√

Environmental & Social Impact	Positive/ Negative	Direct / Indirect	Temporary / Permanent	Major / Minor	Occurrence		
					Construction	Operation	Decommissioning
Occupational Health and Safety (Workers accidents and hazards)	Negative	Direct	Permanent	Minor	√	√	√
Earth and construction material sourcing	Negative	Direct	Temporary	Minor	√	x	x
Waste Generation and management	Negative	Direct	Temporary	Minor	√	x	√
Soil Erosion impacts from vegetation clearance	Negative	Direct	Permanent	Minor	√	√	√
Hazardous Materials	Negative	Direct	Temporary	Minor	√	x	√
Air and noise impacts	Negative	Direct	Temporary	Minor	√	x	x
Fire Outbreaks	Negative	Direct	Temporary	Minor	√	√	√
Impacts on avifauna (Aircraft Accidents)	Negative	Direct & Indirect	Permanent	Minor	x	√	x
Change in Land use patterns	Negative	Direct	Permanent	Minor	√	√	√
Impacts on Avi – Fauna	Negative	Direct	Permanent	Major	√	√	x
Fugitive Emissions	Negative	Direct	Temporary	Minor	√	x	√
Traffic congestion / road wear and tear	Negative	Direct	Temporary	Minor	√	x	x
Fuel & chemical storage	Negative	Direct	Temporary	Minor	√	x	x

7.13 KETRACO Corporate Social Responsibility

KETRACO endeavors to carry out business in a socially and environmentally responsible manner. Towards this end, the company sets aside one percent of its after-tax profit each year to support corporate social responsibility (CSR) initiatives as one way of giving back to communities. These initiatives include:

- Education
- The environment
- Health
- Sports, art and Culture
- The disadvantage and community support

Affected communities can make proposals for consideration by the proponent.

CHAPTER 8. ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)

8.1 Introduction

Environmental and Social Management Plan (ESMP) for development projects provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. ESMP is a vital output of an Integrated Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The ESMP outlined below addresses the identified potential negative impacts and mitigation measures of the proposed Narok-Bomet 132kV Transmission Line during construction, operational and decommissioning phases, based on the Chapter of Environmental Impacts and Mitigation Measures of the expected Negative Impacts.

This section presents the environmental and social management plan (ESMP) for the proposed project. The ESMP specifies the mitigation and management measures which the Proponent will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation, and decommissioning.

8.2 Approach to Environmental Impact Management

The proposed ESMP will be the responsibility of the proponent and the contractor as outlined. **The section below** presents the range of approaches that will be used to manage potential impacts of the proposed project. KETRACO as the proponent will have to constitute a team including project engineer and Environmental and Social specialist to coordinate implementation of the ESMP. The contractor on his part shall use the Proponent's ESMP to prepare a Contractor ESMP (C-ESMP).

The contractor shall further appoint EHS officer(s) to coordinate C-ESMP implementation during construction period. During construction KETRACO Engineer, Environmentalist and SHE officer will ensure continuous supervision and monitoring of activities by the contractor as per recommendations in the ESMP. E&S reporting will be done on regular basis will be captured in the construction site log, monthly I E&S reviews with the Engineer, E&S monthly or quarterly. The Engineer will be required to generate various reports including production of minutes of monthly site visits and quarterly supervision reports. While the Environmentalist & SHE Officer will be required to provide reports on environmental, social and safety issues compliance on monthly basis.

The contractor specifically will be required to regularly report Environmental, social and safety issues on Monthly basis. The aspect to be reported by the contractor will include safety issues i.e. hours worked, recordable incidents and corresponding Root Cause Analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training etc.); Environmental incidents and near misses; noncompliance incidents with permits and national law; Training on E&S issues (dates, number of trainees, and topics); Details of any security risks; Worker & External stakeholder grievances and E&S inspections and audits by contractor, engineer, or others, including authorities.

8.3 Management of Impacts during Construction Phase

The ESMP will put in place measures to avoid and mitigate impacts and optimize benefits arising from activities during construction phase of the project. The principal focus of project management for construction phase will include:

- Personnel and contractor management
- Conduct onsite management
- Landowners relations
- Maintenance of complaints register

- Emergency preparedness; and
- Management and mitigation of impacts such as noise, dust, safety, and pollution.
- Assignment of responsibility and contractor management is important during the construction and operation phase. The contractor will be held to the highest EHS performance requirements to ensure they meet national and international standards
- All the works for the project will be under the supervision of KETRACO project Engineer.

8.4 Management Plan during construction phase

The following management plans (among others) will be used by the contractor to prepare C-ESMP during construction phase of the proposed project:

- Construction management plan
- Labour and human resources plan including Local Recruitment Plan
- Workplace health and safety plan
- Community Health and safety and Security plan
- Emergency management and response plan
- Rehabilitation and closure management plan
- 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
- Grievance Redress Mechanism
- Gender Based Violence (SEA/SH) Management Plan
- CSR Plan (to be informed by KETRACO's CSR Policy)
- Child Protection Strategy
- HIV/AIDs Prevention Strategy

8.4.1 Construction Management Plan

The construction management plan for the proposed project shall include the following:

a) Management of fuels and other hazardous materials

- 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.

b) Management of the construction site

- The contractor shall prevent littering and the random discard of any solid waste on or around the construction site
- The contractor shall manage hazardous waste

c) Emergency Preparedness

- The Contractor shall develop an emergency plan that will enable rapid and effective response to all types of environmental emergencies in accordance with recognized national and international standards. The emergency plan shall include establishment of a network of communication between the Contractor and emergency services including police, ambulance services, and fire brigades among others.

d) Fire Prevention and management

- The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process.
- The Contractor shall prepare a fire prevention and fire emergency plan as a part of the Environmental Plan to be submitted to KETRACO

e) Management of air quality

- The Contractor shall institute appropriate measures to minimize or avoid air quality impacts. This can be achieved through formulation of air quality management plan.

f) Neighboring land owner and occupier relations

- The Contractor shall always respect the property and rights of neighboring landowners and occupiers and shall treat all persons with deliberate courtesy.
- The Contractor shall respect any special agreements between the Proponent and the neighbors e.g., the wayleaves agreements signed between Kenya power and landowners will need to be respected by the contractors.

g) Complaints register

The Contractor shall establish and maintain a register for periodic review by the Proponent that logs all the complaints raised by the neighbors or the public about construction activities. The register shall be regularly updated, and records maintained including the name of the complainant, his/her domicile and contact details, the nature of the complaint and any action taken to rectify the problem.

h) Health management

- The Contractor shall comply with all relevant legislative requirements governing worker health and safety (e.g. OSHA 2007 and its subsidiary legislations).
- The Contractor shall prepare and implement a programme to minimize diseases likely to be contracted by the construction workers because of the proposed project such as HIV & AIDs.
- The contracted companies shall have obligations of managing the safety of its employees by
 - Provision of appropriate PPEs to employee
 - Training employees on competence
 - Employing competence and qualified staff to powerlines
 - Provision of first Aid Kit onsite
 - Should have a trained first aider
 - Safe work procedures and work instruction
- The contractor will manage accidents by having an emergence response plan which will include contacts for all emergency service provider e.g. ambulances, fire brigade and nearest hospitals (Some of the hospitals which can be utilized while working on route include (Narok County referral hospital, Longisa Hospital, Tenwek Hospital, Kapkimolwa Health Centre)

a) Construction Control

The Construction control for the proposed project shall cover the following:

Control of access

The contractor shall ensure that the construction site is accessed by authorized persons only.

Control of material supply and burrow areas

- The Contractor shall, as far as possible, source all material needed to construct the proposed project from the licensed mines and /or quarries in Narok and Bomet counties.
- In instances where materials are to be obtained from a new burrow area; the Contractor shall comply with relevant legislations.
- The Contractor shall prepare a method statement including plans, detailing the expected quantity of excavation, temporary and permanent drainage control, the final contouring of the burrow pit and the proposed method of rehabilitation.

Rehabilitation

- After completion of construction activities, the Contractor shall clear the site of construction materials and dispose wastes in appropriate disposal sites.
- The Contractor shall remove all temporary works on the construction site and grow grass on the sloppy areas where retaining wall will not be constructed to control soil erosion

8.4.2 Labour and Human Resources Plan

In designing the labour and human resources plan Contractor shall:

- Comply with the provisions of Employment Act, 2007
- Wherever possible, give priority to qualified local people when hiring employees.

8.4.3 Workplace Health and Safety Plan

The workplace health and safety plan to be implemented by the Contractor and KETRACO shall include the following key measures:

- All relevant national legislation, including the OSHA 2007 and related regulations, shall be adhered to ensure that health and safety of proximate communities and the public at large are not threatened during construction and operational phases of the Project.
- The Proponent shall ensure workplace health and safety during the operational phase of the project
- Health and safety performance will be continuously monitored, and procedures reviewed with the aim of eliminating risk as far as reasonably practicable.

8.4.4 Community health and safety plan

The community health and safety plan to be implemented by the Contractor and KETRACO shall include:

- Adherence to OSHA 2007 Act and its subsidiary legislations to ensure that health and safety of immediate neighbors and the public is not threatened.
- The Contractor to ensure that construction work is undertaken in manner not likely pose risks to community health and safety.
- The Proponent to undertake an independent quantitative risk assessment prior to operation of the facility. The findings of this assessment will inform the development of an emergency safety plan the Contractor and KETRACO to create awareness among the neighbors on the community safety procedures

8.5 Management of Impacts during Operation Phase

The operation phase of the proposed project will be mainly power supply, line maintenance and clearing of wayleaves. KETRACO will be responsible for all the mitigation measures for negative impacts during the operation phase. This will have done by following the following steps

- Inspections
- Corrective Action
- Reporting

Impacts and mitigation/ management measures

Table 8-1 presents the ESMP for the proposed project. It covers on the proposed management and mitigation measures for the identified impacts. In addition, the ESMP provides a schedule for the implementation of management/mitigation activities, sub-divided by project phases. The schedule shows at a glance, the timing and responsibility of the many actions required under the ESMP. It is particularly useful where management/mitigation measures extend across phases.

ENVIRONMENT AND SOCIAL MANAGEMENT PLANS

Table 8-1: Environment and Social Management Plan

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
PHASE 1: PRE-CONSTRUCTION PHASE						
Land Take/Loss of Land and Land use rights	<ul style="list-style-type: none"> •Preparation of a resettlement action plan to guide compensation, relocation, and resettlement •Community sensitization by KETRACO on alternative land uses of wayleaves, and design themes to reduce the effect of land take by the transmission line project. •KETRACO to follow way-leave rules and provide 30-day notice prior to way-leave maintenance works. Sufficient notice post compensation to be accorded to those who require rebuilding their dwelling units and relocate. •KETRACO will be required to enter an agreement/arrangement with landowners on alternative afforestation/reforestation •Compensation against loss and damage to crops when land will be temporarily acquired for construction purposes •Compensation for land 	Prior to project commencement	KETRACO	<ul style="list-style-type: none"> •Prepared RAP •No. of community sensitization meetings •No of PAPs compensated •Notice period given to PAPs 	<ul style="list-style-type: none"> •Prepared and Disclosed RAP •Minutes of Community/PA Ps meetings •Compensation records 	RAP Budget (given below)

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Physical Displacement of PAPs	Conduct a Resettlement Action Plan (RAP) along the transmission line	3 months before project construction	KETRACO	•No. of RAP reports completed	•Approved RAP Report	3,200,000
	<ul style="list-style-type: none"> •RAP Implementation through •Compensation of PAPs and giving a disturbance allowance •will be carried out in compliance with the Kenyan legislation, and AFDB safeguard standards Physically or economically displaced people will be offered an option between either cash or a full compensation or replacement of residential houses and affected structures •The project will make every effort to sensitize the affected on wise use of the compensation package. 	3 months before project construction	KETRACO	<ul style="list-style-type: none"> •No. of persons compensated and resettled before construction •No of structures compensated and replaced •Sensitization On the use of cash compensation 	<ul style="list-style-type: none"> •Compensation Records •Replaced structures •Sensitization records 	666,000,000
Occupational Health and safety impacts	<ul style="list-style-type: none"> •Health, Safety and Environmental training of KETRACO Supervisory Staff and Contractors •Training of Site management staff on ESMP 	•Prior to project implementation	KETRACO	•No of KETRACO and contractor staff trained and number of trainings held	•Training records (reports, minutes, attendance lists)	150,000
Low knowledge level on high		Prior to construction	CONTRACTOR	• Number of members of	• Meeting minutes	200,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
energy transmission infrastructure	Sensitization of the Public-on-public occupational health and safety			the public and sensitized	• Attendance records	
Sub total						669,700,000
PHASE 2: CONSTRUCTION PHASE						
Increased Air quality (Air pollution and dust generation)	<ul style="list-style-type: none"> • All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction • The Contractor to protect stockpiles of friable material subject to wind-throw by wetting, or with a barrier, vegetation, or windscreen. • Cover loads of friable material during transportation. • Restrict speed on loose surface roads during dry or dusty conditions. • Suppress dust during dry periods by use of water sprays. • Maintain equipment and machinery in good running condition – no vehicles to be used that generate excessive black smoke. • A maintenance plan for the construction machinery and vehicles shall be prepared and 	Throughout Construction phase	Contractor	<ul style="list-style-type: none"> • No of Trainings for staff • Frequency of air quality tests done as per schedule • Number of respiratory disease cases • Vehicles Maintained in good condition • No of Speed limits signage • No of • No. of Maintenance plan for the construction machinery 	<ul style="list-style-type: none"> • Air quality PM measurement reports • Medical reports of workers and PAPs • Quarterly ESMP Reports • Vehicles and machines maintenance records • Training records (reports, minutes, attendance lists) • Photos of traffic signage • Maintenance plan for the construction 	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>implemented to prevent excessive emissions.</p> <ul style="list-style-type: none"> • Burning of woody debris & construction waste to be prohibited within the wayleave • 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 impurity into the atmosphere. • Use of personnel protective equipment (PPE) • Keep stockpiles and exposed soils compacted and re-vegetate as soon as possible. • Regular air quality tests 			and vehicles prepared	machinery and vehicles	
Solid waste generation	<ul style="list-style-type: none"> • The wrappings and packaging materials should be reused or recycled where applicable • The contractor should prepare and adhere to the site waste management plan • No burning of solid waste on site • Provision of waste skips and bins for various types of wastes on site • Any service/Repair of vehicles to be done offsite in approved garages or service stations 	During Construction	Contractor	<ul style="list-style-type: none"> • Amount in tonnes of waste generated • Nema licensed solid waste handler hired • Prepared site waste management plan 	<ul style="list-style-type: none"> • Waste consignment notes 	100,000
					<ul style="list-style-type: none"> • Nema licensed solid waste handler hired • Prepared site waste management plan 	<ul style="list-style-type: none"> • NEMA Waste license for approved waste handlers/contract for the waste handler • Waste tracking documents

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Construction wastes to be managed in accordance with standards. • Application of 3R Principle in waste management • Contractor on site MUST have a NEMA licensed waste handler to always collect any waste residue and dispose effectively • Separation of waste to be affected 			<ul style="list-style-type: none"> • No. of Waste skips and bins for various types 	<ul style="list-style-type: none"> • Documents for final waste disposal site 	
Impacts on water quality and water resources	<ul style="list-style-type: none"> • Unchanneled flow of water at the site during construction will be controlled to avoid soil erosion • Storage areas that contain hazardous substances should be bunded with an approved impermeable liner • Care will be taken during concrete pouring activities to ensure there is no pollution of surface • Siting of towers away from drainage lines and floodways can also minimize interference to natural drainage systems. Siting of towers away from drainage lines and floodways can also minimize interference to natural drainage systems 	Construction	Contractor	<ul style="list-style-type: none"> • Quantity in m3 of water used daily • No of awareness sensitization /trainings on water management • Location OF towers • Location of vehicle servicing yards • Location of storage areas for 	<ul style="list-style-type: none"> • water meter usage reports • Training attendance records • Water quality reports • Vehicle servicing records 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Siting of towers away from drainage lines and floodways to minimize interference to natural drainage systems • Limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass • Train work crews in safe handling of petro-chemicals. • Follow WRA regulations 			hazardous substances		
Noise & vibration	<ul style="list-style-type: none"> • 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. • Landowners along the routes to be notified about the construction schedule & activities, including blasting, should it be required. • Construction techniques and machinery selection to minimize noise and vibration. 	Construction	Contractor	<ul style="list-style-type: none"> • Number of noise level tests done • Number of machines and equipment producing noise • No of silencers or enclosures for noise generating machines • Notices for landowners on construction activities 	<ul style="list-style-type: none"> • Noise measurement reports • Visual Noise Hazard warning signages in specified locations • PPEs issuance register • NEMA Noise license • Notices for the public 	300,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> Noise generating activities that take place near residential or sensitive institutional receptors will be restricted to between 0800 and 5pmhrs, which is defined as 'daytime' in the Kenyan noise regulations 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 centimeters per second beyond any source property boundary or 30 metres from any moving source. Provision of protective devices like earmuffs/earplugs to workers, who are continuously exposed to high levels of noise during construction activities. 			<ul style="list-style-type: none"> Type of PPEs issued for noise protection Construction timing 		
Visual & aesthetic impacts	<ul style="list-style-type: none"> Extensive public consultation during the planning of power line and power line right-of-way locations; Maximize straight-line runs to reduce the need for angle towers; 	Construction Phase	KETRACO/Contractor	<ul style="list-style-type: none"> Number of towers erected per location Location of powerlines, sub stations etc 	<ul style="list-style-type: none"> Rehabilitation program plan Photos of location of towers, sub stations etc. 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Locate new towers adjacent to already existing high-impact visual features, such as forests where possible • Where possible, locate the new line adjacent to existing power lines • Siting power lines, and designing substations, with due consideration to landscape views and important environmental and community features. • Location of high-voltage transmission lines in less populated areas, where possible • Existing tracks will be used for construction and maintenance operations as much as possible 					
Land Take	<ul style="list-style-type: none"> • Route selection to avoid existing settlements and minimize disturbance. • KETRACO to follow Land Act 2012 Laws of Kenya and Land Acquisition Act; • Community sensitization on alternative land uses • Compensation of the affected people at current Market rate for land and other loss assets 	Preconstruction, construction, and operation phases	KETRACO	<ul style="list-style-type: none"> • Prepare RAP • No Of PAPs compensated 	<ul style="list-style-type: none"> • Signed minutes of discussion on community sensitization on project impacts and controls • Approved RAP 	RAP budget

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Prior to wayleave acquisition free and informed consent should be sought • Consultation with PAP should continue throughout project phases • KETRACO will identify all potential Project Affected Persons (PAPs) & develop a Resettlement Action Plan (RAP) to address economic losses, physical resettlement & loss of land or land rights. The RAP should be framed in consultation with the PAP • Appropriate ongoing consultation with local communities throughout Project construction as well as informing workers on local cultural sensitivities and health matters 					
Fire Hazards	<ul style="list-style-type: none"> • The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process. • Monitoring ROW vegetation according to fire risks • The Contractor shall prepare a fire prevention and fire 	Construction	Contractor	<ul style="list-style-type: none"> • Conducting Fire audit • fire prevention and fire emergency plan • adequate firefighting appliances 	<ul style="list-style-type: none"> • Fire clearance certificate by contractor • Purchase records for firefighting equipment 	600,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>emergency plan as a part of the Environmental Plan to be submitted to KETRACO</p> <ul style="list-style-type: none"> • The Contractor shall provide adequate firefighting appliances at specified localities on the worksite to meet any emergency resulting from ignition of a fire. • No burning of any litter/ cleared vegetation on site • Avoid Careless handling of cigarette butts • Sensitizing community of fire hazards and prevention • Training of Staff and personnel on fire fighting • Monitoring right-of-way vegetation according to fire risk • Removing blowdown and other high-hazard fuel accumulations. • Time thinning, slashing, and other maintenance activities to avoid forest fire seasons; 	Construction	KETRACO	<ul style="list-style-type: none"> • No of training and sensitization sessions (community/workers) on fire • No of participants attending fire safety training • Personnel training and community sensitization • Fire Safety plan developed 	<ul style="list-style-type: none"> • Fire safety policy in place • Fire warden/marshall certificates • Roll call register for fire drills • Quarterly ESMP Reports highlighting status • Firefighting equipment inspection records • Sensitization/training records 	600,000
Impacts on Traffic (Traffic congestion)	<ul style="list-style-type: none"> • Contractor to prepare and implement a Traffic Management Plan. • KETRACO and contractor will choose traffic routes to reduce the impact in the neighborhood 	Construction	Contractor	<ul style="list-style-type: none"> • Prepared Traffic Management Plan. • Public notifications 	<ul style="list-style-type: none"> • Records indicating date time and delays caused by traffic 	800,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>avoiding, as far as practical any sensitive areas</p> <ul style="list-style-type: none"> • The contractor will ensure due regard of drivers to traffic regulations and always insist that courtesy be shown to other road users • Where traffic is anticipated, the contractor in close consultation with KETRACO should ensure they notify KERRA • Effecting of traffic routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood. • Choice of routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood • Employment of a road safety coordinator to oversee implementation of the traffic controls • Regular maintenance of delivery and dispatch trucks. • Wherever possible, use should be made of the existing roads and existing tracks during construction. If damage occurs to roads or properties, it should 			<p>of planned traffic</p> <ul style="list-style-type: none"> • Hiring OF a road safety coordinator • Reinstated roads/property 	<ul style="list-style-type: none"> • Recorded complains by local road users • a road safety coordinator contract 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>be repaired when the work is finished.</p> <ul style="list-style-type: none"> • Personnel driving construction vehicles will be required to adhere to speed limits and all other applicable road rules to ensure vehicle and pedestrian safety. • All vehicles to be in good working order, particularly as there are many pedestrians and animals in the area; and • A safe sight distance will be always maintained by cutting grass or other vegetation on either side of the access road/s to the substation site 					
Impacts on Archaeological, cultural and historic sites	<ul style="list-style-type: none"> • Diversion of the Right of Way for the proposed transmission line, to minimize the impacts of these sites if they are present. • Selective tower placement to span archaeological site if any • Contractor to follow procedures for chance find and protection of Archaeological sites and contact the National Museums of Kenya (NMK). • Avoid siting transmission line towers on cultural property 	Construction	Contractor	<ul style="list-style-type: none"> • Preparation of chance find and protection of Archaeological sites • Sensitization trainings on chance find • Location of transmission line towers 	<ul style="list-style-type: none"> • NMK Manual of critical areas of archeological importance • Chance find procedure training attendance sheets • Route firming reports showing location of archeological resources 	200,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>(Graves, shrines etc) consult with local community.</p> <ul style="list-style-type: none"> • If avoidance is not possible prepare a management plan to ensure least damage to cultural, archaeological sites. 					
Construction Material Sourcing	<ul style="list-style-type: none"> • Ensure accurate budgeting to ensure only Necessary material is ordered • Proper storage to ensure minimal loss • Strip & store topsoil separate from subsoil for major tower site excavations. • Rehabilitation of exposed sites as soon as practicable • Source Raw Materials from NEMA approved sites • Use recycled and recyclable materials where possible 	Construction phase	Contractor	<ul style="list-style-type: none"> • Quantity in tonnes of materials abstracted • Amounts of recycled materials 	<ul style="list-style-type: none"> • NEMA License for sand or quarry stone harvesting 	1,500,000
Impacts on flora & Fauna-Loss of Vegetation/terrestrial habitats	<ul style="list-style-type: none"> • Mark out areas for clearance and use manual method of clearance • Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the way leave • Prevent colonization by invasive species 	Construction Phase	KETRACO	<ul style="list-style-type: none"> • Migration of fauna species • Invasive species • No of trees cleared for construction works 	<ul style="list-style-type: none"> • Crops and trees data • Monitoring records • Reafforestation programs records 	5,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Vegetation removal will be kept to a minimum during construction of the substation and powerline / vegetation should be cleared only as and when required. • Care will be taken to remove topsoil and then subsoil and to stockpile these separately to be replaced at a later stage to facilitate revegetation. • The amount of time vegetation is covered by stockpiled material should be minimized. • Temporary access routes to construction areas will be kept to a minimum. • Re-vegetation using indigenous species and rehabilitation of areas temporarily cleared during construction should occur. • Alien vegetation should be removed from site on completion of construction. • Construction personnel should be properly trained to use equipment, particularly in terms of the dangers associated with the operation of heavy plant machinery; and 			<ul style="list-style-type: none"> • No of trees planted as part of re-forestation 		

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Following completion or partial completion of construction 					

<p>Occupational Health & Safety - workers</p>	<ul style="list-style-type: none"> • Staff Training and regular equipment service and testing • Only trained & certified workers to install, maintain or repair electrical equipment. • 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 • Testing structures for integrity prior to undertaking work. • Use of signs, barriers, and education/ public outreach to prevent public contact with potentially dangerous equipment. • Community policing to be encouraged to reduce vandalism of towers • Ensure provision and proper use of Personal Protective Equipment (e.g. Safety harness, helmet, dust masks, etc) • Follow safe work procedures • Maintain a fully stocked and accessible first aid kit under trained first aider 	<p>Construction,</p>	<p>contractor KETRACO</p>	<ul style="list-style-type: none"> • Induction sessions with employees • Community sensitization trainings on EHS • PPE provision • No of fully stocked first aid kits • Install hazard signage and warnings • Prepared Safe Work procedures and manuals • A Response and Evacuation Plan developed • Contracted qualified health and safety advisor • health and safety 	<ul style="list-style-type: none"> • Appointed SHE Expert on site • Training records • DOSH Workplace register on site • Induction records for workers • Inspection & Maintenance records • Visible Hazard communication signages • Safe Work procedures and manuals available • A Response and Evacuation Plan • Contract for the qualified health and safety advisor • health and safety committee • copy of WIBA 	<p>12,000,000</p>
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	<ul style="list-style-type: none"> • Observe OSHA 2007 regulations • Ensure there is no encroachment on the transmission line wayleave • A Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees • The contractor should contract a qualified health and safety advisor to conduct training and monitoring of construction works. • The contractor must ensure establishment of a health and safety committee for the project as per the Health and Safety Committee Rules 2004 of the OSHA, 2007 Act. • Provide for WIBA 			<p>committee in place</p> <ul style="list-style-type: none"> • WIBA policy in place 		
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Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Impacts on Public Health	<ul style="list-style-type: none"> • Reduce Perceived EMF impacts during design • The proposed line will be constructed to safe standards to ensure the height and way leave trace protects the public from any adverse effects of electric power and electromagnetic frequencies. • A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. • The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. • KETRACO policy of keeping the residence away from the wayleave will also minimize exposure of the general public to EMFs. • On HIV/AIDS, The contractor should install bill boards written in English, Kiswahili and local language to warn and educate 	Construction	KETRACO& Contractor	<ul style="list-style-type: none"> • EMF Testing before commissioning • No.of Contraceptive dispensers • Awareness training • HIV aids awareness signposts • Prepare COVID-19 Preparedness management plan • Provision of hand sanitizing facility or handwashing soap and water • Temperature checks on site access • Community Grievance Mechanism. 	<ul style="list-style-type: none"> • EMF Test reports • Training register on COVID 19 • Weekly temperature logs • PPEs issuance records • Training attendance sheets • No.of COVID prevention and control signages on site • Copies of the Developed Traffic Management plan, Response and Evacuation Plan, community Health and Safety Management Plan (CHSMP), Emergency 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>the public on HIV/AIDs along active construction sites.</p> <ul style="list-style-type: none"> • Develop and communicate to all employees (skilled, semi-skilled and 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. • Sensitize all workers (skilled, semi-skilled and unskilled) on COVID-19 risk mitigation measures with sufficient information to keep them and local community safe. • Establish prevention and mitigation measures against COVID-19 and arrangements for dealing with suspected and confirmed COVID-19 cases. The measures should include but not limited to. • Infection control plans, • Ensuring social distancing of not less 1.5 meters between employees in all directions, • Hygiene promotion through suitable hand sanitizing facility or handwashing soap and water 			<ul style="list-style-type: none"> • Developed Traffic Management • Signage on HIV AIDS • A Response and Evacuation Plan • Community Health and Safety Management Plan (CHSMP) • An Emergency Response Plans (ERPs) 	<p>Response Plans (ERPs)</p> <ul style="list-style-type: none"> • Signage on HIV AIDS 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Strict and proper use of face masks throughout all working hours and public places. • Routing or siting Transmission line is to avoid or minimize exposure to the public and where it is unavoidable all resettlements within the wayleave will be relocated. • 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 • As part of the C-ESMP, contractor to develop and monitor implementation of a Community Health and Safety Management Plan (CHSMP) which will include the following measures: <ul style="list-style-type: none"> ○ Keep construction site cordoned off from the public and employ full time security guard. Signs are put up around work fronts and 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>construction sites advising people of the risks associated with trespass. 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.</p> <ul style="list-style-type: none"> ▪ Adequate collection and storage of waste on site and safe transport to the disposal sites and disposal 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>methods at designated area shall be provided in addition cover for refuse containers so that waste does not become source of diseases.</p> <ul style="list-style-type: none"> ▪ Contractor will provide access to health care for those injured by its activities. ▪ Provision of protective condoms in worker's sanitation facilities. ▪ Provision of Voluntary Counselling and Testing (VCT) services <ul style="list-style-type: none"> • Ensure any trucking companies employed to work on the Project will have policies around health screening of their 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>workers in line with Project requirements.</p> <ul style="list-style-type: none"> • Ensure all workers including contractors and subcontractors receive education on symptoms of communicable diseases of concern and STDs. • Ensure all the COVID-19 protocols by the Ministry of Health are adhered to including social distancing, use of masks, hand washing, and use of sanitizers and vaccination of workers • Proponent 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. • Proponent will implement a Community Grievance Mechanism. 					

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> Proponent 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. Institute a compensation mechanism for animals knocked by contractor or sub-contractor/supplier vehicles An Emergency Response Plans (ERPs) in cooperation with local emergency authorities and hospitals to be prepared to deal with any emerging issues e.g., accidents involving the community. 					
Impacts on soils and geology	<ul style="list-style-type: none"> During the foundation excavations, it is recommended that excavated material is stockpiled a sufficient distance from the excavation. 	Construction phase	Contractor KETRACO	<ul style="list-style-type: none"> Total surface area of excavated ground 	<ul style="list-style-type: none"> Geotechnical reports Blasting licence with their 	3,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Material to be backfilled will be compacted to limit the possibilities of erosion; Backfilling of foundations should occur as quickly as possible; and • Unchanneled flow of water at the site during construction should be controlled to avoid soil erosion. •The contractor will ensure recovery of exposed soils with grass and other ground cover as soon as possible. •The project should ensure monitoring of areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled. •The contractor should ensure that construction related impacts like erosion and cut slope destabilizing should be addressed through landscaping and grassing, carting away and proper disposal of construction materials in the various site works. •The contractor should ensure that recommended compaction 			<ul style="list-style-type: none"> • Number of blasted tower locations 	<ul style="list-style-type: none"> signed risk assessment • ESMP implementation reports during construction phase 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>of spoil areas is undertaken and effective drainage of spoil sites to avoid land instability in form of soil subsidence, slip and mass movement.</p> <ul style="list-style-type: none"> •The contractor should ensure landscaping of the completed site. 					
<p>Influx of people- Social vices e.g Theft and Vandalism</p>	<ul style="list-style-type: none"> •Adopt and implement a Grievances Redress Mechanism to receive and address complaints from PAPs and host community. •Minimize overcrowding at the construction site to prevent double handling of materials and equipment. •Provision of proper management of materials by allocation to specific persons involved. •Advanced tracking of on-site construction machinery which facilitate an improvement in the safety performance job site layout and prevent theft •Optimize the utilization of construction equipment. •Proponent to engage local persons as Wayleave Officers to work with the contractor, to 	Construction & Operational Phase	KETRACO	<ul style="list-style-type: none"> • Grievances Redress Mechanism set up • Number of reported cases of vandalism • Community Liaison Officers (CLOs) hired 	<ul style="list-style-type: none"> • Security project status reports • Quarterly ESMP Reports • Community Liaison Officers (CLOs) contracts 	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>ensure the project is implemented smoothly</p> <ul style="list-style-type: none"> •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. •Liaise with law enforcement in the project area to ensure theft and vandalism perpetrators are held to account. 					
Gender-Based Violence (GBV)- Sexual Exploitation and Abuse (SEA) /Workplace Sexual Harassment (SH)	<ul style="list-style-type: none"> •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 	Construction phase	Contractor	<ul style="list-style-type: none"> • Number of trainings for workers and sensitization meetings for community • Developed GBV-SEA/SH Management Plan • No of workers who have signed CoCs • Established survivor centered GRM 	<ul style="list-style-type: none"> • Employee code of Conduct signed by all employees • Training records on GBV • Community sensitization meeting minutes • GRM records 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>including temporary and casual workers.</p> <ul style="list-style-type: none"> •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 •Adopt and implement a grievance redress mechanism (GRM) and referral mechanism to address all emerging complaints related to Sexual Exploitation and Abuse (SEA) / Sexual Harassment (SH). •Implement the GBV-SEA/SH Management Plan Ensure establishment and Implementation of a GBV-SEA/SH Action Plan by the contractor which should reflect the unique dimensions of COVID-19. 			<ul style="list-style-type: none"> • No of GBV cases reported and how addressed • Separated men and women latrines on site • Signage prohibiting SEA/GBV 		
Hazardous Materials (Fuel, Oil)	<ul style="list-style-type: none"> • The Contractor shall comply with all applicable laws, regulations, permit and approval conditions 	Construction	Contractor	<ul style="list-style-type: none"> • Type and Number of activities 	<ul style="list-style-type: none"> • Have licenced fuel handlers 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
& chemical storage on site)	<p>and requirements relevant to the storage, use, and proper disposal of hazardous materials.</p> <ul style="list-style-type: none"> • 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. • The contractor shall place on-site tools and equipment, such as generators, compressors on compact impermeable sheeting to prevent oil spills/leaks from causing subsurface contamination. • 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; • The Contractor shall ensure that fueling and repairs are carried out by trained personnel familiar with spill containment and clean- 			<p>/processes involving hazardous materials</p> <ul style="list-style-type: none"> • Set up procedures of dealing with spills and leaks • No of workers inducted and safety trained on spills handling • 	<ul style="list-style-type: none"> • MSDS Records • NEMA licensed hazardous waste handler • Destruction certificate for any disposed hazardous waste • Spill containment kits • Training records 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>up procedures and in Garages and licensed petrol stations</p> <ul style="list-style-type: none"> The Contractor shall ensure that all the employees working onsite are trained on good housekeeping practices 					
Community Health and Safety	<ul style="list-style-type: none"> Adherence to OSHA 2007 Act and its subsidiary legislations to ensure that health and safety of immediate neighbors and the public is not threatened. The Contractor to ensure that construction work is undertaken in manner not likely pose risks to community health and safety. The contractor should use barricading tape to prevent members of public from accessing excavated tower foundations and work sites during construction 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 The contractor should conduct public awareness on safety requirements within construction sites 	Construction	ESS Officer-KETRACO and EHS Officer-contractor	<ul style="list-style-type: none"> Number of community PAPs sensitized Barricade excavations and warning signage Security personnel on sites HIV AIDS awareness training and no of participants 	<ul style="list-style-type: none"> Community sensitization meeting minutes records Hazard signages on all tower Barricades and signage purchase records 	2,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • HIV & AIDS education and awareness • Provide adequate security where necessary for the public and staff • Public awareness of the public health issues identified. • Provision of condoms for staff • Distribution of HIV & AIDS awareness materials in collaboration NACC • Condone working sights and ensure controlled access 					
Avifauna Impacts	<ul style="list-style-type: none"> • Identify locations as far away as possible from any significant bird breeding or staging areas • Consider migratory bird routes when planning the route of the proposed transmission line • Locate the proposed transmission line adjacent to prevailing natural obstacles such as trees or cliffs to prevent them from perching on the line • Sensitive areas such as the streams, rivers and grasslands should be avoided during the construction phase where possible to limit the impact on avifauna. If these areas are accessed, 	Operation	KETRACO	<ul style="list-style-type: none"> • Number of Bird mortality cases 	<ul style="list-style-type: none"> • Reported documented of bird mortality cases • Avifauna Monitoring reports 	800,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> particular care should be taken to limit impacts; and assess the electrocution threat posed to avifauna from the new tower structures 					
Impacts on Aviation	<ul style="list-style-type: none"> Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers Consider aircraft flight route when locating the proposed transmission line Proponent must get approval from KCCA by issue of an approval certificate 	Construction	KETRACO	<ul style="list-style-type: none"> Type of air safety signals on towers Flight path zones record No.of towers with signals 	<ul style="list-style-type: none"> Approved record and data sheets of LED Aviation lights Testing records of functionality of aviation lights on towers KCCA Approval on transmission line route 	1,500,000
Child Labour/Exploitation	<ul style="list-style-type: none"> No employment for anyone under the age of 18 All persons seeking employment (contractor, subcontractor) should be required to provide a national identity card. The client and contractor will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. 	Construction	KETRACO Contractor	<ul style="list-style-type: none"> No.of workers and casual laborer's n site No.of workers trained on Labour and welfare 	<ul style="list-style-type: none"> Records of employee age or DOB. Copies of I.Ds of workers to verify age Training manuals Training attendance list 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> • Implement a labour management plan –to promote fair and equitable labour practices during the COVID 19 pandemic including the project cycle for the fair treatment, protection of workers’ rights, non-discrimination, and equal opportunity of workers • Implement a local recruitment plan - to create opportunities for local employment and to adopt a fair and consistent approach to the recruitment, assessment, and selection of local employees during the COVID 19 pandemic including the project cycle. • Adopt and implement a Grievances Redress Mechanism to receive and address grievances from host community during the COVID 19 pandemic including the project cycle. 					
Sexual harassment (SH)	<ul style="list-style-type: none"> • Ensure clear human resources policy against sexual harassment that is aligned with national law. • Integrate provisions related to sexual harassment in the employee code of conduct and have the Code of Conduct signed by all employees. A key element 	Construction	KETRACO Contractor	<ul style="list-style-type: none"> • No.of workers trained and sensitized • No.of reported SH Cases to authorities 	<ul style="list-style-type: none"> • Training records- attendance list and certificates • OB register records of ay SH Cases 	1,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>of the CoC is the sanctions that may be applied if an employee is confirmed as a SEA/SH perpetrator</p> <ul style="list-style-type: none"> • Have a robust complaints and grievance handling system. Ensure appointment of human resources personnel to manage reports of sexual harassment according to policy • The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and abuse • The contractor will implement provisions that ensure that gender-based violence at the community level is not triggered by the Project, including: <ul style="list-style-type: none"> ✓ Effective and on-going community engagement and consultation, particularly with women and girls. 			during project implementation	<ul style="list-style-type: none"> • Incident reports if any • Visual signs displayed on site to inform and warn on SH 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<ul style="list-style-type: none"> ✓ Review of specific project components that are known to heighten GBV risk at the community level, e.g., compensation schemes; employment schemes for women; etc. • Have separate, safe and easily accessible facilities for women and men working on the site. Locker rooms and/or latrines should be in separate areas, well-lit and include the ability to be locked from the inside. • Visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where SEA/SH is prohibited. • As appropriate, ensure public spaces around the project grounds are well-lit. • Enhance security on site with guards and CCTV Cameras • Train all Teams in Sexual Harassment prohibition at work 					
Sub-total						36,400,000
PHASE 3: OPERATION PHASE						

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Avifauna impacts/Bird Mortalities	<ul style="list-style-type: none"> Undertake wire marking/reflective balls to alert birds to the presence of power line. Build raptors platforms on top of pylons for roosting and nesting Dress existing and proposed transmission lines with conspicuous bird warning devices, where necessary, such as areas where bird migratory routes cannot be avoided 	Operation Phase	KETRACO	<ul style="list-style-type: none"> Number of recordable bird electrocution & collision cases 	<ul style="list-style-type: none"> KWS Bird mortality reports along wayleave Quarterly monitoring Reports KWS bird migratory route maps 	2,000,000
Impacts on Aviation	<ul style="list-style-type: none"> Consider international Civil Aviation Organization and Kenya Aviation guidelines and manuals regarding height and visibility of towers Dress existing and proposed transmission lines with conspicuous aviation warning devices, where necessary, such as areas where aircraft flight path cannot be avoided 	Operation Phase	KETRACO	<ul style="list-style-type: none"> Near misses/ aircraft incidents and accidents 	<ul style="list-style-type: none"> KCCA Approved clearance 	3,000,000
Health and Safety impacts during operation. Electrocution from powerlines	<ul style="list-style-type: none"> A maintenance system to ensure physical integrity of structures is maintained Deactivating and properly grounding live power 	Operation and maintenance phase	KETRACO	<ul style="list-style-type: none"> Number of injury incidences during 	<ul style="list-style-type: none"> Incident reports EMF test reports 	2,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Worker's exposure to EMF	<p>distribution lines before work is performed on, or in close proximity, to the lines.</p> <ul style="list-style-type: none"> • Ensuring that live-wire work is conducted by trained workers should not approach an exposed energized or conductive part even if properly • Ensure vegetation along wayleave id below 12ft in height • Electric utility workers have a higher exposure to EMF than the public due to working in proximity to electric power lines. Occupational EMF exposure should be prevented or minimized through the preparation and implementation of the EMF safety program including the following components: <ul style="list-style-type: none"> • Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities • Training of workers in identification of 			<p>maintenance</p> <ul style="list-style-type: none"> • Number of EMF regular tests 	<ul style="list-style-type: none"> • Monitoring and maintenance records and Reports 	

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>occupational EMF levels and hazards</p> <ul style="list-style-type: none"> Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers. Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the institute of Electrical and Electronics Engineers (IEEE). 					
Community health and safety- Perceived EMFs	<ul style="list-style-type: none"> If EMF levels are expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF 	Operation	KETRACO	<ul style="list-style-type: none"> Community complaints No Of regular 	<ul style="list-style-type: none"> EMF test reports Complaints and 	300,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	<p>produced by power lines. Examples of these techniques include:</p> <ul style="list-style-type: none"> ○ Shielding with specific metal alloys ○ Burying transmission lines ○ Increasing height of transmission towers <p>Modifications to size, spacing, and configuration of conductors</p>			EMF tests undertaken	<p>grievances reports</p> <ul style="list-style-type: none"> ● Medical reports on identified cases 	
		● Sub – total				7,800,000
DECOMISIONING PHASE						
Demolition waste	<ul style="list-style-type: none"> ● 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 ● Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary 	Decommissioning	CONTRACTOR	● Weight in tonnes	● Waste carriers' license	1,500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	landfilling					
Noise	<ul style="list-style-type: none"> 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. Landowners along the routes to be notified about the construction schedule & activities, including blasting, should it be required 	Decommissioning	KETRACO CONTRACTOR	<ul style="list-style-type: none"> Duration of the noise exposure Number of noises complains 	<ul style="list-style-type: none"> Noise meter records NEMA License 	600,000
Vegetation disturbance	<ul style="list-style-type: none"> Implement an appropriate re-vegetation programme to restore the site to its original status (selected critical locations eg AP5) Consider use of indigenous plant species in re-vegetation Trees should be planted at suitable locations to interrupt slight lines (screen planting), between the adjacent residential area and the development 	Decommissioning	Contractor	<ul style="list-style-type: none"> Area of cleared vegetation 	<ul style="list-style-type: none"> Crop Damage Report Compensation matrix Monitoring report for greening program 	5,000,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
Buried/ underground infrastructure including cables from third parties, water pipes, sewer systems	<ul style="list-style-type: none"> Contractor should conduct extensive ground investigations where pylons will be sited to ensure that no damage is caused on buried/ underground infrastructure. The contractor will be liable for damages and associated costs for any of the infrastructure he may tamper with during implementation and installation of the proposed Narok – Bomet line. 	Decommissioning	KETRACO CONTRACTOR	<ul style="list-style-type: none"> Number and types of buried services 	<ul style="list-style-type: none"> County infrastructure plans Demolition works approval 	1,000,000
Water Pollution	<ul style="list-style-type: none"> 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 No waste to be disposed in water body. KETRACO to supervise all activities 	Decommissioning	CONTRACTOR	<ul style="list-style-type: none"> Change in water quality in specified areas Water borne diseases No of mortalities of aquatic species 	<ul style="list-style-type: none"> Effluent discharge License NEMA licenses for transporter Water quality reports Medical reports 	1,500,000
Fire Hazard	Electrocution and fire by line snapping	Decommissioning	CONTRACTOR	<ul style="list-style-type: none"> Availability of fire warden 	<ul style="list-style-type: none"> Fire clearance report 	500,000

Possible Impacts	Recommended Mitigation Measures	Duration /Frequency	Responsibility	Indicators	Verifiers	Estimated Cost in Ksh.
	Transmission tower/pylon collapse Flooding and fire hazards of substation and transmission line •				<ul style="list-style-type: none"> • Fire equipment register 	
Sub-total					10,100,000	

8.6 Environmental and Social Monitoring Plan (ESMoP)

8.6.1 Monitoring

The proposed programmes and plans will be subjected to monitoring. Monitoring will have two elements: routine monitoring against standards or performance criteria; and periodic review or evaluation. Monitoring will often focus on the effectiveness and impact of the programmed or plan.

During construction phase, the Proponent shall monitor the contractor's activities to verify that the management measures/procedures/specifications are implemented as contained in the ESMP. Compliance will mean that the Contractor is fulfilling their contractual obligation.

During operation phase, the Proponent will monitor facility's operations to ensure compliance with management measures in the ESMP and operation procedures. As part of this monitoring, the Proponent will undertake statutory initial environmental audit as required by the EIA/EA Regulations, 2003 and subsequent annual self-environmental audits.

8.6.2 Programme Monitoring

The Proponent shall regularly monitor programme implementation. The process will include the regular monitoring of:

- Erosion of soil resulting in the immediate surroundings of the facility caused by the presence of facility or impacting on structures associated with the facility
- Air quality and ambient emissions, including dust generated by construction activities
- Noise generation during construction, operation, and decommissioning phases, among other areas

8.6.3 Plan Monitoring

All of the management plans make provision for monitoring and evaluation. Special attention should be given to the monitoring arrangements relating to biophysical impacts, occupational health and safety, facility operational and emergency response.

During the construction phase of the project, the Contractor's HSE Officer shall report all environmental impacts as well as accidents and incidents to the Proponent's HSE Officer.

The reported impacts and incidents will be captured on a database to ascertain trends and track progress in the implementation of preventive and corrective actions, and benchmarking against other, similar operations. Depending on the level of severity, accidents and incidents will be investigated by the Contractor's SHE section, with key input from the line management to ensure accountability.

During operation, the Proponent's SHE department will monitor the health and safety of personnel and contractors, in compliance with legislative requirements. Emergency incidents should be reported to the relevant authorities. The reported impacts and incidents will be captured on a database to identify weakness in the emergency response plan and track progress in the implementation of preventative and corrective and benchmarking against other similar operations.

The Environmental and Social Monitoring Plan (*ESMP*) will provide the basis for monitoring of Potential Environmental Impacts associated with the Transmission Line Project. The implementation of the Monitoring Plan together with the Environmental and Social Management Plan will provide a benchmark for future environmental audits. The ESMP provides effective observation and documentation of monitorable parameters that will help in analyzing the effectiveness of the proposed mitigation measures with the advantages of improving operational efficiency, promoting competitive advantage, improving risk management, reducing liabilities, and improving business performance.

8.6.4 Environmental and Social Monitoring by Contractors

KETRACO will require that contractors monitor, keep records and report on the following environmental and social issues for their subproject:

1. *Safety*: hours worked, recordable incidents and corresponding Root Cause Analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training, and so forth).
 2. *Environmental incidents and near misses*: environmental incidents and high potential near misses and how they have been addressed, what is outstanding, and lessons learned.
 3. *Major works*: those undertaken and completed, progress against project schedule, and key work fronts (work areas).
 4. *E&S requirements*: noncompliance incidents with permits and national law (legal noncompliance), project commitments, or other E&S requirements.
 5. *E&S inspections and audits*: by contractor, engineer, or others, including authorities—to include date, inspector or auditor name, sites visited, and records reviewed, major findings, and actions taken.
 6. *Workers*: number of workers, indication of origin (expatriate, local, nonlocal nationals), gender, and skill level (unskilled, skilled, supervisory, professional, management).
 7. *Training on E&S issues*: including dates, number of trainees, and topics.
 8. *Footprint management*: details of any work outside boundaries or major off-site impacts caused by ongoing construction—to include date, location, impacts, and actions taken.
 9. *External stakeholder engagement*: highlights, including formal and informal meetings, and information disclosure and dissemination—to include a breakdown of women and men consulted and themes coming from various stakeholder groups, including vulnerable groups (e.g., disabled, elderly, children, etc.).
 10. *Details of any security risks*: details of risks the contractor may be exposed to while performing its work—the threats may come from third parties external to the project.
 11. *Worker grievances*: details including occurrence date, grievance, and date submitted; actions taken and dates; resolution (if any) and date; and follow-up yet to be taken grievances listed should include those received since the preceding report and those that were unresolved at the time of that report.

12. *External stakeholder grievances:* grievance and date submitted, action(s) taken and date(s), resolution (if any) and date, and follow-up yet to be taken grievances listed should include those received since the preceding report and those that were unresolved at the time of that report. Grievance data should be gender disaggregated.
13. *Major changes to contractor's environmental and social practices.*
14. *Deficiency and performance management:* actions taken in response to previous notices of deficiency or observations regarding E&S performance and/or plans for actions to be taken— these should continue to be reported until KETRACO determines the issue is resolved satisfactorily.

8.7 Rehabilitation and Decommissioning Management Plan

The rehabilitation and decommissioning management plan include the following:

8.7.1 Planning for closure

- a) The Proponent shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before the end of facility's operations.
- b) The Proponent shall investigate practical options for closure of the facility at least one year before decommissioning and submit a report to relevant authorities NEMA included.
- c) The Proponent to explore options of re-use and recycling of the facility's components/structures.

8.7.2 Decommissioning

- a) The Proponent shall take into consideration the health and safety of personnel, contractors, neighbors and the public during the planning and implementation of the demolition process.
- b) The Proponent shall undertake a further survey to identify any contaminated areas remediate them accordingly.

8.7.3 Post Closure

The Proponent shall ensure that the facility's site is free of impacts associated with the abandonment/closure.

The Proponent shall develop, rollout and implement a monitoring plan that includes:

- a) Monitoring of the rehabilitated site to confirm whether progress is satisfactory.
- b) Outline of how land improvement and future land use will be affected by the past operation and decommissioning of the transmission line and its associated infrastructure.

CHAPTER 9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Public Review and disclosure of the ESIA Report

Upon submission of the ESIA report to NEMA; Within fourteen (14) days of having received the ESIA study report NEMA will review the report and prepare a summary of the report (advert) and invite the public to make oral or written comments on the report. NEMA will, at the expense of the proponent:

- a. Publish an advert in the Kenya Gazette and
- b. Newspaper that has a nationwide circulation
- c. Announce Over the Radio in both official and local languages in a radio with a nationwide coverage for at least once a week for two consecutive weeks.

The invitation for public comments or ‘the advert’ will state –

- The nature of the project.
- The location of the project.
- The anticipated impacts of the project and the proposed mitigation measures to respond to the impacts.
- The times and place where the full report can be inspected (In this case, NEMA Headquarters, NEMA website – www.nema.go.ke , KETRACO, and NEMA County Offices); and
- The period within which the authority shall receive comments. (Not more than 60 days

The purpose of the adverts is to allow all stakeholders to read and understand how they would be affected by the project. Upon receipt of both oral and written comments NEMA may hold a public hearing. The date and venue of the public hearing will be publicized at least one week prior to the meeting.

- In at least one daily national newspaper & local newspaper
- At least two announcements in the local and National language through radio with a nation-wide coverage.

Presiding officer shall present the public hearing report to NEMA within fourteen (14 days) from the date of the public hearing. The public review period will last a minimum of 60 days. After expiry of the public review period, NEMA will collate the comments submitted from the public and hand them over to the proponent highlighting which key issues require to be addressed. The proponent in liaison with the ESIA expert will prepare written responses either into an additional chapter or an addendum to the ESIA report. This chapter will clearly explain how each of the comments and concerns raised by the public have been addressed and resolved. Once NEMA is satisfied that the revised ESIA Study report addresses all the issues raised by stakeholders it would decide on issuance of an ESIA/EIA license.

KETRACO ESMF frameworks requires that environmental reports for projects are made available to project affected groups, local NGOs, and the public at large. KETRACO should therefore disclose summaries of ESIA's and all project frameworks/plans to PAPs in culturally appropriate languages and in accessible locations. Public disclosure of EIA reports is also a requirement of the national EIA procedures in line with the provisions of EMCA, Cap 387 as elaborated in the Environmental Impact Assessment and Audit Regulations, 2003 and amendments 2019.

In addition to the environmental documentation requirements described above, the proposed project ESMF notes that the following consultation and disclosure requirements be utilized for all Category A subprojects:

KETRACO will be expected to consult and make the ESIA findings about the project's environmental and social aspects available to project affected persons (PAPs) and take their views into account. The disclosure of ESIA findings to PAPs will be undertaken in culturally appropriate languages, using feasible techniques such as FGDs, public barazas, in easily accessible locations, and in a timeframe that enables meaningful consultations. For meaningful consultations, the KETRACO should apply the following disclosure requirements:

In line with the AfDB ISS requirements, the ESIA and RAP shall also be disclosed on the Bank's website to meet the minimum disclosure period prescribed for a Category 1 project of 120 Days prior to project appraisal process.

9.2 Budget for ESMP and ESMnP

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

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

Table 10-9-1 RAP, ESMP & ESMmp Implementation estimate costs

Item	Cost
<i>RAP costs</i>	669,200,000.00
<i>Environmental and social management costs</i>	51,500,000.00
<i>Environmental and social monitoring costs</i>	6,500,000.00
<i>Costs to be included in contractor's Boq</i>	27,200,000.00
<i>Costs that should be part of routine or periodic maintenance</i>	6,250,000.00
<i>Total</i>	755,650,000.00
<i>Training/institutional costs 2% of total cost</i>	15,113,000.00
<i>Grand total</i>	775,763,000.00

9.3 Conclusion and Recommendation

1. The ESIA study has established that the proposed transmission line and substations are a worthwhile investment. The project will contribute significantly to the power stability, provide reliability, enhance security of supply to the existing demand hubs in Narok and Bomet counties and country at large which by extension will spur economic development; expand transmission capacity necessary to enhance electrification initiatives and reduce technical losses in areas currently served by long medium voltage lines.

2. The ESIA study estimated that a total of 242.90 Ha or 600.219 Acres will be affected by the right of way for the proposed transmission line. The highlighted social -cultural and economic issues within this ESIA study report underpins the need for a comprehensive resettlement action plan (RAP) that would ensure compensation and livelihood restorations for projected affected persons.

3. The proposed line traverses natural forested areas (especially the Narok section) and riverine habitats notably the Mara and Nyongores river riverine ecosystems. Crossing across these ecosystems may result in loss of vegetation and associated habitats. The ESIA study recommends ninety degrees crossing (wherever possible) to minimize the impact of vegetation clearance. It is further recommended that KETRACO in collaboration with other agencies such as the Kenya Forest Service rolls out afforestation programmes in the project areas to offset vegetation/tree loss.

4. It's worth to note that the proposed project is especially designed to veer off and avoid the the Maasai Mara National Reserve and the Mau Forest. The line is closest to the the Mau Forest at AP15 (11.69km) to the North East. It is closest to the Maasai Mara National Reserve at AP13 (46.33km) to the South West. In addition, the proposed transmission route avoids densely populated areas, towns, and market centres and follows existing roads as closely as possible. These design measures minimizes negative environmental, social and economic impacts.

5. The ESIA study has established detailed environmental and social management plan (ESMP); and an environmental and social monitoring plan (ESMmP); including standalone management plans for various aspects with mitigation measures for the anticipated impacts. The ESIA has recommended the need to ensure stakeholder engagement and grievances management is undertaken post ESIA (applicable to the pre-construction, construction, operations, and decommissioning phases).

6. This ESIA also recommends that the proponent disseminates the correct information on KETRACO's CSR policy and the cap for trees and crops allowed under the RoW guided by the RPF provisions to PAPs in consecutive stakeholder engagement sessions e.g., during the disclosure of the RAP and ESIA.

7. An approximate budget to implement the RAP, ESMP and ESMmP has been calculated at **Ksh 775,763,000.00**.

Some of the management plans to be implemented alongside the ESMP and ESMmp are as follows:

- Atmospheric Emissions Management Plan
- Hazardous Substances Management Plan
- Spill Prevention and Countermeasures Management Plan
- Fire Risk Management Plan
- Noise Management Plan
- Surface Water Management Plan
- Waste Management Plan
- Biodiversity Management Plan

- Occupational Health and Safety Management Plan
- Emergency Preparedness and Response Management Plan
- Labour Management Plan
- Labour influx management plan
- Local Recruitment Plan
- Associated Facilities Management Plan
- GBV-SEA/SH action management plan
- Stakeholder Engagement Plan
- Grievance Redress Mechanism
- CSR plan.
- Resettlement Action Plan
- Livelihood Restoration Plan
- Gender mainstreaming plan
- Chance Finds Procedure
- Resource Efficiency and Pollution Prevention and Control Plan
- External Communication Mechanism on Environmental Issues
- Community Health and Safety Plan

Particularly, the contractor will be availed this ESIA and ESMP, and required to develop and submit to the client a detailed C-ESMP. Further, the Contractor will be required to have environmental, Health and social/liason 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.

8. 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 supervising 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 always 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.

9. The proponent is committed to putting in place the proposed measures to mitigate the potential negative environmental, safety, health, and social impacts during 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. ESMmP and respective management plans.

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Annex 2: Avifauna Study Report

Annex 3: Ecological/Biodiversity study report

Annex 4: Attendance Lists of Key Stakeholders

Annex 5: Sample filled Questionnaires- KPLC

Annex 6: Key Informants Questionnaires

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Annex 8: Meeting Minutes

Annex 9: Public sensitization barazas attendance sheets

Annex 10: Route firming report

Annex 11. KCCA Approval

Annex 1 Lead Experts NEMA Certificate and Practicing License

FORM 7

(r.15(2))



**NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT**

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/17759

Application Reference No: NEMA/EIA/EL/22818

M/S **DAVID MATARA MOINDI**
(individual or firm) of address

P.O. Box 746-00204 Athi River

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **1501**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **5/20/2022**

Expiry Date: **12/31/2022**

Signature.....

(Seal)

Director General
The National Environment Management Authority

P.T.O.



FORM 7

(r.15(2))



**NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT**

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/15008

Application Reference No: NEMA/EIA/EL/19449

M/S **David Matara Moindi**
(individual or firm) of address

P. O. Box 746 - 00204, Athi River

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **1501**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **5/17/2021**

Expiry Date: **12/31/2021**

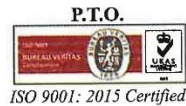
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(Seal)

Director General

**The National Environment Management
Authority**



FORM 5

(r. 14(4))

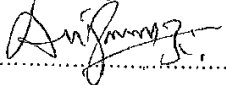
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**THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
 CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT
 ASSESSMENT/AUDIT EXPERT**

This is to certify Ms..... **MR. DAVID MATARA MOINDI**.....
 of..... **P. O. BOX 65611 – 00607, NAIROBI**..... (Address)
 has been registered as an Environmental Impact Assessment Expert in accordance with the provisions
 of the Environment Management and Coordination Act and is authorized to practice in the capacity of
 a Lead Expert/Associate Expert/Firm of Experts (Type)..... **LEAD EXPERT**.....

Dated this **7TH** day **APRIL** of 20.08.....

Signature..... .....

(Seal)

Director General
 The National Environmental Management Authority

BPK(L)

Annex 2

Avifauna study report

ORNITHOLOGICAL SURVEY REPORT



ENVIRONMENTAL ASSESSMENT ADDENDUM OF THE PROPOSED
NAROK – BOMET 132kV DUAL CIRCUIT LINE
ORNITHOLOGICAL COMPONENT

Prepared by:

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KENYA POWER

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ORNITHOLOGICAL SURVEY REPORT

1. Background

The Government of Kenya through its implementing agency; Kenya Power and Lighting Company plans to construct and commission a 132kV double circuit transmission line linking Narok 132/33kV and Bomet 132/33kV substations.

Bomet 132/33kV substation is currently supplied from Sotik on the Kegati- Chemosit line. The newly completed Narok 132/33kV substation is to be supplied from Olkaria I substation by a 132kV line that is currently under construction by KETRACO. At present, power from the Olkaria geothermal generating plants flows to the Western region of the country through the Olkaria I- Naivasha single-circuit 132kV line with a capacity of 150MVA and onwards on double-circuit Naivasha-Lanet-Lessos 132kV lines with a capacity of 166MVA. Western region has a maximum demand of 391MW which cannot be met by the generation in the region (Sondeu, Sangoro, Muhoroni GTs and Turkwell) supplemented by imports from UETCL.

In the last financial year, load shedding was instituted in the western region anytime there was poor system voltages, a trip of the Naivasha-Lanet line on overload or outage of any of the generation plants in the region. This resulted to loss of revenue for the company and the economy at large. There are also increased transmission losses when the power is evacuated through the 220kV Okaria II-Nairobi North-Dandora lines and 132kV Dandora-Juja Rd-Naivasha-Lanet-Lessos lines route especially in case of an outage on the Olkaria I-Naivasha line.

2. Narok-Bomet 132kV Double Circuit Powerline Route Description

The proposed transmission line is 85km starting from Narok substation and terminates at Bomet 132/33 substation. The line will start from Narok Olmasharian area and run straight on the Narok North Subcounty for some of the distance before crossing to Narok South before Ololunga and run for about 13kms before crossing to Narok West at Olereut area where it then crosses to Bomet County at Mara river to Bomet East, Kapkimolwa location, Koibeyon sublocation and it crosses the valleys, ridges, hills and rivers as crosses to Bomet central and partly Chepolungu in Cheboin and Kyogong locations before termination in Itembe location in Bomet Central subcounty in Bomet substation at sachangwan area. The proposed route was carefully selected to minimize interruption of human settlement, habitat and social amenities. Associated ground structures will avoid sensitive habitats such as wetlands and riparian land.

In localities where the existing pole based 33kV and 132kV has traversed densely populated human and environmentally fragile ecosystems, a detour of the proposed 132kV transmission line route will be done with an aim of reducing any undesirable interruption.

3. Bird Studies in The Area Traversed by the 132kv Transmission

There are a number of bird species within the area, but the proposed transmission route is not a bird migratory route. Most birds traversing the proposed route are resident and attracted by grains in the farms and the livestock herds of the pastoral community. Some birds of importance are found in Narok forested areas of Mau, Loita, Enosopukia and Kilgoris but it should be noted that the proposed line does not traverse these forested areas. Most of the birds observed within the proposed routing are not endangered species and mostly include common terrestrial birds common in the semi-arid to arid areas. The greater portion along which the proposed line traverse is characterized by cleared farm lands and open grass land areas save for patched thickets observed around olopito and Ole-Keiwa's areas. There are two major rivers coupled with other small water bodies along the route. The main rivers in the project are Nyongores and Mara which have several tributaries. It was observed that the birds are common along the riverine ecosystems and within farms where cereal crops are planted. Massive clearance of land for farming poses a big threat to Grasslands and important bird areas in the County.

4. Methodology of data collection

Information about birds available in the proposed project route was collected using primary and secondary data collection methods. Primary data collection was carried out through observation, photography and face to face discussions with relevant stakeholders. Secondary data collection was done through books and journals review to help identify specific birds observed during route survey. Secondary data collection was also carried out to help identify the birds' scientific names, adaptabilities and known habitats. Through secondary data collection methods, the team realized that most of the birds observed are highflyers and mostly feed on ground thus there are minimal chances of colliding with the lines.

Species Identification

Through observation, photography, face to face discussions, books and journals review; the following birds were identified:

Some of the Endemic birds spotted along Narok – Mulot section:

English Name	Scientific Name
Red-billed quelea	<i>Quelea quelea</i>
Marabaou Stock	<i>Leptoptilos crumenifer</i>
Hadada Ibis	<i>Bostrychia hagedash</i>
Great Egret	<i>Ardea alba</i>
Black Headed Heron	<i>Ardea melanocephala</i>
Helmet Guinea Fowl	<i>Numida meleagris</i>
D'Anard's Barbet	<i>Trachyphonus darnaudii</i>
Pied Crows	<i>Corvus albus</i>
Superb Starling	<i>Lamprotornis superbus</i>
Doves	<i>Columbidae</i>
Sharpes Long claw	<i>Macronyx sharpei</i>

Aberdare Cisticola	<i>Cisticola aberdare</i>
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Even though Narok County has important bird areas such as Mau forest, Loita forest, Enosopukia forest and Laila forest which are habitats for a variety of bird species; it should be taken to account that the proposed power line will not be routed in such areas. Some endangered bird species such as Sharpe's Longclaw (*Macronyx sharpei*) and Aberdare Cisticola (*Cisticola aberdare*); both endemic in Kenya are found in Mau Narok/Molo Grasslands in Narok county. This important Bird Areas (IBAs) are also renowned for holding a significant population of Jackson's Widowbird, another species of conservation concern. Most of the birds of concern do not traverse the proposed transmission route. Some local migratory birds such as *Quelea quelea* are known for their menace and damage to wheat farms for instance in June 2016; the ministry of Agriculture officials stated that *Quelea quelea* had destroyed more than 100 acres and had been traced to have migrated from Lake Natron in Tanzania.

Most of the birds spotted along the proposed transmission route are common within the area because of availability of food especially cereals in the farms and the dumpsites around Narok town.

5. Site assessment and findings

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in Kenya are the electrocution of birds (and other animals) and birds colliding with power lines. Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure and disturbance and habitat destruction during construction and maintenance activities.










6. Some of the Endemic birds spotted along Narok – Bomet Line Species Identification







Through observation, photography, face to face discussions, books and journals review; the following birds were identified:

Some of the common birds notice in area include but not limited to goshawks, buffalo weaver and palm nut vultures, African skimmers, other birds are weaverbirds, sunbirds, kingfisher, Dusky Turtle Dove, Yellow-crowned bishop; Long tail widowbird, Broad-Billed Roller, Striated Heron, Cattle Egret, Common Squacco Heron, Marabou Stork, Sacred Ibis, Lizard Buzzard, Long –Crested Eagle, Winding cisticola, Ruffus chatterer, Red –billed firefinch, hunters Cistola, gunea fowl, greater sand plovaer, steepe eagle and Speckled pigeon and hornbills. The areas is also done with Red-billed quelea, Hadada Ibis, Great Egret, Black Headed Heron, Helmet Guinea Fowl, D'Anard's Barbet, Pied Crows, Superb Starling, Doves, Sharpes Long claw, Aberdare Cisticola

Since the proposed area is not very far from Mau forest, it has several types of birds and most of the birds are not the large birds but small ones which can easily manouvare through the proposed line. Most of the birds noted along the proposed line and its vicinity does not fall under the endangered or the threatened species as shown in 12.2.

		
White-Browed Robin Chat	Marabou Stork	Hunter's Cistola
		
Vulturine Gunea Fowl	Greater Sand Plover	Steepe Eagle
		
Crowned Plover	Malachite Kingfisher	Lilac-Breasted Roller
		
White-Bellied Go-Away -Bird	Spur-Winged Plover	Common Ringed Plover

		
Northern Brownbul	Grey-Headed Sparrow	Augur Buzzard
		
Red-Billed Hornbill	Broad-Billed Roller	Eurasian Bee -Eater
		
Cranes	Carmine Bee-Eater	Collared Sunbird
		
Marabou Stock common in Narok town	Hadada ibis spotted in a water pan within the area	Great Egret within the study area

		
Black Headed Heron	Helmeted Guinea Fowl within the study area	D'Arnaud's Barbet found in dumpsites adjacent to proposed route
		
Pied Crows	Superb Starling	Quelea quelea

Even though Narok County has important bird areas such as Mau forest, Loita forest, Enosopukia forest and Laila forest which are habitats for a variety of bird species; it should be taken to account that the proposed power line has not in any been routed in such sensitive areas. Some endangered bird species such as Sharpe's Longclaw (*Macronyx sharpei*) and Aberdare Cisticola (*Cisticola aberdare*); both endemic in Kenya are found in Mau Narok/Molo Grasslands in Narok county. This important Bird Areas (IBAs) are also renowned for holding a significant population of Jackson's Widowbird, another species of conservation concern. Most of the birds of concern do not traverse the proposed transmission route. Some local migratory birds such as *Quelea quelea* are known for their menace and damage to wheat farms for instance in June 2016; the ministry of Agriculture officials stated that *Quelea quelea* had destroyed more than 100 acres and had been traced to have migrated from Lake Natron in Tanzania.

Most of the birds spotted along the proposed transmission route are common within the area because of availability of food especially cereals in the farms and the dumpsites around Narok town.

7. Endangered and threatened birds

Taitaapalis (*Apalisfuscigularis*); Taita thrush (*Turdushelleri*); Madagascar pond-heron (*Ardeolaidae*); Saker falcon (*Falco cherrug*); Egyptian vulture (*Neophronpercnopterus*); Sokokescops-owl (*Otusireneae*); Aberdarecisticola (*Cisticolaaberdare*); Basra reed-warbler (*Acrocephalusgriseldis*); Turner's eremomela (*Eremomelaturneri*); Spotted ground-thrush (*Zootheraguttata*); Amani sunbird (*Anthreptespallidigaster*); Clarke's weaver (*Ploceusgolandi*); Sharpe's longclaw (*Macronyxsharpei*); Sokoke pipit (*Anthussokokensis*); Lesser kestrel (*Falco naumanni*); White-headed vulture (*Trigonocepsoccipitalis*); Lappet-faced vulture (*Torgostracheliotos*); Greater spotted eagle (*Aquila clanga*); Eastern imperial eagle (*Aquila heliaca*); Madagascar pratincole (*Glareolaocularis*); Blue swallow (*Hirundoatrocaerulea*); White-winged apalis (*Apalischariessa*); Karamojaapalis (*Apaliskaramojae*); Papyrus yellow warbler (*Chloropetagracilirostris*); Hinde's pied-babbler (*Turdoideshindei*); Abbott's starling (*Cinnyricinclusfemoralis*); Chapin's flycatcher (*Muscicapalendu*).

Note: It is important to note that none of the birds notice in Narok-Bomet powerline falls under the above category.

Potential Impacts

Proposed construction of the 132kV transmission line may cause collision and electrocution of the birds.

Collision mostly happens when the birds are soaring up while electrocution takes place when birds are moving between lines.

Most birds have a very sharp vision and naturally it is expected that there will be no collisions. However, birds with a big wing span such as Marabou storks can get electrocuted when their wings touch different phases of the conductors.

The spacing of the conductors for the 132kV powerline will be wide enough and since it will be a double circuit visibility will be enhanced and in a short span the birds will adapt to the visual intrusion of the powerline.

Marabou stocks are common on ground feeding in the dumpsites around Narok town and when they soar up they are very high flyers and are known to have a sharp vision.

There is no confirmed birds migratory path across the route of traverse and impacts on avi-fauna is expected to be minimal if any. Continuous monitoring will take place especially for the first year after stringing and any significant deaths to birds would be rectified with the urgency it deserves.

8. Conclusions

In conclusion, field studies show that construction of the proposed 132kV line along Narok and Bomet County will not be a risk to the bird species inhabiting and traversing the area. This is because birds inhabiting Important Bird Areas in the Narok County do not use the proposed route of traverse as a migration route and are endemic in the Mau Narok/Molo Grasslands and Loita forest. In addition, the birds mostly spend their time on ground and in case of takeoff, they are high flyers and thus have minimal chances of colliding with the lines.

This study has shown that there are no fatal flaws from an avifaunal perspective as to why the power line should not be built. The most potential significant impacts are that of Collision of birds with the earth wire associated with the proposed power line which will be managed by use of appropriate mitigation measures including reflective flaps or balls. In conclusion the proposed power line can be built with acceptable impacts on avifauna.

Once established, the distribution line may cause increased risk of collision of birds in flight, however this risk is expected to be minimal since the route does not pass through any known migratory bird routes. Most of the birds in the larger Narok and Bomet area have been classified as non-threatened as per National Museum of Kenya report and as by IUCN red data. Some of this bird includes Yellow-crowned bishop; Long tail widowbird, Broad-Billed Roller, Striated Heron, Cattle Egret, Common Squacco Heron, Marabou Stork, Sacred Ibis, Lizard Buzzard, Long –Crested Eagle, Winding cisticola, Ruffus chattering, Red –billed firefinch and Speckled pigeon. The findings of the study revealed that the most significant impact of the line will be potential collisions of birds with the electrical conductors as the proposed route passes through areas with streams, bushy land, shrub land and grassland, which are generally preferred sites for birds. Other than these streams the general area is very flat and there are no obvious flight paths for birds. The open patches of grassland will however attract species such as storks and ground hornbills, which could be at risk collisions resulting to loss of biodiversity. These patches of grassland are however small as the proposed line route, for the most part, covers more of shrub dominated areas. In this scenario the powerline should be routed away from any of the above situations to reduce the chances of collisions. Once this is done and the spans marked, the risk of collision will be acceptable.

Disturbance of avifauna will occur during the construction phase of the project. However, if best practices are followed and this can be kept to a minimum, the impact on avifauna will be low. Sensitive areas present within the study area include shrub-land and open grasslands and care should be taken in and around these areas to minimize the disturbance of avifauna.

Mitigation

The recommendation and mitigation of the study can be summarized as follows:

- Space conductors in such a way to allow for the birds' easy movement between lines so as to prevent cases of collision and electrocution.
- During stringing of the lines, put in place flaps to act as reflectors for birds that may occasionally cross the area.
- To reduce this is proposed that the area be avoided completely or mark the whole section with bird flappers or reflective aerial marking spheres.
- The possibility of disturbance of breeding large raptors cannot be ruled out. There is a possibility of disturbance of breeding birds in the bushy shrubs but it is impossible to predict where additional disturbance will take place without an aerial inspection to locate other breeding areas along the alignment. Ideally construction should take place outside the breeding season. In reality that is

impossible, therefore one can only hope that the disturbance will be temporary and that breeding will resume after the construction of the line. It is imperative that construction methods are used that minimize the impact on vegetation, the removal of large trees should especially be avoided. The role of the Environmental and Social specialist will be crucial in this respect to ensure strict compliance with the EMP.

- There is need to identify locations as far away as possible from any significant bird breeding or staging areas
- Consider migratory bird routes when planning the route of the proposed transmission line
- Use existing towers route for new lines
- Dress existing and proposed transmission lines with conspicuous bird warning devices, where necessary, such as areas where bird migratory routes cannot be avoided. Aerial marking spheres properly spaced can reduce collisions. However, if not properly installed, they can damage the overhead ground wire or conductor and affect line tension and structure design. Bird flight diverters (BFDs) have large spirals which enhance visibility hence depending on size and spacing, these can reduce collision effectively up to 90%.
- Locate the proposed transmission line adjacent to prevailing natural obstacles such as trees or cliffs to prevent them from perching on the line.
- Underground cabling of power lines is another potential solution to the bird collision problem. Lines up 132kV can be underground successfully for short distances; however the cost can run up to 3-20times as much as overhead.
- Cable insulation where possible can be used to reduce electrocution of large raptors

Annex 3 Ecological /Biodiversity study report



ECOLOGICAL IMPACT ASSESSMENT REPORT

PROPONENT: KENYA POWER

NAROK-BOMET 132KV TRANSMISSION POWER LINE

BY
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1. Description of The Project

1.1 Background Information

Kenya Power plans to construct a 85 Kilometer 132 kV double circuit transmission line on self-supporting steel towers from Narok 132/33 kV Substation to Bomet 132/33 kV Substation. The overall objective is to improve quality of supply and reliability to the western regions of the country as it will provide an alternative route for evacuation of power from Olkaria geothermal plants.

The proposed project seeks to establish a more reliable power supply with improved voltage profiles via the establishment of a line linking the Okaria geothermal generation plants to the Western region transmission network. This will greatly improve supply quality and reliability to the western regions of the country as it will provide an alternative route for evacuation of power from Olkaria geothermal plants. The preliminary proposed route for the transmission line is on the right-hand side of the Narok -Bomet road upto Sigor road junction where the line crosses the Narok-Bomet road and runs on the left-hand side towards Bomet 132/33kV substation. The proposed 132kV double circuit transmission line will be routed along private/communal parcels of land and being a 132kV double circuit, there is a requirement of a wayleave trace of 20m wide on either side of the center line.

1.2 Environmental considerations

Due to high population growth rate there has been high demand for basic resources that has caused pressure on existing services. Notably, urbanization of cities in a country result in rapid changes seen in expansion and development of new buildings, roads, settlement, industries, and other social amenities. These developments compete for space and other resources causing destruction on the biotic and abiotic environment. The impacts vary with the type of development projects, processes and the ground scale starting from the construction, operation, and decommissioning phase of the project. Despite this, it is important to note that development is imperative for economic growth and therefore, change must take place in the environment. However, environmental sustainability should be emphasized in any project development plan to attain effective conservation.

Consideration of environmental issues in socio-economic developments, industrial and urban development should be factored in physical planning. This is due to requirement of sustainability in development activities. In order to ensure this, various management options have been employed. Some of these take into account effects of activities on adjacent ecosystems. Ecosystem approach is a wider approach towards environmental conservation and sustainable use of natural resources. Currently, environmental authorities recognize Environmental Impact Assessment (e.g. the principles of externality) as an excellent planning and decision-making tool that can be used throughout the project life cycle. This is a new management strategy that both authorities and project proponents are coping with in the country.

Among other developmental needs and resources, sufficient energy supply plays an important factor in economic development. Due to this, improvement of energy supply has become an important agenda for the national economic development. In order to enhance the supply, investment in transmission power lines is embraced by government.

This assessment mainly focused on the Ecological Impact Assessment of the proposed construction of the 132KV transmission powerline from Narok to Bomet by Kenya Power.

Generally, power transmission lines are not void of negative impacts on environment. Some of the common impacts are destruction caused by excavation, potential oil spills and drainage of used oil,

exhaust fumes (and associated sulphur dioxide and other gases), and noise pollution. Important issues that were covered included:

- Development of biodiversity baseline information for the construction route and adjacent areas.
- Identification of the potential impacts of the project construction and operation.
- Scrutiny of management options that will ensure environmental sustainability.

2. Methodology

2.1 Data Acquisition

2.1.1 Secondary Data

Secondary data was acquired by various means. These included visiting libraries at the National Museums of Kenya (NMK), Nature Kenya, KWS, KFS and the internet. The information was used for literature review, updating existing vegetation cover and visualization of the potential project site with various adjacent ground features. Data comprised of reports, books and digital thematic maps.

2.1.2 Field Survey

The field survey was carried out between mid-February to Mid-March ,2018. The main activities involved were:

- Examining plant community structures and species composition, and faunal composition in the potential project site and in a 200-meter buffer zone around the boundary of the powerline. Identification of the species was done using practical experience complemented with a field guide book and indigenous knowledge of the locals and experts;
- On-going activities and status of the environment at the site and adjacent areas.

3. Baseline Ecological Information (Flora and Fauna)

3.1 Spatial Information

The proposed project site has a frontage in some areas to Narok-Bomet Road. On the way to Narok from Bomet, the site is situated on the right-hand side until Kyogong sublocation in Bomet County where it crosses to the left-hand side of the road. On the Narok side the line travel Towards the Northeastern site mainly passing through big tracks of wheat and Maize farms with intermittent appearances of indigenous vegetation cover along the route. the line then takes a turn near ilubi secondary school and run eastward towards Bomet where it scales up the mountains and descend the valleys. The land size in Bomet is relatively small and more populated as compared to Narok. The vegetation cover in the Bomet site is relatively dense with the occurrence of both indigenous and exotic vegetation covers in various farms. The south west of the site in kapkimolwa and Kyongong sublocation, there exists a soil bank approximately 2.5 m high and extending further is an area that is currently being used as a quarry and is still currently active but to smaller extent. The soils in the Narok site are mainly volcanic soils which are loose and friable and susceptible to erosion while the Bomet soils are mail clay loam to sandy clay which tends to retain water during rainy season, but the soils are quite stable and not susceptible to erosion.

3.2.1 Plants Diversity

Plant species were observed both within the project site and outside of it. A buffer zone of 200 meters around the tentative project boundary was examined for important species. Most of the tree species recorded is within the buffer-zone of the construction. The construction site comprises of *Cordia abbynica*, *Croton megalocrpus*, *Albizia coriara*, *Acacia xanthophloea*, *Prunus African*, *Caesalpinia Decapetala kirkii*, *Diospyros Abyssinica*, *Olea Europaea*, *Pavetta Gardeniifolia*, *Acokanthera schimperi*, *Acacia abyssinica*, *Vangueria infausta*, *Carissa spinarum*, *Tamarindus indica*, *Ficus sur*, *Olea capensis*, *Balanites aegyptiaca*, *Cordia monoica* and *Dovyalis Abyssinica* just to mention a few and other annual/seasonal weed species. Other species are scantily distributed which include the *Acacia* species and *Aloe* as shown in Figure 3.

3.2.1.2 Reproduction and dispersal of important species

Most of the important tree species observed in the area reproduce sexually. Therefore, seeds are transported and dispersed by either animals that feed on them, by wind and further by runoffs during rainy seasons. Ecologically, the seed dispersal patterns will not be affected as the species are distributed in the areas around the site.

4. GENERAL TREE SPECIES DISTRIBUTION

4.1 Exotic trees

The dominant exotic tree species that will be lost are;

- *Eucalyptus grandis* forms almost 40% cover in the entire area.
Its uses include; Building, source of fire wood, source of timber, wind breakers.
- *Cupressus lusitanica* forms 10% cover in the area. Its uses include building, live fences, and wind breakers.
- *Bottle bush species* forms 15% cover in the area
- *Gravellia robusta* forms 15% cover in the area. Uses include source of fuelwood, timber, windbreakers.
- *Cypress* is also common in the area. They form approximately 20%
- Other include *Azadiracta indica*, *Acrocarpus fraxinifolius*, *Casuarina agustifolia*, *Jacaranda mimesifolia*, *Terminalia mantaly*



Mixture of exotic trees (Blue gum and Grevillea) and cypress along the route

4.2 Indigenous trees

The dominant indigenous tree species that will be lost will include;

1. *Acokanthera schimperi* (Kelyot) forms almost 50% cover in the area. Uses include; carvings, (Superstition tree- wealth tree), soil conservation, fuel wood.
2. *Spathodea campanulata* (Nandi flame), forms 10% of cover, Uses medicinal, Aesthetic,
3. *Ficus sycomorus* (Fig tree), forms 1% of cover, uses; ornamental, soil conservation
4. *Croton macrostachyus* covers 5%, uses; ornamental, soil conservation, fuel wood.
5. *Phoenix Reclinata* (Palm Tree) – it is one the main species covering the riverine vegetation in the project. It is found along river banks of most rivers and streams.

S/NO	Tree species	S/NO	Trees species
1.	<i>Cordia abbynica</i> ,	2.	<i>Bersama abyssinica</i> (cheptoroguet)
3.	<i>Croton megalocarpus</i> , (tebengwet)	4.	<i>Rauwolfia caffra</i> (Rerendet)
5.	<i>Albizia coriara</i> ,	6.	<i>Zanthoxylum chalybeum</i> (sagawaita)
7.	<i>Acacia xanthophloea</i> , (ochmnyaliliet)	8.	<i>Albizzia gummifera</i> (seet)
9.	<i>Prunus African</i> (tenduet)	10.	<i>Ficus thornningii</i> (simotuet)
11.	<i>Caesalpinia Decapetala kirkii</i> (Chepkomon)	12.	<i>Rubus volkensisii</i> (tangaimamiet)
13.	<i>Diospyros Abyssinica</i> (cheptuiyet)	14.	<i>Rubus pinnatus</i> (tangaimamiet)
15.	<i>Olea Europaea</i> (emotiot)	16.	<i>Rhoicissus revoilii</i> (tarotuet)
17.	<i>Pavetta Gardeniifolia</i> (chorwet)	18.	<i>Croton macrostachyus</i> (tebesuet)
19.	<i>Acokanthera schimperi</i> (Kelyot)	20.	<i>Dombeya burgessiae</i> (silibwet)
21.	<i>Vangueria infausta</i> (kimolonik)	22.	<i>Warburgia ugandensis</i> (soget)
23.	<i>Carissa spinarum</i> (legetetyet)	24.	<i>Euclea divinatorum</i> (usuet)
25.	<i>Tamarindus indica</i> (Lemechwet)	26.	<i>Ricinus communis plant</i> (imanek)
27.	<i>Ficus sur</i> (Mogoiwet)	28.	<i>Acacia abyssinica</i> (sirtuet)
29.	<i>Olea capensis</i> (msaita/ msetet)	30.	<i>Dovyalis Abyssinica</i> (mwokiot)
31.	<i>Balanites aegyptiaca</i> (Ng'oswet)	32.	<i>Pavetta gardeniifolia</i> (chorwet)

33.	<i>Cordia monoica</i> (Nogirwet)	34.	<i>Acacia karkii</i> (chepnyaliliet)
35.	<i>Elaeodendron buchananii</i> (saonet)	36.	<i>Celtis Africana</i> (chepkeleliet)
37.	<i>Ekebergia capensis</i> (araruet)	38.	<i>Polyscias fulva</i> (Aounet)
39.	<i>Allophyllus rubifolius</i> (borowet)	40.	<i>Osyris lanceolate</i> (kapurwet)
41.	<i>Combretum molle</i> (kemeliet)	42.	<i>Rhus vulgaris</i> (monjororriat)
43.	<i>Vangueria volkensii</i> (kimolwet)	44.	<i>Ehretia cymosa</i> (mutereriet)
45.	<i>Dichrostachys cinereal</i> (katet)	46.	<i>Podocarpus falcatus</i> (saptet)
47.	<i>Phoenix reclinate</i> (Sosiyot)	48.	<i>Terminalia brownie</i> (moissot)
49.	<i>Ormocarpum trichocarpum</i> (koipeyot)	50.	<i>Apodytes dimidiata</i> (chesimboliet)
51.	<i>Vepris nobilis</i> (kuriot)	52.	<i>Syzygium guineense</i> (Lamaiyak)
53.	<i>Cussonia holstii</i> (Lulukwet)	54.	



Castor oil plant found in Kyogong area









Chebindorwet

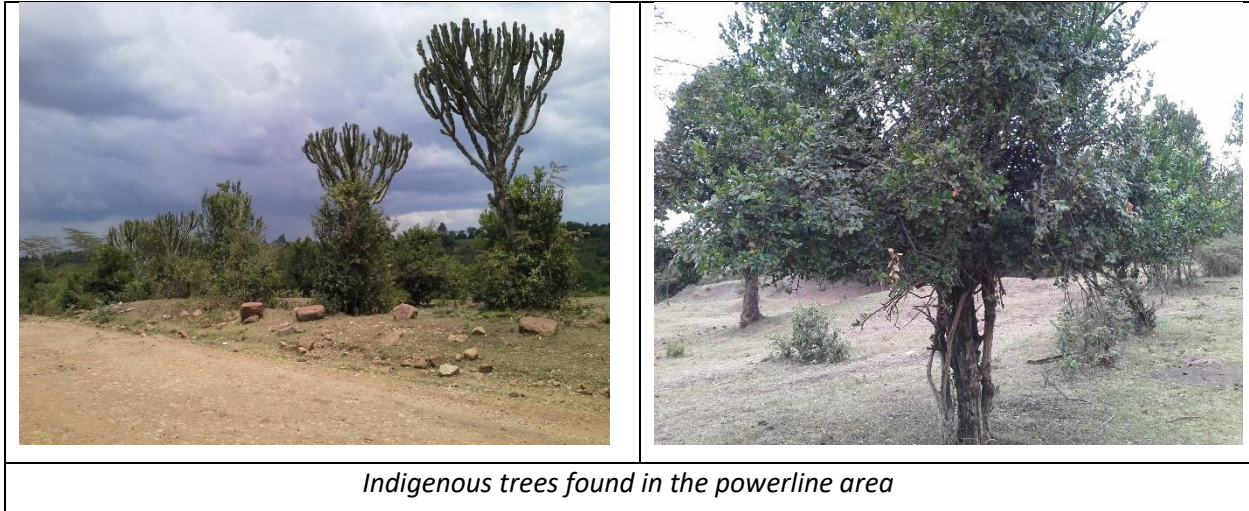


Rauwolfia caffra (rerendet)



Ficus sur (Mogoiwet)

	
<p>Acacia abyssinica (sirtuet) and Acacia karkii (chepnyaliliet)</p>	<p>Chebisorwet</p>
	
<p>Croton megalocarpus, (tebengwet)</p>	<p>Acokanthera schimperi (Kelyot)</p>
	
<p>Caesalpinia Decapetala kirkii (Chepkomon)</p>	<p>Sisal planted along the fences (boundary marking)</p>



4.3 Fruit trees

Fruit trees forms a major percentage vegetation cover in the area, the following are the most endemic fruit trees in the area include

Mangifera indica (Mango), *Psidium guajava*(Mapera), *Persia Americana*(Avacado), oranges and passion fruits.

It is worthwhile to mention other dominant vegetation covers such as; *Agave sp(sisal)*- forms the major source of fencing and strips while dividing land.

Phoenix reclinata (Indigenous palm trees)- dominant along the riverine, riparian, tributary section of the rivers

5. Assessment of Ecological Impacts

Potential impacts are described and assessed below. Impacts may arise due to various activities or infrastructure, including the following:

1. pylons;
2. temporary construction impacts;
3. access and service roads impacts; and
4. clearing within wayleave, e.g. to maintain vegetation below 4 m height.

Potential impacts and issues include the following:

- A. Destruction or disturbance to sensitive ecosystems: This will lead to localized or more extensive reduction in the overall extent of a particular habitat. Consequences of this may include:
 - increased vulnerability of remaining portions to future disturbance;
 - negative change in conservation status of habitat;

- general loss of habitat for sensitive species;
 - loss in variation within sensitive habitats due to loss of portions of it;
 - general reduction in biodiversity;
 - increased fragmentation (depending on location of impact); and
 - disturbance to processes maintaining biodiversity and ecosystem goods and services.
- B. Destruction of vegetation in the footprint of tower structures: This will lead to localized reduction in the overall extent of a particular habitat. This may only be an issue if the tower is situated within a sensitive habitat or upon a population of a species of special concern.
- C. Fragmentation of sensitive habitats: This will arise due to destruction of habitat in such a way as to divide areas of habitat partially or fully into smaller parts. Consequences of this may include:
- impaired gene flow within fragmented populations;
 - breakdown of ecological relationships, e.g. pollinator-plant;
 - breakdown of migration routes; and
 - reduced functional use, e.g. grazing.
- D. Destruction/permanent loss of individuals of Red List species during the construction and/or operational phase: This may arise if the proposed infrastructure is located where it will impact on such individuals. Consequences of this may include:
- negative change in conservation status of affected species;
 - fragmentation of populations of affected species;
 - reduction in area of occupancy of affected species; and
 - loss of genetic variation within affected species.
- E. Disturbance of natural vegetation through trampling, compaction by motor vehicles etc.: This may occur around construction sites and in order to access infrastructure. Consequences of this may include:
- destruction of vegetation or habitat;
 - degradation of vegetation or habitat;
 - loss of sensitive habitats;
 - loss or disturbance to individuals of rare, endangered, endemic and/or protected species; and
 - fragmentation of sensitive habitats.
- F. Impacts on the movement and migration of animal species: This will occur if the infrastructure imposes an insurmountable barrier to movement. Consequences of this may include:
- impaired gene flow within fragmented populations;
 - breakdown of ecological relationships, e.g. pollinator-plant; and
 - breakdown of migration routes.

- G. Increased soil erosion, increase in silt loads and sedimentation: This will occur due to soil disturbance, especially along the steeper slopes, increased run-off from compacted areas etc. Consequences of this may include:
- loss of or disturbance to indigenous vegetation;
 - loss of sensitive habitats;
 - loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
 - fragmentation of sensitive habitats; and
 - impairment of wetland function
- H. Establishment and spread of declared weeds and alien invader plants: This may occur in disturbed areas and/or where propagules of these plants are readily available. Consequences of this may include:
- loss of indigenous vegetation;
 - change in vegetation structure leading to change in various habitat characteristics;
 - change in plant species composition;
 - change in soil chemical properties;
 - loss of sensitive habitats;
 - loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
 - fragmentation of sensitive habitats;
 - change in flammability of vegetation, depending on alien species;
 - hydrological impacts due to increased transpiration; and
 - impairment of wetland function.
- I. Damage to wetland areas: This may occur if wetlands are directly affected by the construction of infrastructure. Consequences of this may include:
- Impairment of wetland function;
 - reduction in water quality, potentially leading to impacts on wetland flora and fauna; and
 - change in hydrological regime, usually increased runoff.
- J. Increased dust during construction: This may affect animals and vegetation in the vicinity. Consequences of this may include:
- will cause stress in individuals of various animal species, which may result in them moving away or cause changes in behaviour;
 - will cause some territorial animals to be displaced; and
 - will result in deposition of dust on vegetation leading to impaired photosynthesis and respiration, potentially causing damage to individual plants.
- K. Increased noise pollution during construction: This may affect animals in the vicinity. Consequences of this may include:

- will cause stress in individuals of various animal species, which may result in them moving away or cause changes in behaviour; and
- will cause some territorial animals to be displaced.

L. Increased risk of veld fires: There is a higher risk of veld fires around construction sites due to the use of fires for cooking, warmth, etc. by construction workers. Consequences of this may include:

- damage to sensitive habitats;
- damage to populations of sensitive plant species; and
- loss of vegetation production leading to reduction in available grazing/browsing for wild or domestic animals.

6. Ecological Impacts Evaluation and Mitigation Measures of Proposed Transmission Powerline Between Narok and Bomet

Destruction or disturbance to sensitive ecosystems

Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a particular habitat. The potential magnitude of this impact is low due to the fact that grassland vegetation is not usually cleared below the power lines. It will have an impact at the scale of the proposed infrastructure (pylons and access roads), which is relatively local in extent. The duration of the impact will be permanent, and the probability of occurrence is definite, unless the powerline is routed away from sensitive habitats.

Mitigation measures: 1. During design stage, ensure powerline is routed outside of sensitive habitats. 2. If sensitive habitats cannot be avoided, then during construction, ensure construction impacts are contained as much as possible to as small an area as possible.

Destruction of vegetation in the footprint of tower structures

Destruction of vegetation in the footprint of tower structures leading to reduction in the overall extent of a particular habitat, the potential magnitude of this impact is minor due to the small size of the pylons relative to the overall extent of the natural vegetation. It will have an impact at the scale of the proposed infrastructure, which is very local. The duration of the impact will be permanent, and the probability of occurrence is definite. **Mitigation measures:** 1. During design stage, ensure powerline is routed outside of sensitive habitats. 2. If sensitive habitats cannot be avoided, then during construction, ensure construction impacts are contained as much as possible to as small an area as possible.

Fragmentation of sensitive habitats

Fragmentation may occur if vegetation is completely cleared below the powerline, which does not appear to be the case in the study area where grasslands occur. It is therefore assumed that no clearing will take place and that localized fragmentation may only occur where access roads are required to be constructed. The potential magnitude of this impact is therefore low. This is not too contentious if the impact is located on the edge of the natural area of vegetation but could be more severe if it cuts a contiguous block of vegetation into pieces. It will have an impact at the scale of the proposed infrastructure, which is relatively

regional in extent, although fragmentation is only likely to occur in localized areas. It is therefore scored as being local. The duration of the impact will be permanent, and the probability of occurrence is probable.

Mitigation measures: 1. During design stage, ensure powerline is routed outside of sensitive habitats. 2. If sensitive habitats cannot be avoided, then during construction, ensure construction impacts are contained as much as possible to as small an area as possible. 3. Keep construction of access roads to a minimum.

Destruction/permanent loss of individuals of rare, endangered, endemic and/or protected species

If populations or individuals of Red List species are directly affected by the proposed infrastructure, then the potential magnitude of this impact depends on the overall distribution and abundance of the species concerned. At worst a Critically Endangered or Endangered species may be affected, in which case the impact would be high in magnitude, possibly having a severe impact on the survival probability of the species. If a Critically Endangered or Endangered species is affected, then the scale of the impact could be global. The duration of the impact will be permanent, and the probability of occurrence is highly probable (depending on where the powerline is routed).

Mitigation measures:

During design stage, ensure powerline is routed outside of sensitive habitats or areas where populations of threatened species occur.

Assess the footprint of the infrastructure where it occurs in untransformed natural habitat in order to determine whether any populations of sedentary threatened organisms will be affected by the infrastructure. Thereafter, plan to place powerline route and individual pylons and other infrastructure away from these sites. It will be necessary for specialists in different groups of organisms to undertake detailed field assessments of the untransformed natural habitats where there is a high possibility of Red List organisms occurring. According to the Impact Assessment methodology, the significance remains high even if the probability is reduced to low. The mitigation measures reduce the likelihood of the impact occurring but do not reduce the significance of the impact if they do occur.

Disturbance of natural vegetation during construction phase through trampling, compaction by motor vehicles etc.

leading to degradation or destruction of vegetation or habitat or loss of individuals of rare, endangered, endemic and/or protected species, the potential magnitude of this impact is moderate. It will have an impact at the scale of the proposed infrastructure, although this is relatively regional in extent and is therefore scored as regional. The duration of the impact will be long-term, since the vegetation may recover, and the probability of occurrence is probable, unless sensitive habitats are avoided.

Mitigation measures: 1. During design stage, ensure powerline is routed outside of sensitive habitats, where possible. 2. If sensitive habitats cannot be avoided, then during construction, ensure construction impacts are contained as much as possible to as small an area as possible. Avoid any sensitive habitats with construction vehicles and equipment during construction and limiting undue trampling, where possible. 3. Keep construction of access roads to a minimum.

Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts

Clearing under the powerline or other infrastructure may cause barriers to movement of animals. This is usually only a problem where the height of the vegetation is physically managed, which is not usually done in grasslands. The potential magnitude of this impact is therefore potentially small since it is unlikely to result in impairment of processes. However, if it affects a population of a sensitive species, the magnitude could be more serious and is scored as moderate. It will have an impact in remaining natural vegetation at the scale of the proposed infrastructure, which would be local in extent, but could affect regional population structure and is therefore scored as regional. The duration of the impact will be permanent, and the probability of occurrence is probable, unless the powerline is routed away from sensitive animal populations. Mitigation requires routing the powerline away from known populations of sensitive animal species, in which case the significance can be reduced from a MEDIUM to a LOW negative impact.

Mitigation measures: 1. During design stage, ensure powerline is routed outside of sensitive habitats, where possible. 2. During design stage, ensure powerline is routed outside of sensitive habitats or areas where populations of threatened animal species occur. Assess the footprint of the infrastructure where it occurs in untransformed natural habitat in order to determine whether any populations of sedentary threatened animals will be affected by the infrastructure. Thereafter, plan to place powerline route and individual pylons and other infrastructure away from these sites. It will be necessary for specialists from potentially affected groups of animals to undertake detailed field assessments of the untransformed natural habitats where there is a high possibility of Red List animals occurring. 3. Keep construction of access roads to a minimum.

Increased soil erosion, increase in silt loads and sedimentation

Where there are erodible soils, it is possible that construction of infrastructure may result in local exposure of the soil surface or increase in runoff off impermeable surfaces. The most severe likely impact would be on wetland systems, where siltation may occur. The potential magnitude of this impact is moderate. It will have an impact at the scale of the proposed infrastructure and possibly downstream, if a drainage area is affected. This infrastructure is relatively regional in extent and potential impacts may extend beyond the study area (in the case of impacts on wetlands). The impact is therefore scored as regional. The duration of the impact will probably be medium-term, and the probability of occurrence is probable.

Mitigation Measures: Mitigation requires strict storm water management, and, in which case the significance can be reduced from a MEDIUM to a LOW negative impact. Mitigation measures: 1. A stormwater management plan is required to manage potential runoff problems during construction and operation. 2. Following construction, rehabilitation of disturbed areas is required. 3. Avoid of areas with sensitive soils, steep slopes, etc.

Establishment and spread of declared weeds and alien invader plants

On the basis of existing alien invasions in the study area, the potential magnitude of this impact is considered to be high. It will have an impact at the scale of the proposed infrastructure, although this is relatively regional in extent and is therefore scored as regional. The duration of the impact will be long-term, and the probability of occurrence is highly probable, unless effective measures are put in place to reduce the possibility of alien invasions.

Mitigation measures: 1. During design stage, ensure powerline is routed outside of sensitive habitats. 2. If sensitive habitats cannot be avoided, then during construction, ensure construction impacts are contained as much as possible to as small an area as possible. 3. Following construction, rehabilitation of disturbed areas is required. 4. Avoid translocating stockpiles of topsoil from one place to another in order to avoid translocating soil seed banks of alien species. 5. Keep construction of access roads to a minimum. 6. During operation, the clearing of alien plants within the powerline and infrastructure servitude is required to control alien invasions. This is mandatory, according to current legislation.

Damage to wetland areas

The potential magnitude of this impact is moderate to high due to the fact that physical alteration to wetlands can have a severe impact on the functioning of those wetlands. It will have an impact at a localised scale but could result in downstream impacts further away and is therefore scored as regional. There may also be secondary impacts beyond the boundaries of the study area, e.g. reduction in water quality downstream of the development. The duration of the impact will be long-term, and the probability of occurrence is improbable since it is unlikely that pylons would be located within major wetlands occurring in the study area. If the powerline pylons and associated infrastructure is kept away from sensitive wetland habitats then the potential impact can be avoided.

Mitigation measures: Mitigation requires keeping the powerline infrastructure outside of sensitive wetland habitats, in which case the significance can be reduced from a HIGH to a LOW negative impact.

Mitigation measures:

- During design stage, ensure powerline is routed outside of sensitive wetland habitats or drainage areas.
- A stormwater management plan is required to manage potential runoff problems during construction and operation.
- Following construction, rehabilitation of disturbed areas is required.
- Avoid of areas with sensitive soils, steep slopes, etc.

Increased dust during construction leading to potential loss of habitat or displacement of animals

The potential magnitude of this impact is low to moderate. It will have an impact at the scale of the proposed infrastructure. It is unlikely to be a uniform impact across the entire powerline and more likely to be a localised issue. The impact is therefore scored as local. The duration of the impact will be short-term, primarily for the construction phase and the probability of occurrence is probable.

Mitigation measures: 1. During construction, control potential dust problems at construction sites by regular spraying of water onto the ground.

Increased noise pollution during construction leading to potential displacement of animals

The potential magnitude of this impact is low to moderate. It will have an impact at the scale of the proposed infrastructure. It is unlikely to be a uniform impact across the entire powerline and more likely to be a localized issue where construction is occurring. The impact is therefore scored as local. The

duration of the impact will be short-term, primarily for the construction phase and the probability of occurrence is highly probable, depending on the method of construction.

Mitigation measures: 1. No mitigation measures are proposed.

Increased risk of fires

Increased risk of veld fires leading to damage to sensitive habitats or loss of individuals of rare, endangered, endemic and/or protected species or loss of vegetation production the potential magnitude of this impact is low due to the fact that vegetation already experiences seasonal burning. It is unlikely to be a uniform impact across the entire powerline and more likely to be a localized issue where construction is occurring. The impact is therefore scored as local. The duration of the impact will be short-term, primarily for the construction phase and the probability of occurrence is highly probable. Mitigation requires, in which case the significance can be reduced from a LOW to a LOW(er) negative impact.

Mitigation measures: 1. During construction, management of fires emanating from construction camps is required and education of labourers concerning management of fires. 2. During operation, a burning programme should be compiled to reduce fuel loads under powerlines without implementing a fire frequency that is too high for the affected vegetation.

7. Summary of Recommendations for Mitigation of Impacts

- Undertake surveys to locate potentially occurring populations of Red List species. Such populations should be avoided. Recommendations for such surveys are provided in the section below.
- During and after construction of the infrastructure, ensure effective storm water management around permanent infrastructure, rehabilitate disturbed areas, protect topsoil and avoid sensitive soils on steep slopes. This will reduce the possibility of soil erosion.
- Avoid translocating topsoil stockpiles from one place to another or importing topsoil from other sources that may contain alien plant propagules.
- Alien plants must be controlled along the powerline and service road servitude as well as within any areas controlled by the Proponent. This should take place during and after construction and may require long-term follow-up.
- Control dust on construction sites and access roads using water-sprayers.
- During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the vegetated areas must not take place.
- As part of restoration of the lost vegetation cover the following initiatives should be done;
- Before and after construction, flora & fauna surveys should be undertaken by the Proponent to ascertain biodiversity;
- Limit way leave areas to 30m along the proposed powerline
- KPLC will estimate Total Economic Value of lost forest resource & allocate equivalent monies for compensation including issuance of tree seedlings in the areas affected.
- Construct new transmission line immediately adjacent to existing line to minimize fragmentation effects,

**Annex 4 Attendance Lists for Key stakeholders held for Narok-Bomet 132kV Double
Circuit Powerline**

Annex 5	Samples of Filled Public and stakeholders Questionnaires(KPLC)
Annex 6	Key informants questionairres
Annex 7	Community Questionaires
Annex 8	Meeting Minutes
Annex 9	Public sensitization barazas attendance sheets
Annex 10	Route Firming Report