THE KENYA POWER AND LIGHTING COMPANY LIMITED

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

PROPOSED KPLC KINDARUMA –MWINGI - GARISSA 132KV TRANSMISSION LINE

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January 2010

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Disclaimer:
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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED KINDARUMA –MWINGI - GARISSA 132KV TRANSMISSION LINE

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ACRONYMS, ABBREVIATIONS AND SYMBOLS

AAAC	All Aluminium Alloy Conductors
ACSR	Aluminium Conductor Steel Reinforced
app.	Approximately
CBO	Community Based Organization
CO	Carbon Monoxide
CO2	Carbon Dioxide
dB(A)	Decibel(sound level unit) weighted on the 'A' scale
EMCA	Environmental Management And Coordination Act
EMF	Electromagnetic Frequency
ERC	Energy Regulatory Commission
ESIA	Environmental and Social Impact Assessment
Gwh	Giga Watt Hours
HIV/AIDS	Human Immuno-Deficiency Virus / Acquired Immune Deficiency Syndrome
ICNIRP	International Commission On Non-Ionizing Radiation Protection
IEC	International Electro-technical Commission
IEEE	Institute of Electrical And Electronics Engineers
IFC	International Finance Corporation
IPP	Independent Power Producers
Km	Kilometre
KPLC	Kenya Power & Lighting Company
kV	Kilo Volts
LCPD	Least Cost Power Development Plan
MW	Mega Watts
NEMA	National Environment Management Authority
NOx	Nitrous Oxides
OHS	Occupational Health And Safety
OP	Operational Procedures
PAH	Poly Aromatic Hydrocarbons
PAP	Project Affected People
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
S/S	Sub-Station
SERC	Standards And Enforcement Review Committee
SF_6	sulphur hexafluoride
sq km.	Square Kilometres
TL	Transmission Line
UETCL	Uganda Electricity Transmission Company
VCT	Voluntary Counselling And Testing
VOC	Volatile Organic Carbons
WB	World Bank

EXECUTIVE SUMMARY

Introduction

The Government of Kenya plans to increase access to electricity in Kenya tenfold from the current 4% in the rural areas to about 40% by 2020. To do this, the transmission lines network is being considered for upgrading and with it the communication system required for line protection and management purposes. The Kenya Power and Lighting Company Limited (KPLC) least cost power development plan identified various 132 KV developments for improving the performance of the national grid network to cater for the increasing load growth and meet the objectives of 2030. KPLC is planning to construct a new single circuit 132 kV transmission line between Kindaruma-Mwingi-Garissa Power Transmission, comprising the following:

- 132 kV line (Wolf) Kindaruma - Mwingi, 32 km
- 132 kV line (Wolf) Mwingi - Garissa, 192 km

The proposed line will serve the greater districts of Mwingi in Eastern province, Tana River in Coast province, and Garissa in North eastern province and beyond.

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction and operations stages. Norken (I) Ltd has been contracted by KPLC to carry out an Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the proposed 132kV transmission line.

Scope of ESIA Study

The project in its entirety comprises of feasibility studies for the Energy Access Scale-Up Program to include initial system studies of the KPLC transmission system; metering system; previous studies and data collection; and the load forecast. Transmission system planning and an economic and financial analysis was also carried out, as well as cost estimates and justification and the establishment of ranking and performance targets. This study covers the 132kVTransmission Line from Kindaruma-Mwingi-Garissa.

ESIA Study Objectives

The objectives of the study are to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;

- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.
- Identify and quantify different categories of project affected people (PAPs) who would require some form of assistance, compensation, rehabilitation or relocation.
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project.
- Verify the adherence and compliance of the World Bank's safeguard policies.

ESIA Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003, and the World Bank Safeguard Policies. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site areas, public consultations with members of the community in the project areas, survey, photography, and discussions with the Proponent.

ESIA Methodology

Environmental Screening: In screening the Consultant set out to confirm whether or not this project falls within a category that requires EIA prior to commencement. In addition, other considerations during the screening process included a preliminary assessment of the environmental sensitivity of the areas along the proposed transmission line route; this comprised of a desk study involving the analysis of project maps and proposed line route, as well as literature review of previous studies on the proposed project. It was determined that infrastructure development activities (such as the development of the proposed power transmission line) are listed under Schedule 2 of EMCA, 1999 among projects requiring an EIA study. The Proponent has therefore commissioned this study in line with the provisions of EMCA, 1999.

Environmental Scoping: a Project Report has been prepared and submitted to NEMA. This exercise helped to narrow down the most critical environmental and social issues requiring detailed evaluation. Below are the key activities that were undertaken during the study:

- Consultations with the Proponent and regarding the proposed project details, the site planning and implementation plan,
- Desk review of available documentation on t he project,
- Thorough field investigations along the proposed line route, photography, surveys, informal and discussions with people from the immediate neighbourhood.
- A participatory rapid assessment method using tools including literature review, questionnaires, observation, geographical positioning system device (GPS), and in-depth interviews as well as public consultative meetings were used as follows:
- Sixty one household interviews were conducted along the project corridor and twenty one interviews amongst the end target beneficiaries in Garissa town. It involved eighteen sub-locations spread across six divisions along the project corridor.
- In-depth interviews were held with district heads of departments, provincial administration, NGOs, CBOs and Faith based Organisations.
- Consultative Public Participation in each of the project divisions whose venue included Thaana Nzau (Migwani), Mwingi (Mwingi Central), Ngiluni (Nguni), Madogo Social hall (Bangale and Madogo) and Garissa County Council hall (Garissa central)
- Evaluation of the project setting and baseline conditions;

- Analysis of the potential impacts of the proposed project on the biophysical and socio-cultural/economic environment;
- Formulation of appropriate mitigation measures and development of an environmental and social management plan, monitoring plan, and guidelines for capacity building in environmental and social management;

Final ESIA Report: A detailed analysis of the potential impact and the corresponding recommendations on mitigative measures was undertaken during the preparation of the final Environmental and Social Impact Assessment Study. This study takes into account all of the findings of the previous assessments undertaken, to include all the consultations that have been carried out with key stakeholders.

ESIA Study Team
As required by the Environmental Regulations (2003), this ESIA study was conducted by a NEMA-registered 'Firm of Experts' – Norken (I) Ltd. NEMA Reg. No. 0181. The team had the following professionals:

- Lead EIA Experts (Environmental Scientists)
- Electrical Engineer
- Occupational Health and Safety Expert
- Ecologist/Natural Resource Expert
- Sociologist/Socio-Economist.
- Surveyors

Policy, Legal and Regulatory Framework
The Environmental Management and Co-ordination Act 1999, is the legislation that governs EIA studies in Kenya. This project falls under the Second Schedule of EMCA 1999, which lists the type of projects that are required to undergo EIA studies in accordance with Section 58 (1- 4) of the Act. Various other key national laws that govern the management of environmental resources in the country have been discussed in the report. This study is also based on internationally respected procedures recommended by the World Bank, covering environmental guidelines. Reference has been made to the World Bank Safeguard Policies and Environmental Assessment Source Book Volume II, which provide relevant sectoral guidelines.

Project Description
The proposed project is part of the Proponent's energy access scale-up program, which has the following objectives:

- Extending the transmission and distribution lines and installation of new 132/33kV substations, as well as new and reinforced distribution lines with the aim of reducing technical losses and improving voltage conditions, thereby coping with additional demand.
- Increasing access to electricity to 20% by 2010 by accelerating connection rates;
- Voltage upgrading to increase supply capacity and reduce system losses;
- Provide alternative electricity supply paths to increase reliability and improve power quality in the regions.

Currently electricity is accessible to less than 20% of the total population and approximately 5% of rural population. The Government's goal is to accelerate access rate to 20% of rural population by 2010 and to at least 40% by 2020. To achieve this goal, Government has prepared the Energy Scale Up Program covering the period 2008 to 2017. This would be approached not only from

improvement and expansion of the network, but also on raising the generation to match the demand.

A main criterion when concluding on the adopted conceptual design has been to ensure that the transmission line is designed in a safe, cost effective and reliable manner. This study provides the Proponent with considerations on the environmental and social impacts of the project as proposed.

Project Activities
Assembling of structures, concrete casting, and stringing of conductors: Erection of the lattice structures (pylons) will involve delivery of complete structures, physical assembly at site and laying using cranes. The steel structures will be assembled on site. They will have rivets and will be bolted. Strong aluminium rollers will be used to hoist the structures and in exceptional situation helicopters can be used. The average height of the line will be between 30-40 m.

The foundations of the lattice structures/pylons will be dug manually then casting concrete are used. The depth will be a minimum of 5m. The depth will be determined after geotechnical study is undertaken. Vegetation clearing will be done manually by use of pangas and slashers. Where there are big trees, portable power saw mills (petrol powered) will be used.

Modes and quantity of transport vehicles employed in the project will be approximately 5no lorries and 4no 4x4 vehicles. Maintenance of these vehicles will be done through licensed garages found in the project area. There will be no on-site maintenance of vehicles. Powered equipment expected to be used in the construction include power saw mills, and compressor to break had ground (if required).
Once the lattice towers are erected and structural integrity established, minimal maintenance is required. During the operation phase of the project the Wayleave will be maintained through manual vegetation clearing. Routine aerial inspection and ground inspection will however be done annually.

Approximately 10 unskilled labour, five artisans, 2 technicians and three engineers will be employed in the project construction phase.

Site Ownership
The proposed transmission line traverses a vast area comprising land owned by various public and private entities and comprises agricultural land use, grazing land, and human settlements. The most significant social/socio-economic impact will be the need for compensation and relocation of people affected by the project siting.

Environmental Setting
The proposed Kindaruma-Mwingi-Garissa Power Transmission line will serve the greater districts of Mwingi in Eastern province, Tana River in Coast province, and Garissa in North eastern province and beyond. The profile of the greater districts traversed by the project is summarised as follows:

- Yatta district, in Eastern province borders Mbeere district to the North, Kitui district to the East, Thika district to the West and Maragwa district to the south West. The total area of the district is 2469 Km2. The district comprises four administrative divisions, which are further subdivided into 17 locations and 51 sub-locations.
- Mwingi District is in Eastern Province of Kenya. It borders Kitui District to the South, Yatta District to the West, Mbeere to the North and Tana River District to the East. The district lies

between latitude 0° 03' and 1° 12' South and longitudes 37° 47' and 38° 57' East and has a total area of 5,215.40 km2. Mwingi district is divided into 5 divisions, namely Migwani, Central, Nguni, Nuu and Mui.

- Kyuso district is in Eastern Province. It borders Mwingi District to the South, Mbeere District to the West, Tharaka District to the North West and Tana River District to the East. The district lies between latitude 00 03' and 10 12' South and longitudes 37° 47' and 38° 57' East. The district has an area of 4,814.90 Km2 and is divided into 5 administrative divisions (Mumoni, Ngomeni, Kyuso and Tseikuru), 16 locations and 53 sub-locations.
- Tana River District is in Coast province and has a total area of 22,452.9 km2. Tana River district was split into two districts in October 2007 to form Tana River and Tana Delta. The proposed project however traverses Tana River district which borders Mutomo District to the West, Mwingi District to the Northwest, Garissa and Fafi to the North East, Ijara District to the East, Tharaka and Isiolo District to the North and Tana Delta District to the South.
- Garissa district, and specifically Garissa town, is the main beneficiary of the proposed Kindaruma-Mwingi-Garissa Transmission line. The town of Garissa is currently rated as the fastest growing town in Kenya and yet it has very few and inadequate infrastructure notably electricity as it entirely relies on diesel power generators. The district is located between latitude 0° 58' north and 1° 30' south; and longitudes 38° 34' east and 41° 05' west. The district covers an area of about 33,620 square kilometers.

Socio-cultural Setting

Yatta and Mwingi districts are predominantly occupied by the Akamba. Tana River district is occupied by the Pokomo, Orma, Wardei, Somalis, Munyoyaya, Wata Malakote, Korokoro, Boni, Sanye, Somali, and the Mijikenda tribes among others. Garissa town and its surrounding which is the major beneficiary of the proposed project is a metropolitan town whose major inhabitants are the Somali. The Somali consists of broad clan federations, each of which traces its origin from genealogical ties and politics are done within the framework of clanism.

The Kindaruma-Mwingi-Garissa transmission line traverses areas that are largely occupied by dominant social groups with structured land control patterns, traditional practices, traditional land-based modes of production. Indigenous peoples - defined here as social groups with identities that are distinct from dominant groups, who are usually marginalised and vulnerable segments of society would include the Malakote, Korokoro, Boni and Sanye peoples.

Key Findings

As a result of this assessment it is anticipated that the most adverse impact will be the need for compensation and relocation of people affected by the project study. A Resettlement Action Plan (RAP) has therefore been included as a distinct part of the proposed project.

Project Affected Persons

From the field survey conducted, it is expected that the Project shall mostly affect through construction of the transmission line, 3no districts, 6no divisions, 8no locations and 11no sub-locations. In effect, a total of 239no households will lose land, 89no will lose dwellings and/or business structures, 23no will lose crops, and 9no will loss businesses.

Summary Outcome of Interviews, Discussions and Public Consultations

The local population is willing to participate in ensuring success of the proposed project in a number of ways such as:

- Offering their land in exchange of "good" money whereby they will be adequately compensated at current market values

- Supplying both unskilled and skilled labour for the project
- Providing market for the electricity and ensuring its security by reporting electric faults and vandalism
- Creating awareness among community members on dangers of electricity and tempering with electricity lines

Despite the unwavering support accorded to the proposed project, stakeholders consulted raised red flag that they should be given the timeframe for the project implementation, involved and informed clearly and adequately so as to understand the compensation process and values of property. This calls for an all inclusive and participatory awareness creation and social engineering before and during project construction.

Following the consultation process on the transmission line corridor, most of the PAPs did not want to be resettled in a common area and instead asked to be compensated in monetary form so that they could purchase land in their preferred areas. Alternatively, they wanted to recommend to the Proponent their preferred areas of choice and let the government develop that land for them.

Components Requiring Land Acquisition
The project components that would require land acquisition and resettlement under this consideration include the transmission line corridor whose width is 30 meters and a length of 224 Kilometres.

Kindaruma – Mwingi 132 kV line Length 32 km: This section starts at Kindaruma Electricity Power Station (B1-0) in Kyondoni Sub-location (Masinga district), crosses the seasonally dry Kithyoko River before entering Thaana sub-location. The line then crosses the seasonally dry Nzuli River into Kairugu sub-location proceeds to Kiomo sub-location, from where it turns west for the last 2 km up to Mwingi. This section consists of rural villages which rely on subsistence farming. The average household size is 6no with sub-location population density per km2 ranging from 28 in Kairugu, Thaana - 35, Kyondoni - 42 and Kiomo (neighbouring Mwingi town) - 85.

132 kV line Mwingi Garissa, 192 km: This section of the proposed transmission line starts a few meters to the North East of Tyaa river bridge. The line turns due east and crosses Mwingi-Tseikuru road at Mwingi Cottage Hotel. From this point, the line follows road tracks for over 7 kilometers before following the Mwingi-Garissa road alignment to Madogo in Tana River district. This section portrays three settlement patterns: urban sites including Mwingi town and Mutyangombe, Nguni, Ngiluni, Ukasi, Bangale and Madogo markets; permanently settled areas between Mwingi and Ukasi; and uninhabited areas from Ukasi to Madogo

Identification of Potential Impacts
Summary of anticipated positive impacts include:

- In Garissa particularly, which is the main beneficiary of the project, there will be in the long run more households/premises being connected to the national grid;
- The transmission line will contribute to achieving the government's developmental goals in reducing poverty and improving living standards; these would result from employment creation (direct and indirect) and increased investments especially in value addition processing of primary products.
- Improved power capacity and reliability would increase opportunities to invest in heavy industries and facilitate direct and indirect employment particularly in Garissa town which is fast growing economically.

- The construction phase will bring about job creation for both skilled and unskilled labour for vegetation clearing, menial works, drivers and machine operators. The total number of local jobs created by this project as will depend on availability of labour and policies of the contractor and KPLC while casual wages range from KSh. 250 to 800 per day
- Power problems/outages especially experienced in Garissa town which relies on a diesel generator, will reduce significantly.
- Improved security in the beneficiary communities will be achieved through better lighting.

Other potential impacts identified include the following:

- Terrestrial Habitat Alteration: The construction of transmission line rights-of-way, will result in some alteration and disruption to terrestrial habitat through vegetation clearing. (4.2.5.) The climatic conditions of the project area precludes establishment of forest systems. The area vegetation mainly ranges between bushed grasslands to bushed woodlands, characteristic of semi-arid, which is classified as Ecological Zone V (defined in section 4.2.5). The impacts to the terrestrial habitat due to construction of the transmission line will not have significant injurious effects; similarly it will not have significant impacts to wildlife and human communities dependent on these habitats.
- Alteration of Aquatic Habitats: The route of the proposed transmission line crosses several rivers and streams, such as R. Kithyoko, R. Nzuli, R. Tyaa, R. Ndiani, R. Tula, and R. Arer. Soil erosion from construction activities may result in siltation however this impact is expected to be minimal and temporary. The proposed transmission line does not affect international waterways, described by the World Bank OP 7.50 Safeguard Policy on international waterways as any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states.
- Wildlife Species: The construction phase is not expected to have significant negative impact on wildlife owing to the short width of the Wayleave and low wildlife density in the line route. Furthermore, most of the wildlife in the general area is well protected in neighbouring conservation areas (Map 2) under the management of Kenya Wildlife Service and the County Councils.
- Power Line Associated Avifauna Mortalities: Electrocution and collision are possible outcomes along the proposed power line affecting raptors and other birds. Examples of the bird species found in the project area listed in section 4.2.5.1
- Soil erosion: during the construction phase, the excavation of soil for pylon erection will loosen the soil along the Wayleave Occasionally, temporary access roads to construction sites will have to be created where they did not exist before and this will result in displacement/ loosening of top soil in the affected sections.
- Air quality: During the process of construction, some dust and exhaust fumes will be generated from the construction vehicles (5 Lorries and 4 off-road vehicles) as they make their way through the mainly dry and perched terrain especially in the project areas in Mwingi and Tana River districts. The area between Mwingi and Garissa the ground conditions are rocky and therefore there will be need to use a compressor to break hard ground. These processes will lead to dust generation and exhaust fumes.
- Hazardous Substances: Use of engines (construction vehicles) and other equipment on site has the potential to lead to spillage of petroleum products. It is however worth noting that the risks of a major oil spillages occurring are minimal because only a few construction vehicles (3-5no trucks and 4no 4WD vehicles) will be needed in the construction of the transmission line. Highly-refined, mineral insulating oils will be used to cool transformers and provide electrical insulation between live components.
- Solid Waste Generation: During the construction period, solid waste will be generated from the actual construction activities (packaging materials, excess materials, recovered materials,

among other waste) and from the workforce itself (waste in the form of food, wrappers, bottles, containers, cartons, and other disposable or personal items). The workforce on site at any given time is relatively small (approximately 20no.) however the accumulative impact of waste generation can create a significant problem if mitigation measures are not made available.

- Noise pollution: The noise impact during construction is expected to be negative but short-term. Sources of noise will be trucks and the off-road vehicles in transit, use of compressor to break hard ground and the use of motorized chain saws for vegetation clearing. Impacts of noise include noise-induced hearing loss and/or nuisance for the project workers and the affected settlements.
- Aircraft Navigation Safety: The tower heights for the tower structures to be erected are approximately 30-40m. KCAA gives approval for tower heights to ensure safety of aircraft. Power transmission towers, if located near an airport, air strip, or known flight paths, can impact aircraft safety directly through collision, or indirectly through radar interference. Based on consultations with KCAA officials, a full clarification on whether or not the facilities mentioned will be impacted by the project will be determined through a survey.
- Electromagnetic Field (EMF) Exposure: Scientific research on the effects of EMF on public health has not demonstrated clearly the existence of a significant risk, nor has it proven the complete absence of risk. The finding and conclusions are that the field strength on a 132 kV line at the distance of exposure heights of 30-40m is less than what one would ordinarily be exposed to in a domestic setup. In this context, the risk is insignificant however prudent avoidance is recommended.
- Maintenance of Transmission Line RoW: The impacts of rights of way maintenance (manual vegetation clearing)may include physical hazards such as injuries sustained from the tools/equipment used, ergonomically problems from poor working posture, and dust inhalation, among others.
- Electrocution from Live Power Lines: During maintenance activities, hazards most directly related to power transmission lines and facilities would occur as a result of electrocution 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 during maintenance activities.
- Working at Heights: During construction or maintenance works, workers will be involved in working at heights (on the transmission towers) and accidental falls from great heights can be fatal to the worker or result in incapacitating injury or disability. The risk of this is minimal, however, because transmission lines rarely need maintenance and they are inspected mainly using aircrafts.
- Visual impact: Visual intrusion as a result of the transmission line and towers was not a major issue of concern based on the public consultations held with communities in the project areas.
- Spread of Disease: During the construction phase of the project, construction personnel brought in from outside the community may be infected with HIV/AIDS and other sexually transmitted diseases, and could introduce these diseases to the community members they interact with.
- Sites of Cultural Heritage: Presently the National Museums of Kenya does not have records in their database of heritage sites in the project area. However, this does not mean that such sites do not exist. What it simply means is that no field survey has been conducted in that area. NMK advices that the identification of such sites must determined through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5, Subsection (1)(n) which mandates the National Museums of Kenya to conduct, subject to provisions of the Environmental Management and Co-ordination Act, an environmental impact assessment of threatened heritage in areas earmarked for development.

- Land Acquisition: The transmission line project would lead to acquisition of land and resettlement of those whose structures are overhead traversed or lie within the 30 meters width along the 224 Kilometres. Similarly, access to land over passed by the transmission line will be limited.
- Resettlement of Project Affected Persons (PAPS): From the field survey conducted, it is expected that the Project shall mostly affect through construction of the transmission line, 3no districts, 6no divisions, 8no locations and 11no sub-locations. In effect, a total of 239no households will lose land, 89no will lose dwellings and/or business structures, 23no will lose crops, and 9no will loss businesses.

Impact Mitigation Measures

Mitigation of potential impacts (environmental and social) as described in Chapter 6, and implementation of the environmental and social management plan presented in Chapter 7 of this report, will help to prevent or avert negative impacts, and enhance the positive outcomes of the project. This will help to achieve project sustainability. The World Bank's OP 4.12 on Involuntary Resettlement and Government of Kenya guidelines will be followed and used complementarily where applicable to avoid conflict. Community participation in planning and implementing resettlement will be encouraged. A Compensation and Resettlement Action Plan will be developed addressing land, housing, crops, and other compensation to be provided to the adversely affected population.

Assessment of Alternatives

- The 'No Action' Alternative: This option maintains the status quo: any social and economic development benefits from the transmission line project would be foregone; there would be no project implementation, neither would there be the associated impacts on the biophysical and socio-cultural/economic environment.
- The Proposed Option: The implementation of the 132kV Transmission Line from Kindaruma-Mwingi-Garissa is the preferred alternative in improving the performance of the national grid network to cater for the increasing load and demand for power. In a feasibility study undertaken previously, the proposed route was identified as best for the proposed transmission line through an analysis of alternatives taking into account economic and financial analyses, load forecasts, system analyses, as well as environmental and social impacts.
- Alternative Option: Preliminary assessment of the transmission line revealed that approximately 31no dwelling structures, 7no business structures and 1no social site, were to be relocated to pave way for the project. The ESIA and RAP have since established that the line follows relatively best alternative given prevailing ground conditions. However, recommendations are hereby being made to avoid or minimize relocation, resettlement and disturbance, by suggesting rerouting sections of the transmission line that have the potential to save approximately KSh. 39,076,400. The down side of this option is that project implementation would be delayed to allow for new surveys. There is no guarantee that the recommended re-routing would yield the benefits as stated.
- Mitigation for the Proposed Option: In view of the fact that this study identifies environmental and social impacts associated with the project as proposed, mitigation measures, including best environmental management practices have been recommended in this Report. When diligently implemented will help to protect the environment of the affected project area.

Environmental Management and Monitoring

Following the desk studies, field investigations and public consultations undertaken in this study, an Environmental and Social Management Plan (ESMP) has subsequently been developed. The responsibility for the incorporation of mitigation measures for the project implementation lies with

the KPLC Environment Unit, who must ensure that the Contractor implements all specified mitigation measures. In order for the Contractor to carry out environmental management activities during construction, the Contractor should draw up an environmental management plan of his own to show how he will address the mitigation measures during the construction period. The Supervising Engineer is responsible for assessing the Contractor's environmental management plan.

Recommendations and Conclusions

As a result of the ESIA scoping, potentially significant environmental and social impacts have been identified including the need for land acquisition and resettlement.

Avoidance of negative environmental impacts should be the Proponent's priority. Impacts can be avoided completely by a "no-project" alternative, but it should be recognized that even existing transmission lines have impacts on their surrounding environment; these impacts can increase over time with economic growth and development, however their effect on the environment may be reduced by maintenance, rehabilitation, design and construction actions.

Additional surveys required include a cultural heritage impact assessment survey in the project area by NMK; and an aerial survey by KCAA of the proposed transmission line route in order to ascertain that it will not create an obstruction to flights into airstrips in the vicinity.

The effective implementation of the Environmental Management Plan of the project will require capacity and awareness building. While the Proponent must ensure that capacity and awareness building, mitigation measures and monitoring concerns are implemented, actual training activities should be the overall responsibility of the Environment Unit, who may have to commission external consultants to carry out the training component.

1.0 INTRODUCTION

1.1 BACKGROUND

Kenya Power and Lighting Company Limited (KPLC), also referred to as the Proponent, is a limited liability company responsible for the transmission, distribution and retail of electricity throughout Kenya. The Proponent owns and operates the national transmission and distribution grid, and as at June 2009 was retailing electricity to approximately 1,262,309 customers throughout the nation. The Proponent proposes to construct and operate approximately 224 Km of single circuit 132 kV transmission line between Kindaruma Power Station and Garissa town, comprising the following:

- 132 kV line (Wolf) Kindaruma - Mwingi, 32 km
- 132 kV line (Wolf) Mwingi - Garissa, 192 km

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The Government of Kenya plans to increase access to electricity in Kenya tenfold from the current 4% in the rural areas to about 40% by 2020. To do this, the transmission lines network is being considered for upgrading and with it the communication system required for line protection and management purposes.

The generating system in Kenya consists of hydropower as well as thermal power plants, in total 1,197 MW installed capacity. The largest power plant is Gitaru hydropower plant with an installed capacity at 225 MW (as at the end of FY 2007). The transmission system voltage as of June 2007 consisted of 1,323 km 220 kV and 2,122 km 132 kV. Almost all the 220 kV and 132 KV lines are single circuit lines with the conductor Goat at 220 kV and Wolf or Lynx for more than 50 % of the 132 kV lines. Kenya is today interconnected with Uganda through a 132 kV double circuit line. (Norconsult AS, August 2009).

The KPLC least cost power development plan identified various 132 KV developments for improving the performance of the national grid network to cater for the increasing load growth and meet the objectives of 2030. To meet this objective KPLC intends to construct a single circuit 132KV transmission line from Kindaruma through Mwingi and Garissa. The proposed transmission line offers an opportunity to expand the dedicated telecommunications network so as to offer enhanced protection of the lines and upgrade the communication system. (Norconsult AS, August 2009)

1.1.1 Institutional Arrangements

Kenya's Power Sector falls under the ministry of Energy, which offers the general oversight and policy direction. The Kenyan interconnected power transmission and distribution network is owned and operated by KPLC. The Energy Regulatory Commission (ERC) is an independent body responsible for the Regulatory function of the energy sector. The Kenya Electricity Generation Company Limited (KenGen) provides 85% of the electricity generated in Kenya.

KPLC is responsible for electricity transmission, distribution and supply to customers. KPLC purchases bulk power through power purchase agreements with KenGen, Independent Power Producers (IPPs) and the Uganda Electricity Transmission Company (UETCL). The interconnected system has an installed capacity of 1310MW comprising 737MW hydro, 115MW geothermal. 0.4 MW wind and 443 MW thermal and 30MW non-firm import from Uganda.

The effective capacity or the interconnected system is about 1,134MW; while the highest peak attained to date is 1071MW. KenGen has an installed interconnected capacity of 1,006MW while the IPPs have 295MW. The Contract with UETCL is for purchase of 30MW on a non-firm basis. Seven isolated mini-grids are supplied by small Power plants with a total of 9.4MW. Consumption in the year ending June 30, 2008 was 6.385 Gwh. (Norconsult AS, August 2009)

1.1.1.1 KPLC's Environmental Unit

The Proponent has a Safety, Health and Environment (SHE) Department within its organisation, which has within its structure the Environmental Action, Resettlement Action and Health and Safety Committees.

Mandates:

- Prevent work related injuries and illnesses
- Protect equipments from damage
- Promote environmental conservation
- Comply with relevant requirements

Mission:

- To prevent work related injuries, illnesses and damage to equipment; to conserve the environment; and ensure compliance with relevant requirements.

Core values:

- Safety conscious
- Customer focus
- Results driven
- Innovation
- Professionalism
- Teamwork

Vision:

- To attain a world class safe & healthy work environment for all.

1.1.1.2 Electricity Transmission Company of Kenya (KETRACO)

The earmarked project is owned by the Government of Kenya through the Electricity Transmission Company of Kenya (KETRACO) and will be operated and maintained by The Kenya Power and Lighting

Company. KETRACO & KPLC have signed a MOU whereby KPLC offers technical expertise to KETRACO projects.

As the project involves land acquisition, there will be a component of resettlement and hence a need to compensate affected people for the loss of their land and improvements to the land at a set rate. In terms of compensation and resettlement, the overall responsibility, lies with the project sponsor - the Government of Kenya. The Ministry of Lands, Housing and Urban Development, notably the Chief Government Valuer, is a key player whose responsibilities will be guiding the valuation and ascertaining the compensation rates. The Commissioner for lands in collaboration with the District Land Boards, and Land Tribunal will closely participate in the Resettlement Action Plan process and ensure timely execution of the whole process.

1.2 ESIA STUDY

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

Norken (I) Ltd, also referred to as the *Consultant*, has been contracted by KPLC to carry out an Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the proposed 132kV transmission line. The goal of this assignment is to ensure that any potentially adverse environmental and social impacts can be minimized to the extent feasible, and the positive impacts can be enhanced. The RAP exercise on the other hand will set out the framework for policies, principles, institutional arrangements, schedules, and other indicative budgets to facilitate any resettlement process that will be necessitated as a result of this project.

The ESIA assignment has been implemented in accordance with the requirements or the Environment Management and Coordination Act (1999) of Kenya and the Environmental Impact Assessment and Audit Regulations of Kenya (2003). The study also incorporates The World Bank Safeguard Policy guidelines.

The Consultant shall seek to obtain approval of this Project Report from the National Environment Management Authority (NEMA). The Terms of Reference for carrying out the ESIA and RAP studies is appended to this report for reference and adoption by NEMA. It provides detailed information on the scope of the studies and the expected outputs. (See Appendix I)

1.2.1 Study Objectives

The broad objective of this assessment was to identify potential environment and social impacts of the project and formulate recommendations to ensure that the proposed development takes into consideration appropriate measures to mitigate/minimise any adverse impacts through all phases of its implementation.

The assessment was undertaken in compliance with the Environmental Management and Coordination Act (EMCA) 1999 and also the Environmental (Impact Assessment and Audit) Regulations under the Kenya Gazette Supplement No. 56 of 13th June, 2003.

The objectives of this ESIA are to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.
- Identify and quantify different categories of project affected people (PAPs) who would require some form of assistance, compensation, rehabilitation or relocation.
- Provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project.
- Verify the adherence and compliance of the World Bank's safeguard policies.

1.2.2 Scope of the Study

The project in its entirety comprises of feasibility studies for the Energy Access Scale-Up Program to include initial system studies of the KPLC transmission system; metering system; previous studies and data collection; and the load forecast. Transmission system planning and an economic and financial analysis was also carried out, as well as cost estimates and justification and the establishment of ranking and performance targets. This study covers the 132kVTransmission Line from Kindaruma-Mwingi-Garissa.

The study has been structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003.

The study also takes into consideration the World Bank Safeguard Policies, specifically: OP 4.01 Environmental Assessment; OP 4.04 Natural Habitats; OP 4.10 Indigenous Peoples; OP 4.11 Physical Resources; OP 4.12 Involuntary Resettlements; OP 4.36 Forests; OP 4.37 Safety of Dams; OP 7.50 International Waterways; and OP 7.60 Projects in Disputed Areas.

1.2.3 Study Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA 1999, the EIA Regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003, and the World Bank Safeguard Policies. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site areas, public consultations with members of the community in the project areas, survey, photography, and discussions with the Proponent.

1.2.4 Study Methodology

Environmental Screening: In screening the Consultant set out to confirm whether or not this project falls within a category that requires EIA prior to commencement. In addition, other considerations during the screening process included a preliminary assessment of the environmental sensitivity of the areas along the proposed transmission line route; this comprised of a desk study involving the analysis of project maps and proposed line route, as well as literature review of previous studies on the proposed project. It was determined that infrastructure development activities (such as the development of the proposed power transmission line) are listed under Schedule 2 of EMCA, 1999 among projects requiring an EIA study. The Proponent has therefore commissioned this study in line with the provisions of EMCA, 1999.

Environmental Scoping: The scoping exercise helped to narrow down the most critical environmental and social issues requiring detailed evaluation. Below are the key activities that were undertaken during the study:

- Consultations with the Proponent and regarding the proposed project details, the site planning and implementation plan,
- Desk review of available documentation on t he project,
- Thorough field investigations along the proposed line route, photography, surveys, informal and discussions with people from the immediate neighbourhood.
- A participatory rapid assessment method using tools including literature review, questionnaires, observation, geographical positioning system device (GPS), and in-depth interviews as well as public consultative meetings were used as follows:
- Sixty one household interviews were conducted along the project corridor and twenty one interviews amongst the end target beneficiaries in Garissa town. It involved eighteen sub-locations spread across six divisions along the project corridor.
- In-depth interviews were held with district heads of departments, provincial administration, NGOs, CBOs and Faith based Organisations.
- Consultative Public Participation in each of the project divisions whose venue included Thaana Nzau (Migwani), Mwingi (Mwingi Central), Ngiluni (Nguni), Madogo Social hall (Bangale and Madogo) and Garissa County Council hall (Garissa central).
- Evaluation of the project setting and baseline conditions;
- Analysis of the potential impacts of the proposed project on the biophysical and socio-cultural/economic environment;
- For the OHS issues, physical assessment of the project site was carried out to understand the baseline conditions such as noise conditions, air pollution status, climatic conditions and the population distribution of the PAP likely to be exposed to OHS aspects. Additionally the proponent was engaged through a questionnaire to understand in greater detail what the key activities of the project would entail vis –a-vis transportation modes to be used, equipment & machinery to be employed, fuel and other chemicals to be used and the number & qualifications/training of project staff. The questionnaire used to engage the proponent is attached (see Appendix section of the report).
- Formulation of appropriate mitigation measures and development of an environmental and social management plan, monitoring plan, and guidelines for capacity building in environmental and social management;

Final ESIA Report: A Project Report was prepared based on the scoping exercise and was submitted to NEMA in compliance with the Environmental Regulations. Likewise, Terms of Reference for undertaking the full ESIA study were submitted to NEMA for approval and adoption. A detailed analysis

of the potential impact and the corresponding recommendations on mitigative measures was thereafter undertaken during the preparation of the final Environmental and Social Impact Assessment Study. This study takes into account all of the findings of the previous assessments undertaken, to include all the consultations that have been carried out with key stakeholders.

1.2.5 Study Team

As required by the Environmental Regulations (2003), this ESIA study was conducted by a NEMA-registered 'Firm of Experts' – Norken Ltd. NEMA Reg. No. 0181. The Consultant's team is comprised of scientists with experience in carrying out environmental studies in the energy sector, and are conversant with the legislative and regulatory requirements pertinent to this assignment. The team had the following professionals:

i. Lead EIA Experts (Environmental Scientists)
ii. Electrical Engineer
iii. Occupational Health and Safety Expert
iv. Ecologist/Natural Resource Expert
v. Sociologist/Socio-Economist.
vi. Surveyor
vii. Land Valuer

2.0 PROJECT DESCRIPTION

The project description discussed here below is based upon information provided by the Proponent and the design engineers.

2.1 GENERAL

The electric power transmission system is often referred to as a grid. Redundant paths and lines are provided so that power can be routed from any generation facility to any customer area through a variety of routes, based on the economics of the transmission path and the cost of power. The redundant paths and lines also allow power flow to be rerouted during planned maintenance and outages due to weather or accidents.

Power transmission occurs via a system of aboveground power lines and towers located between a power plant and a substation. Transmission networks can cover thousands of kilometers and encompass tens of thousands of towers. For long distance transmission, electricity is usually transmitted at voltages between 110 and 1200 kV. Transmission towers or pylons are utilized to suspend high-voltage overhead power lines. These systems usually transmit three-phase electric power (the common method for transmission of high-voltage lines of over 50 kV) and, therefore, are designed to carry three (or multiples of three) conductors.

2.2 PROJECT OBJECTIVES

Power generated by KENGEN, IPPs and other smaller plants is sold to KPLC in bulk under a Power Purchase Agreement for distribution. The current transmission capacity comprises of 1,323 Km of 220 kV and 2,035 Km of 132 kV main transmission lines and also about 600 Km of 66 kV sub-transmission lines. The proposed project is part of the Proponent's energy access scale-up program, which has the following objectives:

- Extending the transmission and distribution lines and installation of new 132/33kV substations; as well as new and reinforced distribution lines with the aim of reducing technical losses and improving voltage conditions, thereby coping with additional demand.
- Increasing access to electricity to 20% by 2010 by accelerating connection rates;
- Voltage upgrading to increase supply capacity and reduce system losses;
- Providing alternative electricity supply paths to increase reliability and improve power quality in the regions.

2.3 PROJECT JUSTIFICATION

Currently electricity is accessible to less than 20% of the total population and approximately 5% of rural population. The Government's goal is to accelerate access rate to 20% of rural population by 2010 and to at least 40% by 2020. To achieve this goal, Government has prepared the Energy Scale Up Program

covering the period 2008 to 2017. This would be approached not only from improvement and expansion of the network, but also on raising the generation to match the demand.

The KPLC customer base is expected to grow by 150,000 connections every year creating an annual demand growth of about 150 MW. The national economic growth has also been on the upward trend - rising from 1.8% in 2003 to 5.8% in 2005. Significant effects of this growth are notable in agriculture, tourism and construction among others with a corresponding increase in power generation that rose from 4,852GWh in 2003 (with sales of 3,801GWh) to 5,195GWh in 2004 (sales of 4,090GWh). Maximum energy demand was projected at 5,641GWh in 2006 and 24,957GWh by the year 2026.

Although the above overview provides a justification for the expansion and improvement of the transmission lines, it is important to note that the environmental and social implications, as outlined under this report, would need to be integrated into the project design.

2.4 DESIGN CONSIDERATIONS

The design criteria as adopted for the conceptual design are initially based on KPLC current practice, based on studies of recently composed specifications and in-situ inspections of existing transmission lines. Main criteria when concluding on the adopted conceptual design has been to ensure that the various line components are designed in a safe, cost effective and reliable manner.

2.4.1 Transmission Line Design (132 kV Lines)

The sub-sections below provide a brief description of the project's material inputs. (The map of the transmission line route is found in Appendix II of this report).

2.4.1.1 Conductors

The conductors recommended for the various sub-project options are Aluminium Conductor Steel Reinforced (ACSR) "Wolf" and "Lynx" conductors which are in accordance with KPLC's standards. The operational performance of the selected conductors, both electrically and mechanically has proven satisfactory under Kenyan conditions. If the detailed line survey for particular sections result in limitations to the right of way resulting in a compact line design, lighter all aluminium alloy conductors (AAAC) will be considered to minimize pole sizes.

2.4.1.2 Overhead Earth Wires (OPGW)

According to KPLC practise, a single overhead shield wire is recommended for 132 kV lines. The wire would provide a 25 degree shielding angle for the line circuit which is considered satisfactory considering the anisokeraunic level in the region ranging from 120 to 180 thunderstorm days per year.

2.4.1.3 Support Structures

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. 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 life time and subsequent poor reliability and very high operational and maintenance costs.

Solid concrete poles are manufactured locally but their reliability is low. The high weight (above 4 tons) of these poles also involves higher transport and erection costs as heavy lifting and erection equipment is required emphasising line sections 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.

2.4.1.4 Conductor Configuration

KPLC current practise is to use a triangle conductor configuration on their single 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.

2.4.1.5 Foundations

Based on the observation of the ground conditions during the line route surveys conventional pad & chimney foundations, and reinforced concrete pad & chimney foundations are recommended by the design engineer. On certain sections where poor soils or submerged conditions are identified a raft type design will 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.

2.4.1.6 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 together 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.

2.4.1.7 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.

2.4.2 Project Activities

- The key activities in putting up the transmission line include digging of four holes, assembling of structures, concrete casting, and stringing of the conductor.
- Erection of the lattice structures (pylons) will involve delivery of complete structures, physical assembly at site and laying using cranes. The steel structures will be assembled on site. They will have rivets and will be bolted. Strong aluminium rollers will be used to hoist the structures and in exceptional situation helicopters can be used.
- The foundations of the lattice structures/pylons will be dug manually then casting concrete are used. The depth will be a minimum of 5m. The depth will be determined after geotechnical study is undertaken.
- Vegetation clearing will be done manually by use of pangas and slashers. Where there are big trees, portable power saw mills(petrol powered) will be used.

- The average height of the line will be between 30-40 m- this will depend on clearance from KCAA.
- Modes and quantity of transport vehicles employed in the project will be approximately 5no lorries and 4no 4x4 vehicles. Maintenance of these vehicles will be done through licensed garages found in the project area. There will be no on-site maintenance of vehicles.
- Powered equipment expected to be used in the construction include power saw mills, and compressor to break had ground(if required).
- The mode of cooling that will be used in transformers will be transformer mineral oil.
- During the operation phase of the project way leaves 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.
- Approximately 10 unskilled labour, five artisans, 2 technicians and three engineers will be employed in the project.

2.4.3 Site Ownership

The proposed transmission line traverses a vast area comprising land owned by various public and private entities. There are a number of land uses along the line route, including sparsely and densely populated settlements along the line route. It is anticipated that the most significant adverse social/socio-economic impact will be the need for compensation and relocation of people affected by the project. The need for a Resettlement Action Plan (RAP) is discussed further in this report.

2.4.4 Proposed Budget

It is estimated that the proposed transmission line project will cost a total of **10 Million US Dollars.**

As is required by the Environmental Regulations (2003), this amount is derived from project-related cost items, to include:

- Lease of land,
- Various operational licenses and permits,
- Professional services,
- Equipment procurement (importation, local procurements, installation costs, etc.),
- Construction (materials and labour),
- Miscellaneous overheads

It is from this project budget amount that NEMA shall determine the appropriate fees for processing of the EIA Licence (i.e. payment of a prescribed fee of 0.05% of total project cost is required for the processing of an EIA license. Other fees are stipulated in the relevant regulation).

It is also estimated that the land to be acquired for the Wayleave will be a corridor measuring 224Kms (224,000 meters) by 30 meters. That sums to 672 hectares (6,720,000 square meters) or 1,661 acres. Out of the total Wayleave distance approximately 6 kilometres will be within an urban setup while the rest will be through agricultural land. The total cost of compensation is estimated to be 114 M which includes the aspects of injurious affection, severance, and disturbance at 15% of the market value.

3.0 POLICY LEGAL AND REGULATORY FRAMEWORK

3.1 ENVIRONMENTAL PROTECTION AND MANAGEMENT AT THE NATIONAL LEVEL

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

An EIA is a legal requirement in Kenya for all development projects. The Environmental Management and Co-ordination Act 1999, is the legislation that governs EIA studies. This project falls under the Second Schedule that lists the type of projects that are required to undergo EIA studies in accordance with section 58 (1- 4) of the Act. Projects under the Second Schedule comprise those considered to pose potentially negative environmental impacts.

Kenyan law has made provisions for the establishment of the National Environment Management Authority (NEMA), which has the statutory mandate to supervise and co-ordinate all environmental activities. Policies and legislation highlighting the legal and administrative requirements pertinent to this study are presented in section 3.2below.

3.2 NATIONAL POLICY AND LEGAL FRAMEWORK

3.2.1 Policy

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

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

3.2.2 Legal Framework

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

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

Some of the key national laws that govern the management of environmental resources in the country are hereby discussed however it is worth noting that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act 1999 prevails.

3.2.2.1 The Environment Management and Co-ordination Act, 1999

Provides for the establishment of appropriate legal and institutional framework for the management of the environment and related matters. Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue an EIA license as appropriate. The approval process time frame for Project Reports is 45 days and for full EIA Study is 90 days.

This Project falls within Schedule 2 of EMCA 1999 and therefore requires an EIA. The Proponent has commissioned the environmental and social impact assessment study in compliance with the Act. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA, prior to being issued an EIA licence.

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

The Regulation provides the guidelines that have been established to govern the conduct of environmental assessments and environmental audits in Kenya. The guidelines require that the EIA study be conducted in accordance with the issues and general guidelines spelt out in the Second and Third schedules. 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.

This Report complies with the requirements of the Environmental Regulations in the coverage of environmental issues, project details, impacts, legislation, mitigation measures, management plans and procedures. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA.

3.2.2.3 The Occupational Health and Safety Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapours, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.
- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.
- Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.
- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

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

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

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

These Regulations determine that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

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

These regulations also relate noise to its vibration effects and seek to ensure no harmful vibrations are caused by controlling the level of noise. Any person(s) intending to undertake activities in which noise suspected to be injurious or endangers the comfort, repose, health or safety of others and the environment must make an application to NEMA and acquire a license subject to payment of requisite fees and meeting the license conditions. Failure to comply with these regulations attracts a fine of KES 350,000 or 18 months jail term or both.

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

3.2.2.5 Draft Environmental Management and Coordination (Air Quality) Regulations, 2008

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

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

3.2.2.6 The Water Act 2002

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 water permit system.

The project shall have no adverse impact on the local water supply during operations as there are no requirements for the installation of water supply and sanitation facilities on-site. Observation of the requirements of the act shall be observed by the Proponent especially during the construction phase.

3.2.2.7 The Lakes and Rivers Act Chapter 409 Laws of Kenya

This Act provides for protection of river, lakes and associated flora and fauna. The provisions of this Act may be applied in the management of the project.

The proposed project traverses through streams and rivers (R. Kithyoko, R. Nzuli, R. Tyaa, R. Ndiani, R. Tula, and R. Arer) and the requirements of this Act shall be observed by the Proponent to ensure protection of such water bodies and associated flora and fauna.

3.2.2.8 The Wildlife Conservation and Management Act, Cap 376

This Act provides for the protection, conservation and management of wildlife in Kenya. The Act deals with areas declared as National Parks, under the Act. The Act controls activities within the park, which may lead to the disturbance of animals. Unauthorized entry, residence, burning, damage to objects of scientific interest, introduction of plants and animals and damage to structure are prohibited. The provisions of this Act should be applied in the management of the project.

The Proponent shall implement the proposed measures in this document towards protection and conservation of wildlife in the project areas.

3.2.2.9 The Public Health Act (Cap. 242)

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

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

3.2.2.10 Waste Management Regulations (2006)

The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source.

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

3.2.2.11 Physical Planning Act (Cap286)

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

The site layout plan appended to this report shows the proposed route for the transmission line. The Proponent shall secure all mandatory approvals and permits as required by the law.

3.2.2.12 Occupiers Liability Act (Cap. 34)

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

The Proponent shall acquire Wayleave along the transmission line corridor. The Proponent shall endeavour to ensure that the management of health and safety issues is of high priority during the operational phase of the project.

3.2.2.13 Way Leaves Act (Cap. 292)

The Act provides for certain undertakings to be constructed e.g. transmission lines, pipelines, canals, pathways etc., through, over or under any lands. This project is under the provision of the Act. Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity.

In accordance with the Act (section 4), notice will be given before carrying out works with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per section.

3.2.2.14 Land Acquisition Act (Cap. 295)

This Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected.

Full compensation for any damage resulting from the entry onto land to things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

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

The Proponent has undertaken a survey and developed a Resettlement Action Plan (RAP) for those who will be affected by the proposed project. The Proponent shall adhere to the requirements of the Act in the implementation of land acquisition.

3.2.2.15 Public Roads and Roads of Access Act (Cap. 399)

Sections 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent land owners seeking permission to construct the respective roads.

During the construction phase of the project, access to the site areas will be required for the construction vehicles. Where existing roads do not exist, the Proponent shall seek permission from the appropriate authorities to create such access during the construction phase.

3.2.2.16 The Limitations of Actions Act (Cap. 22)

This Act provides for recognition of squatters and the conditions under which they would have rights for compensation for loss of land. If squatters have been in occupation of private land for over twelve (12)

years, then they would have acquired rights as adverse possessors of that land as provided under the limitation of Actions Act, section 7.

The Proponent has undertaken a survey and developed a Resettlement Action Plan (RAP) for those who will be affected by the proposed project. The Proponent shall adhere to the requirements of the Act in dealing with any squatters that will be displaced by the proposed project.

3.2.2.17 The Registered Land Act Chapter 300 Laws of Kenya:

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

The project traverses some areas with Registered Land (e.g. Kyuso). The Proponent shall comply with the provisions of the Act in the acquisition of Registered Land.

3.2.2.18 The Land Adjudication Act Chapter 95 Laws of Kenya

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

The Proponent has undertaken a survey and commissioned a Resettlement Action Plan (RAP) study which complies with the provisions of the Act. Public consultations have also been undertaken extensively in the affected project areas.

3.2.2.19 The Standards Act Cap 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connexion with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

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

3.2.2.20 The Antiquities and Monuments Act, 1983 Cap 215

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

The report includes consultations held with the National Museums of Kenya to identify physical cultural resources that may be impacted by the implementation of the proposed project as well as the appropriate mitigation measures to protect such resources. (Refer to 4.5.3)

3.2.2.21 The Civil Aviation Act, Cap 394

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

The Proponent shall comply with the provisions of the Act in seeking authorisation from KCAA for the installation of the lattice steel self-supporting towers along the transmission line route.

3.2.2.22 The Environmental Management and Co-Ordination (Conservation of Biological Diversity And Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006

The Act states that no person shall not engage in any activity that may have an adverse impact on any ecosystem, lead to the introduction of any exotic species, or lead to unsustainable use of natural resources, without an Environmental Impact Assessment Licence issued by the Authority under the Act.

The Proponent has commissioned this environmental assessment study and seeks to obtain an EIA Licence from the Authority (NEMA) in compliance with the Act; the environmental management plan included in this report provides guidelines for the mitigation of potentially adverse impacts on natural resources.

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

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

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

3.2.2.24 Environmental Management and Coordination, Fossil Fuel Emission Control Regulation 2006

This Act deals with internal combustion engines, their emission standards, inspections etc.

The Proponent shall comply with the provisions of this Act. The environmental management plan included in this report provides guidelines on the management of air emissions from the combustion of petroleum products used.

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

This Act applies to all wetlands in Kenya whether occurring in private or public land. It contains provisions for the utilisation of wetland resources in a sustainable manner compatible with the continued presence of wetlands and their hydrological ,ecological, social and economic functions and services.

The project traverses several rivers and streams (e.g. R. Kithyoko, R. Nzuli, R. Tyaa, R. Ndiani, R. Tula, and R. Arer). The Proponent shall comply with the provisions of the Act in protecting wetlands, preventing and controlling pollution and siltation in rivers.

3.2.2.26 Local Authority Act (Cap. 265)

Under this act, the Local Authority is the custodian of Trust Land and has to authorize various sites where the lines could be passing.

The Proponent has commissioned a RAP study to identify such Trust Lands that may be affected by the construction of the transmission line. The Proponent shall comply with the provisions of the Act in seeking the required authorisations from the Local Authorities as stipulated in the Act.

3.2.2.27 Penal Code Act (Cap.63)

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

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

3.2.2.28 Energy Act, 2006

The Act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any or all of these purposes. The Act establishes an energy commission, which is expected to become the main policy maker and enforcer in the energy sector. This commission among other things shall be responsible for issuing all the different licenses in the energy sector.

3.2.3 Licences, Penalties & Offences

Table 1: Offences and Penalties for Non-Compliance with Provisions under Environmental Legislation

Item	Offences	Penalties for an offence
General offence	Offence against a provision of the Act, where no penalty is specifically provided for.	Fine of not more than KSh 350,000. Imprisonment for not more than 18 months. Or both such fine and imprisonment.

Item	Offences	Penalties for an offence
Inspection	Offences in respect of inspection, including: Hindering or obstructing an environmental inspector in his duties;	Fine of not more than KSh 500,000. Imprisonment for not more than 2 years. Or both such fine and imprisonment.
EIA	Failure to submit project report contrary to the requirements of Section 58 of the Act. Failure to prepare an EIA in accordance with the requirements of the Act. Knowingly give false information in an EIA report.	Fine of not more than KSh 2,000,000. Imprisonment for not more than 2 years. Or both such fine and imprisonment.
Records	Failure to keep records required under the Act. Fraudulently or knowingly altering records. Fraudulently or knowingly making false statements in any records required under the Act.	Fine of not more than KSh 500,000. Imprisonment for not more than 18 months. Or both such fine and imprisonment.
Standards	Violation of any environmental standard established under the Act; Contravenes any measure prescribed under the Act; Uses the environment or natural resources in a wasteful and destructive manner contrary to measures prescribed under the Act.	Fine of not more than KSh 500,000. Imprisonment for not more than 2 years. Or both such fine and imprisonment.

3.3 ADMINISTRATIVE FRAMEWORK

3.3.1 The National Environment Council

The National Environmental Council (the Council) is responsible for policy formulation and directions for the purposes of the Act. The Council also sets national goals and objectives, and determines policies and priorities for the protection of the environment.

3.3.2 The National Environment Management Authority

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment.

3.3.3 The Standards and Enforcement Review Committee

In addition to NEMA, EMCA 1999 provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC). A work plan was set up by SERC to include committees to draw up standards; these include the following:

- Water Quality Regulations
- Waste Management Regulations
- Controlled Substances Regulations
- Conservation of Biological Diversity
- Noise Regulations
- [Draft] Air Pollution Regulations

3.3.4 The Provincial and District Environment Committees

The Provincial and District Environmental Committees also contribute to decentralised environmental management and enable the participation of local communities. These environmental committees consist of the following:

- Representatives from all the ministries;
- Representatives from local authorities within the province/district;
- Two representatives from NGOs involved in environmental management in the
- Province/district;
- A representative of each regional development authority in the province/ district.

3.3.5 The Public Complaints Committee

The Act (EMCA) has also established a Public Complaints Committee, which provides the administrative mechanism for addressing environmental harm. The Committee has the mandate to investigate complaints relating to environmental damage and degradation. Its members include representatives from the Law Society of Kenya, NGOs and the business community.

3.4 INTERNATIONAL ENVIRONMENTAL GUIDELINES

Kenya has ratified or acceded to numerous International treaties and conventions, as described below:

- 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 on the basis of periodic scientific and technological assessments, 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 stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system.
- Kyoto Protocol: Drawn up in 1997, pursuant to the objectives of the United Nations (UN) Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990.

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

3.5 WORLD BANK'S SAFEGUARD POLICIES

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

3.5.1 Safeguard Policies Triggered by the Proposed Transmission Line Project

3.5.1.1 OP/BP 4.01 - Environmental Assessment

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment. Its purpose is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

Table 2: OP/BP 4.01 Environmental Assessment (January 1999)

Objectives	Operational Principles
To help ensure the environmental and social soundness and sustainability of investment projects.	1. Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken proportional to potential risks and to direct, and, as relevant, indirect, cumulative, and associated impacts. Use sectoral or regional environmental assessment when appropriate.

Objectives	Operational Principles
To support integration of environmental and social aspects of projects into the decision making process.	2. Assess potential impacts of the proposed project on physical, biological, socio-economic and physical cultural resources, including transboundary and global concerns, and potential impacts on human health and safety.
	3. Assess the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, and confirm that they provide that the cooperating government does not finance project activities that would contravene such international obligations.
	4. Provide for assessment of feasible investment, technical, and siting alternatives, including the "no action" alternative, potential impacts, feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training and monitoring requirements associated with them.
	5. Where applicable to the type of project being supported, normally apply the Pollution Prevention and Abatement Handbook (PPAH). Justify deviations when alternatives to measures set forth in the PPAH are selected.
	6. Prevent and, where not possible to prevent, at least minimize, or compensate for adverse project impacts and enhance positive impacts through environmental management and planning that includes the proposed mitigation measures, monitoring, institutional capacity development and training measures, an implementation schedule, and cost estimates.
	7. Involve stakeholders, including project-affected groups and local nongovernmental organizations, as early as possible, in the preparation process and ensure that their views and concerns are made known to decision makers and taken into account. Continue consultations throughout project implementation as necessary to address EA-related issues that affect them.
	8. Use independent expertise in the preparation of EA where appropriate. Use independent advisory panels during preparation and implementation of projects that are highly risky or contentious or that involve serious and multi-dimensional environmental and/or social concerns.
	9. Provide measures to link the environmental assessment process and findings with studies of economic, financial, institutional, social and technical analyses of a proposed project.
	10. Provide for application of the principles in this Table to subprojects under investment and financial intermediary activities.
	11. Disclose draft EA in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders.

The proposed project triggers this policy because although there is justification of the proposed transmission line (as well as its associated infrastructure), there are environmental and social issues associated with the construction and operation of the proposed project as discussed in chapter 5 of this report. OP 4.01 requires an environmental assessment (EA) of projects proposed for WB financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making. In this regard, a comprehensive environmental and social impact assessment study with an exhaustive

public participation process is being undertaken by the Proponent to establish a detailed environmental management plan that will provide a guideline for the entire project cycle (construction through to decommissioning).

3.5.1.2 OP 4.12 - Involuntary Resettlement

This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

Table 3: OP/BP 4.12 Involuntary Resettlement (December 2001)

Objectives	Operational Principles
To avoid or minimize involuntary resettlement and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	1. Assess all viable alternative project designs to avoid, where feasible, or minimize involuntary resettlement.
	2. Through census and socio-economic surveys of the affected population, identify, assess, and address the potential economic and social impacts of the project that are caused by involuntary taking of land (e.g., relocation or loss of shelter, loss of assets or access to assets, loss of income sources or means of livelihood, whether or not the affected person must move to another location) or involuntary restriction of access to legally designated parks and protected areas.
	3. Identify and address impacts also if they result from other activities that are (a) directly and significantly related to the proposed project, (b) necessary to achieve its objectives, and (c) carried out or planned to be carried out contemporaneously with the project.
	4. Consult project-affected persons, host communities and local nongovernmental organizations, as appropriate. Provide them opportunities to participate in the planning, implementation, and monitoring of the resettlement program, especially in the process of developing and implementing the procedures for determining eligibility for compensation benefits and development assistance (as documented in a resettlement plan), and for establishing appropriate and accessible grievance mechanisms. Pay particular attention to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, Indigenous Peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.
	5. Inform displaced persons of their rights, consult them on options, and provide them with technically and economically feasible resettlement alternatives and needed assistance, including (a) prompt compensation at full replacement cost for loss of assets attributable to the project; (b) if there is relocation, assistance during relocation, and residential housing, or housing sites, or agricultural sites of equivalent productive potential, as required; (c) transitional support and development assistance, such as land preparation, credit facilities, training or job opportunities as required, in addition to compensation measures; (d) cash compensation for land when

Objectives	Operational Principles
	the impact of land acquisition on livelihoods is minor; and (e) provision of civic infrastructure and community services as required.
	6. Give preference to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
	7. For those without formal legal rights to lands or claims to such land that could be recognized under the laws of the country, provide resettlement assistance in lieu of compensation for land to help improve or at least restore their livelihoods.
	8. Disclose draft resettlement plans, including documentation of the consultation process, in a timely manner, before appraisal formally begins, in an accessible place and in a form and language that are understandable to key stakeholders.
	9. Apply the principles described in the involuntary resettlement section of this Table, as applicable and relevant, to subprojects requiring land acquisition.
	10. Design, document, and disclose before appraisal of projects involving involuntary restriction of access to legally designated parks and protected areas, a participatory process for: (a) preparing and implementing project components; (b) establishing eligibility criteria; (c) agreeing on mitigation measures that help improve or restore livelihoods in a manner that maintains the sustainability of the park or protected area; (d) resolving conflicts; and (e) monitoring implementation.
	11. Implement all relevant resettlement plans before project completion and provide resettlement entitlements before displacement or restriction of access. For projects involving restrictions of access, impose the restrictions in accordance with the timetable in the plan of actions.
	12. Assess whether the objectives of the resettlement instrument have been achieved, upon completion of the project, taking account of the baseline conditions and the results of resettlement monitoring.

The project triggers this policy in that it shall require [involuntary] acquisition of land and restrictions of access to legally protected areas within the transmission line Wayleave. It is estimated that the land to be acquired for the Wayleave will be a corridor measuring 224Kms (224,000 meters) by 30 meters. Out of the total Wayleave distance approximately 6 kilometres will be within an urban setup while the rest will be through agricultural/pastoral land. From the field survey conducted, it is expected that the Project shall mostly affect through construction of the transmission line, 3no districts, 6no divisions, 8no locations and 11no sub-locations. In effect, a total of 239no households will lose land, 89no will lose dwellings and/or business structures, 23no will lose crops, and 9no will loss businesses.

(Please refer to Appendix V for more information on all the World Bank Safeguard Policies)

4.0 DESCRIPTION OF BASELINE ENVIRONMENT

4.1 PROJECT SETTING

The proposed Kindaruma-Mwingi-Garissa Power Transmission line will serve the greater districts of Mwingi in Eastern province, Tana River in Coast province, and Garissa in North eastern province and beyond. The information on the project setting below is based on observations made during earlier field surveys:

4.1.1 132 kV-line Kindaruma – Mwingi, Length 32 km

This section of the proposed line of route starts at Kindaruma and heads to Mwingi on the outskirts of the town. The section has very few settlements that include rural villages which rely on subsistence farming and is characterized by crop failure and abandoned *shambas*. Charcoal burning is widespread. The dominant vegetation is dry bush with trees the most widespread vegetation is semi-arid deciduous thicket and bushland, particularly *Acacia/Commiphora.* The dominant soil groups are alfisols, ultisols, oxisols, and lithic soils.

As the proposed line nears Mwingi town it passes through a hilly terrain and then heads downwards to a dry river valley just next to the last bridge crossing near the Mwingi town. From Kindaruma sub-station (S/S) the line crosses the seasonally dry Kithyoko River near the Kwakyumbu Grazing Area, and also the seasonally dry Nzuli River. After the river crossing the route follows parallel to the river for approximately 2 km up to a sharp bend where it turns to the south east. From there it follows various tracks and roads down to the village Syailungu. From there it follows the main road further via Malembo, Kwamasi and Kwakwanya, and further across a saddle point at the southern end of the Klormo ridge, from where it turns west for the last 2 km up to Mwingi S/S which is proposed located 3 km south east of Mwingi near road C94 and river Tyaa.

(Please see the Proposed Transmission Line Route in Map 1overleaf)

Map 1: Transmission Line Route: Kindaruma-Mwingi-Garissa

4.1.2 132 kV-line Mwingi - Garissa, 192 km.

The line starts from Mwingi area approximately 2 km south west of Mwingi town.

From Mwingi S/S the line goes north east along the main road to Mwingi, crossing Tyaa River and the main road and up to angle point EW1 880 m from the S/S. The vegetation and soil condition along this section is generally bush, with black cotton soil and sand near the river, and red loam soil on the northern side of the road. There are no settlements within or close to the line.

In EW1 the line turns a little more east for 2.3 km up to EW2. The vegetation is mixed bush and cultivations. The soil conditions are red loam and loam soil partly containing gravel. The landscape is sloping undulating, and there are visible rock outcrops in the area near EW2. There are scattered settlements along the line, but none observed within the line corridor.

In EW2 the line turns due east towards EW3 6.7 km away, and crosses Road C93. The area along the road is relatively densely settled. Also along this section there are visible rock formations. The landscape is undulating, sparsely settled with bush and cultivations of maize and mango trees, more or less evenly distributed along the section. The line is crossing at least one mango plantation with trees less than 2 m high. The soil conditions are red loam, and there are visible rocks in the area.

Picture 1: **Eastwards view towards EW3, behind right hand base of hill**

In EW3 the line turns left towards north east for the next 10 km up to EW4. On this section the terrain is a little more undulating with more visible rock than previously observed. There are scattered settlements all along the section, and after app.3 km from EW3 there is rock chipping where it seems to be a certain activity. About 2 km before EW4 the line passes the village Mutuangombe. Here the settlements and cultivations are denser, but no houses seem to be affected.

In EW4 the line turns more easterly for 4.6 km up to EW5. This point is in the vicinity of an old market place with some shops along the old road before it was altered. The area is flat with open bush on loam soil partly mixed with coarse sand. No visible rock. There are a few settlements in the area around EW4, but along the line there are few settlements before EW5 and the area around Enzui School.

From EW5 to EW6, a distance of 5.9 km the landscape is undulating with partly open bush and a few cultivations, mainly corn. The soil is loam and red loam, mixed with black cotton along Ndiani River. There are also visible rocks a few places . There are few settlements along the line.

EW6 to EW8, for 6,3 km is sparsely settled, though the line passes not far from one primary- and secondary school at the middle of the section. Except for the first 2 km from EW6, the land is almost flat with open bush and cultivations. The soil is generally red loam with mostly black cotton along the middle third. At either end rock can be expected.

From EW8 to EW9, Kalanga Corner, for 2.7 km, the soil is more reddish and rocky. The land is slightly sloping, except for a few minor hills near the Kalanga hill. The vegetation is open bush and cultivations, with some Baobab trees near Kalanga Corner.

Picture 2: **Baobab tree at Kalanga Corner.**

From EW9 to EW10, for 8.8 km, there are 2 open settlements, Kakunike and Ngiluni at either end of the section. At Kakunike there are two houses made of bricks and mud that are located close to the proposed line. At Ngiluni another homestead is passed at a distance of approx. 40 m. The land is mainly flat or slightly sloping, but a little undulating in the Kakunike end. There is generally open bush with just a few cultivations. The soil is sandy red loam at either end, with appearing rock near EW9, and mixed with more black cotton-like soil at the middle of the section.

EW10 to EW11, 6.4 km, is passing through a flat, bushy landscape of sandy red loam with gravel, and with a few settlements and cultivations. At EW11, close to the main road, there are a few houses and shops, a church, and a school on the opposite side of the road.

EW11 to EW12, 4.8 km, is flat and bushy, sparsely settled and cultivated. The ground is sandy reddish soil with appearing rock near Ukasi.

EW12 to EW13, 4.3 km, is flat with open bush and a few settlements and cultivations. The ground is sandy red loam soil, but at the middle of the section, near the river, there is some black cotton. Rock appears around Ukasi.

EW13 to EW14, 3.7 km, is slightly sloping, but practically flat. The ground is sandy red loam, bushy and sparsely settled along the line. At EW13 there are a couple of settlements between the road and line, and at EW14 the settlements and cultivations are all beyond the line.

The last 33km of the western section of the line form EW14 through -15, -16, -17 and -18 up to EW19 have no permanent settlements, there are relatively dense bush most of way. The terrain is flat, and, the ground conditions varies from red loam soil at the western end and changes through red soil to murram/lateritic at the eastern end where several old and new murram pits have been observed close to the road. Minor sections with black cotton soil may be found along gullies and old wetland areas. Visible rock has not been observed.

There are a few Borana settlements along the road from EW17, eastwards towards a local waterhole, and along the road to the radio station on Katumba hill. These Boranan camps are normally located within 150- 200 m from the road, and the huts are normally built on framework of wooden sticks covered with straw, mud and rags, and the camps may consist of up to 50 huts. A few of these huts may be affected by the line.

Picture 3: **Part of a Borana Camp**

At EW19, the eastern section starts. The terrain is generally flat, with dense bushy vegetation most of the way. The line follows the road in parallel within a distance of 100 m on straight lines, and will deviate plus and minus along road curves. Due to the population around Bangali market, the line here deviates up to one km to the north. At Bangali the area is flat, and a lot of murram pits along the road shows that there is red soil / murram all the way. There are no permanent settlements, but a few Borana settlements along the road. The land is bushy, with relatively rough and dense bush.

Picture 4: **Typical view along the eastern section.**

From EE13 at Bangali and the next 32 km up to angle point EE7, 2 km east of Tula River, the line follows the road on the southern side. The river crossing is laid with minimum distance to the bridge in order to secure a safest possible crossing. During the survey in March 2009 the river was dry, but when flooded the width in the actual area is up to 600 m.

Between Bangali and the River Arer River there is generally black cotton soil, partly mixed with gravel. The bush is rough and dense, but a little more open near Bangali. The area is flat with no permanent settlements, but a few Borana settlements. From Arer River and up to EE4 there is again red soil /murram. The land is flat, the bush is dense and no settlements on the northern side if the road.

Up to Garissa the land is much eroded. The soil is mainly murram/lateritic soil, with open bush, shrub, and scattered cultivations near the settled areas. At EE4, there is mostly coarse sand. Erosion has made the landscape appear hilly and the vegetation comprises scattered bushes and shrubs. The line then passes Madogo secondary school.

Picture 5: **View of Garissa area**

4.2 SUMMARY DESCRIPTION OF BIOPHYSICAL ENVIRONMENT

Refer to Appendix VII to see a Map showing the Administrative Boundaries of the project area.

4.2.1 Administrative Locations

4.2.1.1 Mwingi

Mwingi District borders Kitui District to the south, Machakos District to the west, Mbeere and Meru South Districts to the north and Tana River District to the east. The District lies to between latitudes 0° 03’ and 1° 12’ south and longitudes 37° 47’ and 38° 57’ The District covers an area of 10,030.30 km². The district is divided into 9 divisions. These are Central, Migwani, Kyuso, Mumoni, Nguni, Ngomeni, Nuu, Mui and Tseikuru. Mwingi has 38 locations and one 127 sub locations. (GoK)

4.2.1.2 Tana River

The greater Tana River District is in Coast Province and was divided recently into two districts of Tana River and Tana Delta. Tana River District is one of the thirteen districts that constitute Coast province. The district borders Mutomo District to the West, Mwingi District to the Northwest, Garissa

and Fafi to the North East, Ijara District to the East, Garbatulla District to the North and Tana Delta District to the South. The district lies between latitudes 000'53" and 200'41'' South and longitudes 38025'43" and 40010'29" East.

4.2.1.3 Garissa

Garissa District is one of the four districts of North Eastern Province. It boarders Isiolo District to the northwest, Wajir to the north, Republic of Somalia to the East, Tana river District River District to the west and Ijara District to the south. The district is located between latitude 0º 58' north and 1º 30' south and longitudes 38º 34' east and 41º 05' west. The district covers an area of 33,620 square kilometers and is administratively divided into 11 divisions, 42 locations and 60 sub locations. The district has three constituencies, namely Dujis, Lagdera and Fafi. The constituencies are vast and sparsely populated.

4.2.2 Climate

4.2.2.1 Mwingi

Climate of the district is hot and dry for the greater part of the year. The maximum mean annual temperature ranges between 26° C and 34° C. The minimum mean annual temperatures in the district vary between 14° C and 22° C. The district has two rainy seasons, i.e. March to May (long rains) and October to December (short rains). Rainfall ranges between 400 mm and 800 mm per year, but is erratic. The short rains are more reliable than the long rains.

4.2.2.2 Tana River

The district experiences a bimodal type of rainfall pattern and is often erratic. The mean annual rainfall ranges between 220 and 500mm. However, the southern part receives annual rainfall of between 750 and 1250mm. The district is generally hot and dry with temperatures ranging between 21 and 38ºC.

4.2.2.3 Garissa

The district receives rain in two seasons, these are the long rains season between March and April and the short rain season between October and December. The rainfall is unreliable with some torrential rains which in many cases are detrimental to vegetation growth. The temperatures in the district are high ranging from 20ºC from to 38ºC.

4.2.2.4 Impact on Project

The climate in the project areas as described above is not expected to create adverse impacts during the construction phase, or on the performance of the project upon commissioning.

4.2.3 Physiography

4.2.3.1 Mwingi

Mwingi District is generally plain with a few inserbergs in Mumoni, Nuu and Migwani Divisions. The highest point of the district is Mumoni Hill, with an altitude of 1,747 meters above sea level. The landscape is generally flat, with a plain that gently rolls down towards the east and northeast where

altitudes are as low as 400m. The highlands namely Migwani, Mumoni, Central and Mui Divisions receive more rainfall compared to the lowlands Nguni, Kyuso and Tseikuru Divisions. The drier areas experience severe droughts, which have led to livestock deaths and food shortages.

4.2.3.2 Tana River

The major physical feature in Tana River District is an undulating plain which is interrupted in a few places by low hills. The land in Tana River district generally slopes south east wards with an attitude that ranges between 0m along the coastline to 200m above sea level on the hills. The river Tana delta traverses the district from Tharaka Nithi district in the north to the Indian ocean in the south, as the river traverses the expansive coastal hinterland, it starts to meander in its lower course forming a large basin whose width ranges between two and forty two kilometers. Towards its mouth between Mnazini area and the Indian Ocean, the river creates an extensive delta which is characterized by wetlands. The extensive Tana delta is a natural habitat an enormously diverse fauna and flora.

4.2.3.3 Garissa

Garissa is low lying with altitudes ranging between 70m and 400m above sea level. The River Tana, which runs along the western boundary of the district, is the only permanent river. Though it is not confined within the district's boundaries, the river has tremendous influence over the climate, settlement patterns, and economic activities within the district, as it forms the single most important source of water for the fast growing Garissa Town and the surrounding areas.

4.2.3.4 Impact on Project

The physiology in the project areas - generally flat with few hills - is not expected to present complexities in the construction and operation of the proposed transmission line. The visual impact of the steel lattice towers may however be significant depending on varied perceptions of individuals within the local community.

4.2.4 Soils and Geology

4.2.4.1 Mwingi

The district has red sandy soils, loamy sand soils and patches of black cotton soils. River valleys have saline alluvial soils of moderate to high fertility. Otherwise, soils are of low fertility and prone to erosion. Most hills are covered by shallow and stony soils unsuitable for crop farming.

4.2.4.2 Tana River

Soils in Tana River District are divided into two groups; well drained sandy soils ranging in colour from white to red, and salty, clayey poorly drained soils that are gray and black in colour.

4.2.4.3 Garissa

The district is generally arid. The soils range from the sandstone , dark clays in some patches, to alluvial soils along the River Tana basin. The soils can be classified into alluvial, white and red sand soils. The white and red sand soils are found in Balambala Division where the terrain is relatively uneven and well drained. The soils hold no water but support vegetation which remains green long

after the rains. These soils have potential for farming. The rest of the district has sandy soils that support scattered shrubs and grassland. The alluvial soils occur along the riverine of Tana River and along the laga valleys. The soils are very fertile and can support increased agricultural production using irrigation.

4.2.4.4 Impact on Project

Weathered rock exists in the project area which might require heavy excavation equipment and supply of imported backfill for the pad & chimney foundations.

The substrate is advantageous to pylon construction which will not be prone to dislodgement on completion owing to weather condition. However, where topography is slopey (for example Mwingi) soil erosion may threaten and weaken the pylon foundation during the wet seasons. Conventional pad and chimney reinforced concrete pad & chimney foundations have been recommended to ensure stability of the tower structures. On sections where poor soils or submerged conditions are identified a raft type design might be required.

4.2.5 Biodiversity

4.2.5.1 Fauna

Mwingi National Reserve is one of the four protected areas that comprise the 4,400 square km Meru Conservational Area (MCA). The other three protected areas include Meru National Park, Bisanadi National Reserve, and Kora National Park. The Reserve has been designated a Wilderness Activity Zone by Kenya Wildlife Service (KWS) which allows for fly camping, camel and horseback safaris, as opportunities for traditional game viewing are extremely limited. Formerly known as Kitui National Reserve, Mwingi National Reserve covers 745km² and is little visited by tourists. However, efforts are underway to improve the area's road access. The Reserve is administered by Mwingi County Council. Wildlife populations are low, but there are hippo, crocodile, buffalo and warthog. Areas of the reserve have been encroached by settlements and permanent agriculture.

The proposed transmission line is far from any of the protected areas in the region. The protected area (Mwingi National Reserve) nearest to the proposed transmission line is approximately 29 km away from the nearest point from the transmission line - at Ithumbi Hill north of Mwingi Town. Therefore, the impacts of the proposed transmission line to the afore-mentioned protected areas will be insignificant during both the construction and operation phases.

The project area once had a wide variety of wild fauna common to the eco-climatic region. Some large mammalian species that were common to this area included the elephant (*Loxodonta africana*), African buffalo (*Syncerus caffer*), giraffe (*Giraffa camelopardalis)*, burchell's zebra (*Equus burchelli*). Other mammalian species previously common to this area are bushbuck (*Tragelaphus scriptus*), bushpig (*Potamochoerus porcus*), kongoni (*Alcelaphus buselaphus*), Common waterbuck (*Kobus ellipsiprymnus*), dik-dik (*Rhynchotragus kirkii*), warthog (*Phacochoerus aethiopicus*), impala (*Aepyceros melampus*), lesser kudu (*Tragelaphus imberbis*), grey duiker (*Cephalaphus jentinki*), olive baboon (*Papio anubis*), spotted hyena (*Crocuta crocuta*) and black-backed jackal *(Canis mesomelas*).

Most of these species are now confined within the adjacent Mwea National Reserve (MNR), to the East of Kindaruma, Mwingi National Reserve to the north of Mwingi town and North Kitui National Reserve, north of Tsavo National Park. However, some of these species are still occurring in small pockets of low human settlement, especially between Mwingi and Garissa town.

The vast areas between Kindaruma Dam and Garissa are relatively wild but drastically undergoing change due to human incursions for rain fed agriculture and pastoralism. Consultations with the Kenya wildlife Service established that there are no sensitive species along the transmission line and clearing of the line will benefit grazers, especially the lesser Kudus. The National Museums of Kenya were also consulted and it was established that there are no important bird areas traversing the proposed transmission line apart from the nearby Kindaruma and Masinga Dams. Roosting sites at a landscape level that may be affected are mainly on hill tops. Large herbivore species have been eliminated or driven away particularly in heavy settlement areas with only the dik-dik being fairly common.

The avifauna in the bushland is characterized by four species of hornbills, vulturine guinea fowl and starlings. Birds of prey are dominated by the goshawk, which is fairly common. Other commonly encounter bird species include: Purple grenadier, steel-blue whydah, Eastern Pale chanting Goshawk, yellow-necked spurfowl, African Orange bellied parrot, Darnaud's Barbet, Donald-Smith's nightjar, Northern pied babbler and Abyssinian scimitarbill. Electrocution and collision are possible outcomes along the proposed power line affecting raptors and other birds.

4.2.5.2 Vegetation

In the Mwingi and Garissa Areasd, the flat to gently undulating, undissected plains are dominated by *Acacia mellifera – Commiphora* spp plant community which forms a transition zone between the un-dissected plains with *A. mellifera – Douspermum eremophilum* plant community and the dissected plains characterized by *Commipora spp – A.tortilis* group of plant communities.

The vegetation within the general Kindaruma area falls broadly under Pratt, Greenway and Gwynne (1966) classification of ecological zone V. Ecological Zone V is defined by the amount of rainfall at a mean of 500 mm per year with the length of the dry season ranging between 7.5-10 months. This zone is classified under tropical semi-arid climate, that covers half of Kenya as well as Ethiopia, Northern Tanzania and North-eastern Uganda. Within this area, the ecological zone is characterized by changes in vegetation over a short distance, in response to underlying topography and soil types. Areas covered by wooded grasslands have black-cotton soils, grey sandy soils and reddish soils, while areas with riverine vegetation - where it exists (see section 5.2.2) - have deep alluvial soils. Vegetation types here range between bushland (thickets, open bushland and dense bushland) to woodlands especially in areas where it has not been cleared for settlement and rain-fed agriculture (see detailed description in section 4.1).

(Refer to the Map overleaf to see the location of the proposed transmission line in relation to the protected wildlife areas)

Map 2: Location of the proposed Transmission Line in Relation to Wildlife Conservation Areas

4.3 DESCRIPTION OF SOCIO-CULTURAL/ECONOMIC ENVIRONMENT

4.3.1 Ethnic Groups

There are a number of major ethnic groups in the project districts. Each ethnic group has its unique culture, social organisation and traditions. The social and cultural aspects in the project area are closely intertwined with ethic groupings. These are:

Yatta and Mwingi districts are occupied by the Akamba who consists of various clans including Atwii, Aombe, Akitondo, Atangwa, Akikui and Atwii among others. These have elaborate cultural practices including strong kinship linkages with organizations spanning from localized merry-go-rounds to strong clan relations and burial societies as well as social interactions mainly during religious ceremonies. They speak Kikamba (Kekamba), Kiswahili and English.

Tana River district is occupied by the Pokomo, Orma, Wardei, Somalis, Munyoyaya, Wata Malakote, Korokoro, Boni, Sanye, Somali, and the Mijikenda tribes among others. The Pokomos, Munyoyaya, Malakote and Mijikenda are engaged in farming activities while the Orma, Wardei and Somalis are mainly engaged in livestock keeping. The Korokoro and Malakote are related to Pokomo, all of whom live along the Tana River occupying the eastern quarter of the district. The Orma occupy the western three-quarters to the west of Tana River. The Orma and the Somali are nomadic pastoralists. The Orma keep cattle, sheep and goats, whereas the Somali are mainly camel herders.

Garissa town and its surrounding which is the major beneficiary of the proposed project is a metropolitan town whose major inhabitants are the Somali. The Somali consists of broad clan federations, each of which traces its origin from genealogical ties and politics are done within the framework of clanism. Clans are the basic point of cultural and political identity for Somalis. The Garissa Somali clans include Ogaden, Darod, Harwiye and Isaac. There are however over 90 sub-clans living in Garissa town. Clanism and kinship are strong elements and driving forces in control of some business centres and service points. Even villages consist of a group of households whose families are related. The main religion in Garissa Town is Islam.

4.3.2 Indigenous Groups

With reference to World Bank Safeguard Policy OP 4.10, the term “Indigenous Peoples” is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories7
- customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- an indigenous language, often different from the official language of the country or region.

The Kindaruma-Mwingi-Garissa transmission line traverses areas that are largely occupied by dominant social groups with structured land control patterns, traditional practices, traditional land-based modes of production. Indigenous peoples - defined here as social groups with identities that are distinct from dominant groups, who are usually marginalised and vulnerable segments of society would include the Malakote, Korokoro, Boni and Sanye peoples. These peoples, however, do not comprise the PAPs identified in the RAP study as being among those who stand to lose their property in the construction of the Transmission Line. World Bank safeguard policy OP 4.10 is therefore not triggered by the project as proposed.

4.3.3 Stakeholders in the Project Districts

There are many stakeholders in this project including government, NGOs, FBOs and CBOs among others. The table below contains a list of stakeholders including their activities and operational areas in the districts traversed by the project.

Table 4: Stakeholders in the project districts

Name of stakeholder	Sectors involved/activities undertaken	Operational areas
CDF	All sectors of development	Across all districts
Red cross	Relief	
K.F.W.T	Microfinance	
Asal Based Livestock and Rural Livelihood support Programme (ALLPRO)	Livestock	
Equity Bank	Microfinance	
NALEP SIDA	Agriculture	
Faulu Kenya	Microfinance	
UNICEF	Water and sanitation	
ALRMP II	All sectors	
Plan International	Club Support	Throughout the district
Mulembuku women group	Merry go round	Kyondoni sub-location
Kaseve communication group	Merry go round	
Dumpsite group	Terracing	
Kikuuni Development group	Reforestation	
Kaamuka communication group	Earth dam	
Kyondoni welfare association	Support widows/widowers	
Genesis CDA	Child support	Throughout the district
Action Aid	Relief	
German Agro action	Earth dams	
Adra	Relief, water and sanitation	
Dorcas Aid	Child sponsorship	
Kivunduu dam group	Earth dam	Kiomo location
Ushirika group	Funeral challenges	
Kiomo widows S.H.G	Terracing	
Catholic Woman association	Merry go round	
Community Resource Persons	Child support	
Kiomo Youth Group	Planting trees, roads clearance	
Wikwatyo	Merry go round	Ukasi Location

Name of stakeholder	Sectors involved/activities undertaken	Operational areas
Muakombaini Women group	Merry go round	
Kiseuni community group	Terracing: livestock	
Kathethya	Earth dam	Mbuvu location
Itana Witikwe	Funeral assistance	
Nzakani S.H.G	Earth dam: cultivation	
Kavuko Women group	Merry go round	
Can Do	Merry go round	
BIMAS	Microfinance	
Miracle S.N.G	Merry go round	Mwasyuma Sub-location
Nguni livestock traders	Marketing livestock	
Kwanduutu Livaliani	Sand harvesting	Endui Location
KWamaki	Road clearence	
Kyeni kya Katinga	Earth dam	
Uyanundu / Kwanduuthi welfare	Funeral assistance	
Kinyambu community group	Earth dam	
Katuluni S.H. G	Buying cows	Kivou sub-location
Katuluni/Kasyaloa	Earth dam	
Wazya wa mwaitu	Widow support	
KAdet LAD	Micro-finance	
Njaa Marufuku Kenya project	Agriculture	District wide
Men group	Education	Madogo location
Kenya women group	Merry-go-round and micro-finance	
Boli self-help group	Merry-go-round	
Angamiza Ukimwi group	Fighting against HIV/AIDS	
Madogo CBO group	Merry-go-round and micro-finance	
Madogo anti Aids group	Fighting against HIV/AIDS	
Bangale youth group	Livestock marketing	Bangali location
Karagara milk group	Selling meat and milk	
Boda Boda group	FGM awareness	
Uhurobo group	Girl child education	

Source: Household and in-depth interviews and Focus Group discussions

Among these, the stakeholders consulted as per the table above included: CDF, Asal Based Livestock and Rural Livelihood Support Programme (ALLPRO), NALEP, SIDA, and ALRMP II.

4.3.4 Districts' Profile

As previously mentioned, the proposed Kindaruma-Mwingi-Garissa Power Transmission line will serve the greater districts of Mwingi in Eastern province, Tana River in Coast province, and Garissa in North eastern province and beyond. However, the transmission line stretches from Kindaruma Electricity Power Station in Kyondoni Sub-location (in Masinga district within the former Yatta District) through Mwingi district to Madogo sub-location in Tana River district.

These have therefore been considered in the assessment of the socio-economic impact of the project. Though in the recent past, the project districts have been subdivided further, data contained in the

social assessment considers the greater districts of Yatta (where the new Masinga district was a division), Mwingi (incorporating the current Migwani and Mwingi and Kyuso districts) and Tana River excluding Tana Delta.

The profile of the greater districts traversed by the project is discussed in the following paragraphs:

- Yatta district, in Eastern province, was created in March 2007 from the larger Machakos District. The district borders Mbeere district to the North, Kitui district to the East, Thika district to the West and Maragwa district to the south West. The total area of the district is 2469 Km^2. The district comprises four administrative divisions, which are further subdivided into 17 locations and 51 sub-locations.
- Mwingi District is one of the districts in Eastern Province of Kenya. The District borders Kitui District to the South, Yatta District to the West, Mbeere to the North and Tana River District to the East. The district lies between latitude 0° 03' and 1° 12' South and longitudes 37° 47' and 38° 57' East and has a total area of 5,215.40 km^2. Mwingi district was curved from Kitui district in 1992 and is divided into 5 divisions, namely Migwani, Central, Nguni, Nuu and Mui.
- Kyuso district is one of the twenty-eight districts in Eastern Province. It borders Mwingi District to the South, Mbeere District to the West, Tharaka District to the North West and Tana River District to the East. The district lies between latitude 0^0 03' and 1^0 12' South and longitudes 37° 47' and 38° 57' East. The district was curved out of Mwingi district in May 2007. The district has an area of 4,814.90 Km^2 and is divided into 5 administrative divisions (Mumoni, Ngomeni, Kyuso and Tseikuru), 16 locations and 53 sub-locations.
- Tana River District is one of the thirteen districts that constitute Coast province and has a total area of 22,452.9 km^2. Tana River district was split into two districts in October 2007 to form Tana River and Tana Delta. The proposed project however traverses Tana River district. The current Tana River district borders Mutomo District to the West, Mwingi District to the Northwest, Garissa and Fafi to the North East, Ijara District to the East, Tharaka and Isiolo District to the North and Tana Delta District to the South.
- Garissa district, and specifically Garissa town, is the main beneficiary of the proposed Kindaruma-Mwingi-Garissa Transmission line. The town of Garissa is currently rated as the fastest growing town in Kenya and yet it has very few and inadequate infrastructure notably electricity as it entirely relies on oil generators. The district is located between latitude 0° 58' north and 1° 30' south; and longitudes 38° 34' east and 41° 05' west. Garissa district borders Isiolo district to the northwest, Wajir to the north, and Republic of Somalia to the east, Tana River District to the West, and the newly created Ijara District to the south. The district covers an area of about 33,620 square kilometres.

The table below presents the administrative units in project districts and their size in sq km.

Table 5: Administrative Units by Division and Size

District	Division	Land Area (sq km)	No of Locations	No of Sub locations
Yatta	Masinga	1094.1	6	20
	Ndithini	316.0	3	8
	Yatta	568	4	13
	Katangi	491.0	4	10
Mwingi	Central	1,204.50	8	29
	Migwani	565.60	6	24
	Nguni	1,751.10	3	8
	Nuu	1,324.40	3	7

District	Division	Land Area (sq km)	No of Locations	No of Sub locations
	Mui	369.80	2	6
Tana River	Bangale	6,125	4	8
	Madogo	1,836.4	4	8
	Bura	4,834.2	4	9
	Galole	9,100.4	11	22
	Wenje	556.9	5	11
Garissa	Central	858.7	5	7
	Sankuri	1,808.3	4	7
	Balambala	1,900.3	3	9
	Danyere	1,120.8	3	7
	Banane	850.4	3	2
	Modogashe	2,075.0	3	4
	Shantaabak	3592.8	3	4
	Dadaab	3,536.0	7	6
	Liboi	3,242.6	3	5
	Jarajilla	8,859.9	4	4
	Bura	5,775.2	4	5
Total	25	63757.4	109	243

Source: District Development Plans (draft) of Yatta, mwingi and Tana River districts, 2008 - 2010

Administratively, the transmission line is earmarked to traverse various administrative units sequentially from Kindaruma through Mwingi to Madogo, as presented in the table below:

Table 6: Administrative Units Traversed By The Project

Province	District	Division	Location	Sub-location
Eastern	Yatta	Masinga[1]	Kivaa	Kyondoni
	Mwingi	Migwani	Thaana	Thaana
		Central	Kiomo	Kairungu and Kiomo
			Mwingi	Kyanika, Kivou, Enziu and Kathoka
			Endui	Kathoka and Katitika
		Nguni	Kalitini	Vumbu
			Nguni	Mathyakani and Mwasuma
			Ukasi	Mbuvu and Ukasi
	Kyuso	Ngomeni	Ngomeni	Ikime
Coast	Tana River	Bangale	Bangale	Bangale
		Madogo	Madogo	Madogo
North Eastern	Garissa	_	_	_

Source: District Commissioners – Masinga, Mwingi and Tana River

1 Currently in Masinga district

4.3.5 Political Units

The project districts have seven constituencies including Yatta and Masinga constituencies in Yatta district, and have a total of twenty one electoral wards. Yatta district, Mwingi North and South constituencies in Mwingi and Kyuso districts, Bura in Tana River district and Dujis, Lagdera and Fafi in Garissa district. The districts have a total of six local authorities and 124 wards as follows:

- Yatta district - Matuu Town and Masaku county councils
- Mwingi and kyuso districts - Mwingi Town and Mwingi county councils all with 25 wards[2.] Thirteen (13) electoral wards fall in Mwingi whilst the remaining 12 are in Kyuso district.
- Tana River district - Tana River County Council with 19 wards
- Garissa district – Garissa Municipal and County Councils with 25 wards

4.3.6 Population

In 1999, the project districts had a total population of 851,883and is projected to have reached 1,095,962in 2008 and 1,219,297by 2012. The average annual growth rates in these districts was 2.75% with Tana River having the highest growth rate of 3.4% and Mwingi/Kyuso having the lowest of 2.4%. The various district annual growth rates and population projections are presented in the table below:

***Table 7:** Population of the Project Districts*

District	Population growth rate (2008)	1999	2008	2012
Yatta	2.8%	232,591	314,606	344,067
Mwingi	2.4 %,	196,842	254,638	291,184
Kyuso	2.4 %,	105,982	131,524	144,555
Tana River	3.4%	113,066	145,344	161,556
Garissa	3.7%	104,227	137,493	143,433
Total	2.94%	851,883	1,095,962	1,219,297
Total	2.75%	747656	958469	1075864

Source: District Development Plans

Overall, the average population density along the 16 project sub-locations is 44.3 persons per 1km^2. The total population of all sub-location traversed by the project is 68,929. Within these sub-locations, Kyanika (within Mwingi town) has the highest population density of 196 persons per km^2 followed by Kivou while Bangale has the lowest of 1 km^2 person per km^2.

The baseline survey showed high density population in the sub-locations of Kyanika and Kivou sub-locations as well as the urban markets of Mwingi, Nguni, Ngiluni and Bangale, consequently there is need to systematically evaluate the transmission route along these areas. The table below presents a summary of population densities and totals along the said sub-locations:

[2] The County Council of Mwingi also serves the recently created Kyuso district

Table 8: Population of the various sub-locations traversed by the project

Sub-location	Population density (1999)	Population	
		1999	2008
Kyondoni	42	2,216	2,936
Thaana	35	2,121	2,630
Kairungu	85	3,939	4,887
Kiomo	28	5,218	6,474
Kyanika	196	4,781	5,932
Kivou	100	3,435	4,270
Enziu	54	5,339	6,624
Kathoka	34	3,283	4,073
Katitika	45	2,078	2,577
Mbuvu	19	4,390	5,447
Mathyakani	35	2,002	2,483
Mwasuma	10	3,894	4,831
Ukasi	7	2,841	3,524
Ikime	4	1,350	
Bangale	1	3,709	4,775
Madogo	14	5,808	7,466
	44.3	56,404	68,929

Source: District Statistical Offices

4.3.7 Settlement Patterns and Housing

Mwingi, Kyuso and Yatta districts were first settled in 1920s as population increased in other areas notably Machakos, Kangundo, Embu and Kirinyaga among others. However, since then, there has been continued immigration and settlement. Settlement patterns have no defined sequence as one settles next to the fathers homestead, on inherited land or a distance on purchased/inherited land parcels. However, majority of households are located near major towns and markets with others sparsely scattered in the interior.

The housing tenure in the project area consists of owner occupier. However there are other housing tenures including rental and employer provided housing. Most of the houses in project area are bungalow houses dominate. There are limited flats, maisonettes and shanties concentrated mainly in the urban centres. The main dwelling houses have 1-10 rooms with majority containing two to three rooms only. The houses are built of various materials depending on the sections including:

- Wall – majority of the houses are built of mixture of mud/wood while there is minimal use of stone, brick/block, mud/wood, mud/cement, corrugated iron sheets, grass/straw and cow dung.
- Floor – Earth is the commonest flooring material while other materials notably cement, wood and tiles respectively account for an insignificant number of house floors.
- Roof – Corrugated Iron sheets dominate as the main roofing material followed by grass/straw, cow dung, tin and *makuti* respectively.

The Settlements in Tana River district are influenced by water, land potentiality and security. In Tana River district, residents live in villages called *manyattas* each comprising approximately 500 households. Most of the villages are found near watering points (rivers, dams, wells and boreholes)

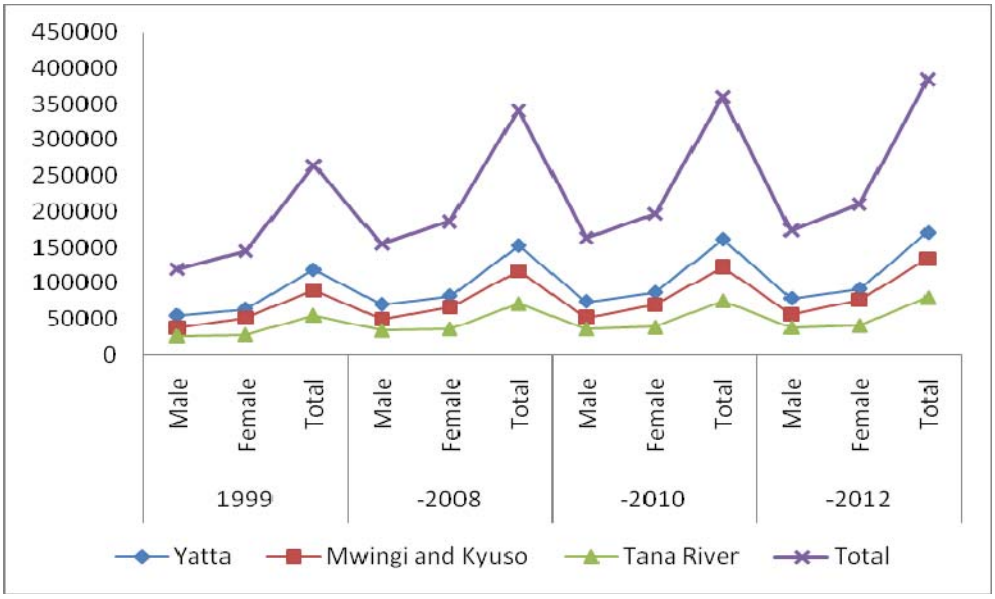
especially along the River Tana where farming is favourable. In terms of security, most communities in the Tana River district live together or close to government institutions (divisional, locational and sub-locations headquarters) because of security concerns.

The most common types of housing in rural areas are the *Manyatta* (traditional houses made of mud and cow dung held together by a frame made of branches) comprising 55.9%, followed by Swahili Houses 1%, and Shanties 0.7%. In urban areas, low quality semi- permanent houses are the commonest and account for 42.4%. 93.5% of households have earth as the main floor material and 6.5% cemented. 54.4% of households are either grass thatched or makuti with only 20.6% having corrugated iron sheets as the main roofing material. 53.6% of households use grass/straw as the main wall material, 32.7% use mud/wood, 7.6% use cemented mud and 4.5% use stone and bricks.

4.3.8 Labour Force

Labour force includes the population aged 15-64 years. This is the age group that has the potential to work and generate income. In the project districts, there is adequate labour force (especially unskilled and semi-skilled) which currently stands at 341259 and is projected to reach 384586 by 2012 as presented in the table below:

***Figure 1:** Labour force in the project districts*



Source: Yatta, Mwingi and Tana River District Development Plans 2008-2012

Majority of this labour force are the unskilled manpower, who can significantly contribute and participate in the proposed transmission line construction. Thus casual-unskilled labour force is available in the area, according to the study. Majority of the youth are standard eight and form four graduates with very few university and college graduates. However, the population around Mwingi town could supply skilled labour in form of electrician, management and clinical personnel. Women are also willing to provide food stuff to the workers e.g. cooked Githeri, Tea, Fruits, and Maandazi etc.

The cost of labour in the area ranges between four hundred (400) and seven hundred (700) shillings per day for the unskilled labour force while the skilled can go with approximately 1000-3000 shillings daily.

Based on the public consultations undertaken during this study, the youth have expressed high expectations of employment from this project while the parents are also happy that the project is coming at the best timing due to prolonged droughts, famine, high prices of food stuff in the market, etc. The expected income would supplement the household finances.

4.3.9 Land Ownership and Use

Land ownership in the project districts vary. In Mwingi and Kyuso districts, many of the residents do not have title deeds for their land as it has not been adjudicated. In Mwingi alone, only about 5% of land owners in the district possess title deeds with the total number of registered titles being 16,377. In Kyuso, only one privately owned parcel of land is fully registered - the Mbeu Group Ranch - comprising of 1,377 hectares, and has a title deed. In Tana River district where 90% of the land is either trust land (20%) or government land (70%) the total acreage of land adjudicated is zero. This has led to land conflicts. Irrespective of this status, the local clans control the area they perceive to be theirs in accordance with the accepted traditions and norm.

Garissa district has a land mass of 5688.1 km^2 Hectares. Much of this land is held in trust by the local authorities. Private leasehold however exists within Garissa town with the total urban area making 182km^2. 100km^2 of the land is arable and part of it has been put under irrigated farming. 43% of the land is unplanned settlements.

Household interview analysis during the social impact assessment revealed that four types of land acquisition exists along the project corridor including inheritance, purchase and lease. Majority of the land owners do not have title deed for only 2% in Mwingi and Kyuso had, while none had title deeds in Tana River district. The average land size per household is 12 acres in Yatta, Mwingi and Kyuso districts. Land in Yatta, Mwingi and Kyuso districts is used for crop growing of mostly maize, beans green gram, cowpeas, pigeon peas, sorghum and finger millet. Other crops grown include vegetables and fruits especially mangoes. In addition, the land is used for pasture and beekeeping as well as construction of buildings, borehole and earth dams.

Majority of population do not value their acreage but use estimation to determine the cost of land. After much probing during the study, we found out that some areas could sell the land at KSh 100,000 per acre (especially near major towns like Mwingi) while others sell between KSh 20,000-40,000 per acre.

4.3.10 Education

Literacy levels in the project area average 49.3%. Yatta district has the highest literacy rate of 65% compared to Mwingi and Kyuso which have 45.1% and Tana River with the lowest of 33.7%. In Tana River district, the major causes of the low literacy levels include traditional practices such as pastoralism that force the boy child to spend most of his time moving with livestock in search of pasture and water; girls on the other hand undergo initiation and are often married off at an early age. The table below summarises the total number of education institutions in the project districts by type.

Table 9: Number Of Education Institutions By Type In The Project Districts

District	Pre-school	Primary schools	Secondary schools	Tertiary institutions	Adult literacy classes
Yatta	298	253	47	5	29
Mwingi	345	237	38	22	83
Kyuso	207	133	18	10	40
Tana River	140	73	5	3	64
Garissa	74	68	12	6	-
Total	649	562	410	18	175

Source: Draft District Development Plans, 2008-2012.

There are several Primary Schools scattered along the project corridor from Kyondoni to Madogo. These include Thaana, Kiomo, Nguni, Ukasi, Bangale primary and secondary schools. Public consultations undertaken during this study revealed that the community have expectations of receiving electricity connections in their education institutions, with consequent improvement in academic performance in these institutions and improved literacy levels.

4.3.11 Health

The project districts have a total of 177 health facilities ranging from district hospitals to private clinics. During construction, commissioning and operation of the proposed transmission line, these facilities will be useful in case of labour force that fall sick or any person who encounters an accident. Connecting these health facilities to efficient power supply will lead to enhanced health response by making it possible to eventually power specialised medical equipment. The various health facilities found in the project districts are tabulated below:

Table 10: Health facilities found in the project districts

District	Number of health facilities							
	District Hospitals	Sub-District Hospitals	Health Centres (GoK)	Dispensaries (GoK)	Dispensaries (Private)	Dispensaries (FBO)	Nursing Homes (Private)	Private clinics
Yatta	1	-	4	29	-	6	-	13
Mwingi	1	1	7	36	3	3	3	1
Kyuso	1	1	2	18	2	3	2	1
Tana River	1	0	2	22	-	1	-	13
Garissa	1	1	1	16	-	-	4	25
Total	5	3	16	121	5	13	9	53

Source: District Development Plans, Garissa, Yatta, Mwingi, Kyuso and Tana River, 2008-2012

Specifically along the project corridor, the main health facilities include: Matuu and Mwingi District Hospital general hospitals, Nguni and Madogo Health Centres and a number of scattered dispensaries and medical clinics (Privately owned) such as Mumbuni Maternity Centre in Mwingi town. The services offered in these facilities include general treatments especially in the dispensaries, family planning services (pills and injection), V.C.T, maternity, in-patient care, dental care, E.N.T, laboratory test, pharmacy, theatre operations and paediatric clinic.

The common diseases noted in the area include: Malaria, Colds and coughs, Tuberculosis, HIV/AIDS, Amoeba, Measles, Pneumonia, Typhoid and Diarrhoea. The measures being taken to curb the above diseases include – use of mosquito nets, boiling of drinking water, general cleanliness, visiting health facilities and getting drugs and using them according to the doctors' prescriptions, good sanitation e.g. construction and use of pit latrines. The study noted increased cases of Malaria, tuberculosis and HIV/AIDS. Thus the construction of the transmission line should be accompanied by awareness creation and provision of preventive anti malaria drugs as well as behaviour change in their local lives.

4.3.12 Poverty

Poverty in the project area is perceived as the inability of an individual or a household to access basic needs i.e. food, shelter, clothing, health and education. It manifests itself in low income, deprivation, isolation, alienation, insecurity and dependency among other forms. The causes of poverty in the project districts are many and include power relationships that deny life skills, assets and resources to people as well as in access to and control over productive resources. The average poverty incidence in the project districts is 66% with Tana River having the highest incidence of poverty (76.9%) while Mwingi had the lowest (58.4%). The key poverty indicators in the project districts are presented in the following table:

Table 11: Poverty Indicators in the project districts

Key indicator	District				
	Yatta	Mwingi	Kyuso	Tana River	Garissa
Absolute poverty	66%	58.4%	62.6%	76.9%	60%
Contribution to national poverty	4.1%	1.4%	1.4%	1.3%	-
Urban poor	60%	63%	N/A	76.9	60%
Rural poor	72%	60%	no data	no data	65%

Source: District development plans, Garissa, Yatta, Mwingi, Kyuso and Tana Rive, 2008-2012

The high levels of poverty in the project district reveal that majority of the population is unable to afford their minimum basic needs such as food, clothing and shelter. The causes of poverty in the area include unreliable rainfall, high levels of illiteracy, poor crop and animal husbandry practices, poor infrastructure, lack of credit facilities, poor marketing systems and infrastructure, natural disasters like floods, drought, livestock diseases, insecurity, wildlife menace, environmental degradation and inadequate industrial power supply.

4.3.13 Insecurity and Conflict

In Yatta, Mwingi and Kyuso districts, insecurity mainly occurs in form of burglary and petty thefts. Other conflicts include human-wildlife conflicts.

In Tana River district, conflicts mainly arise from competing land use namely - farming and pastoralism, coupled with land adjudication issues especially where land is subdivided and allocated to individuals (mainly settled farmers) as private property. Private land ownership does not bode well with the pastoralists since they it limits their movement and hence the reason they continue to oppose the policy. Most of the cases of insecurity are related to ethnic clashes and few cases of banditry. These conflicts have led to livestock theft, loss of lives and destruction (e.g. through burning) of schools, houses and property in general.

In Garissa district, occasional clan flare-ups are common and revolve around access to resources such as water, pasture and social services. The instability in Somali, growing urban population, idleness among the youth are also key security concern to the district.

4.3.14 Livelihood

The project districts livelihoods include Agro-Pastoral, Urban and Mixed farming. The main sources of income in the project area are agriculture (Masinga and Mwingi) and livestock production (Tana River and Garissa districts).

4.3.15 Crop Growing

The main agricultural crops in the project districts are Cow Peas, Green grams, Pigeon peas, Cassava, Maize, Beans, Sorghum and Millet. In terms of food, the project districts are food insecure areas with all ranking from high to moderate levels in terms of food security.

4.3.16 Livestock Keeping

The Kamba traditionally are a pastoralist community but this is slowly changing with more people relying on agro-pastoralism. Livestock rearing nonetheless remains an important production system in the districts and dominates in Tana River and Garissa districts. Key livestock species are cattle, sheep and goats. The project districts have high potential for honey production.

4.3.17 Tourism, Forests and Wildlife

The project districts have no major forests save Mumoni Hills in Mwingi district. However, there are a number of conservation areas that have abundant wildlife and touristic potential including Mwingi National Reserve and Kora national park in Tana River district. Garissa district, boasts to host the Rahole National Reserve and in addition has a variety of wild animals among them Elephants, Lions, Cheetahs, Leopards, Hippopotamus, Crocodiles, Hunters, Hart beasts, Grants Gazelles, Thompson gazelle, Gerenuk, Civil jackals, Spotted hyena, Buffalos, Grey Zebras, Topi, reticulated Giraffes, Dig-dig and Baboons and birds across the land

4.3.18 Gender

Gender, the social construction of roles and responsibilities between men and women, affects the socio-economic and political conditions and position of men and women in the project area. These roles have been defined by tradition and cultural attitudes where in most cases, the male dominates. There are more women than men in terms of population. Women have low literacy level than men and work for 12-15 hours a week, spending correspondingly less time on leisure and sleep.

4.3.19 HIV/AIDS

HIV/AIDS has become a major problem in the project districts where the prevalence rate is 4% in Yatta, 3.5% in Mwingi/Kyuso 2% in Tana River and 2-4% in Garissa district. The districts have a total of 18 VCTs. The results of HIV/AIDS in this area have been disastrous and include:

- Increased number of orphans who lack proper care increasing burden at the family level and stress for the extended families
- Loss of productive manpower as most people affected are in the productive age between 25-45 years, hence declining economic output due to reduced workforce, family income, food and other basic necessities.

4.3.20 Sites of Cultural Heritage

With reference to World Bank OP 4.11, this refers to physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices.

The National Museums of Kenya (NMK) was consulted to determine whether or not there are any physical cultural resources on the line route. NMK does not have records in their database of heritage sites in the project area, because no field survey has been conducted in that area.

NMK advices that the identification of such sites must determined through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5, Subsection (1)(n) which mandates the National Museums of Kenya to conduct, subject to provisions of the Environmental Management and Co-ordination Act, an environmental impact assessment of threatened heritage in areas earmarked for development. NMK proposes that they should carry out a cultural heritage impact assessment survey in the project area. (See Appendix section for a copy of the correspondence).

In the event that the Contractor or Proponent's staff encounter chance finds of physical cultural resources in the course of duty - during both construction and operational phases of the project -
The National Museums of Kenya must be notified immediately and the resource protected from any interference or manipulation of any kind.

5.0 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

5.1 INTRODUCTION

This chapter focuses on the impacts likely to occur as a result of the proposed construction works on the Transmission Line. For ease of reference, the impacts due to or affecting certain elements during construction and operation are presented in matrix form in the Environmental and Social Management and Monitoring Plan (See Section 7.0).

5.1.1 Potential Positive Impacts

- In Garissa particularly, which is the main beneficiary of the project, there will be in the long run more households/premises being connected to the national grid;
- The transmission line will contribute to achieving the government's developmental goals in reducing poverty and improving living standards; these would result from employment creation (direct and indirect) and increased investments especially in value addition processing of primary products.
- Improved power capacity and reliability would increase opportunities to invest in heavy industries and facilitate direct and indirect employment particularly in Garissa town which is fast growing economically.
- The construction phase will bring about job creation for both skilled and unskilled labour for vegetation clearing, menial works, drivers and machine operators. The total number of local jobs created by this project as will depend on availability of labour and policies of the contractor and KPLC while casual wages range from KSh. 250 to 800 per day
- Power problems/outages especially experienced in Garissa town which relies on a diesel generator, will reduce significantly.
- Improved security in the beneficiary communities will be achieved through better lighting.

The potentially adverse impacts have been discussed in greater detail the following section:

5.2 IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

5.2.1 Terrestrial Habitat Alteration

5.2.1.1 Construction and Operation

The construction of transmission line rights-of-way, will result in alteration and disruption to terrestrial habitat through vegetation clearing Right-of-way construction activities will transform habitats, depending on the characteristics of existing vegetation, topographic features, and installed height of the transmission lines. (Please refer to 4.2.5.)

Example of habitat alteration from these activities includes removal of vegetation within 30 m width of the way leave, which would translate into between 1,300 and 1,800 woody species per hectare, leading to habitat loss or its simplification. Clear-felling of vegetation along a total of 124km from Kindaruma to Garissa would displace 372 ha at 30 m Wayleave width.

The transmission line is passing through some settled areas (particularly in Mwingi, Bangale and Madogo areas) which do not have any critical habitats.

The numerous but dispersed hills are known to be habitats which may be termed as IBA's (Important Bird Areas) at a landscape level. These scattered hills are important for conservation and preservation of raptors and their habitats. The transmission line is expected to affect a narrow width and therefore resulting to narrow vegetation denudation if clear felling of woody plants within the 30 m way leave width is avoided.

The climatic conditions of the project area precludes establishment of forest systems. The area vegetation mainly ranges between bushed grasslands to bushed woodlands, characteristic of semi-arid, which is classified as Ecological Zone V (defined in section 4.2.5).

The habitat (semi-arid) through which the transmission line passes is widespread and well represented within the larger landscape from the Tsavo to Northern Kenya, and therefore cannot be termed critical.

The impacts to the terrestrial habitat due to construction of the transmission line will not have significant injurious effects; similarly it will not have significant impacts to wildlife and human communities dependent on these habitats. In summary, the proposed project will not affect the integrity and ecological functions of the habitats traversed by the transmission line, and will not trigger the World Bank's Safeguard Policy OP 4.04 on Natural Habitats.

5.2.1.2 Mitigation Measures

To mitigate on these impacts, vegetation clearing will be done manually by use of *pangas* and slashers. Where there are big trees, portable power saw mills (petrol powered) will be used. Much of the shrubs and trees are below 12 m in height and therefore should not be cleared unless where the pylons are being erected, since the transmission wires will be well above the height of much of the semi-arid woody species. Similarly, the whole way-leave should not be targeted for clear-felling of woody plants where only the transportation tracks are required. The transportation track would only displace only 74.4 ha of clear-felled woody plants at 6 m road track width, minimizing environmental degradation and habitat loss. This could further be reduced by using existing access roads/tracks to the erection sites.

Other measures include:

- Re-vegetation of disturbed areas with native plant species;
- Use human labour as opposed to heavy machinery to avoid herbaceous layer destruction and exposure of the soil to wind and water erosion
- Give the community priority on use of the removed vegetation for wood-fuel, construction or any other purpose.
- Implementation of an integrated vegetation management approach - the selective removal of tall-growing tree species and the encouragement of low-growing grasses and shrubs is the common approach to vegetation management in transmission line rights-of-way;

- Vegetation management should not eradicate all vegetation; excessive vegetation maintenance may remove unnecessary amounts of vegetation resulting in the continual replacement of species and an increased likelihood of the establishment of invasive species.

5.2.2 Alteration of Aquatic Habitats

5.2.2.1 Construction and Operation

The route of the proposed transmission line crosses several rivers and streams, such as R. Kithyoko, R. Nzuli, R. Tyaa, R. Ndiani, R. Tula, and R. Arer. At each tower site there will be four holes dug to a depth of approximately 5m; no major earthworks will be involved in this project; soil erosion from construction activities may result in siltation however this impact is expected to be minimal and temporary.

The proposed transmission line does not affect international waterways, described by the World Bank OP 7.50 Safeguard Policy on international waterways as any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states.

5.2.2.2 Mitigation

- Minimize/avoid clearing and disruption to riparian vegetation in sections where the transmission line crosses the local rivers and streams.

5.2.3 Wildlife Species and Power Line Associated Avifauna Mortalities

5.2.3.1 Construction and operation

The construction phase is not expected to have significant negative impact on wildlife owing to the short width of the Wayleave and low wildlife density in the line route. Furthermore, most of the wildlife in the general area is well protected in neighbouring conservation areas (see section Map 2: Location of the proposed Transmission Line in Relation to Wildlife Conservation Areas) under the management of Kenya Wildlife Service and the County Councils.

Electrocution and collision are possible outcomes along the proposed power line affecting raptors and other birds. Collision and electrocution incidences are species specific and depend on the species behaviour. (Examples of the bird species found in the project area listed in section 4.2.5.1) Raptors for instance are known to have territories which may restrict their ranging behaviour therefore reducing chances of power line mortalities compared to waterfowls e.g. the cranes. Eagles are at low risk due to their solitary behaviour compared to flocking birds like the storks, cranes and vultures. However, eagles frequently use pylons for roosting, feeding and hunting resulting to electrocution.

5.2.3.2 Mitigation

The following mitigation measures address the issues on avifauna electrocution and collision along the proposed power line.

- To minimize collision, undertake wire-marking to alert birds to the presence of power line, allowing them time to avoid the collision.

- Build raptors platforms on top of pylons for roosting and nesting
- Undertake monitoring data on avifauna electrocuted along the proposed transmission line (responsible agencies KWS, NMK, Nature Kenya, NGO's, CBO's, etc.)

5.2.4 Soil

5.2.4.1 Construction

During the construction phase, the contractor is expected to loosen the soil along the Wayleave for the pylons which may lead to soil erosion. Similarly, the Wayleave will serve temporarily as a road to transport material between construction sites. The exposed soil will be prone to wind and water erosion during the construction phase. Occasionally, temporary access roads to construction sites will have to be created where they did not exist before and this will result in displacement of top soil in the affected sections.

5.2.4.2 Mitigation

- Soils excavated for the erection of pylons should be used for re-filling and should not be left exposed to wind or water for long periods
- The contractor should avoid steep terrain during the transportation of construction material by using alternative routes or use light vehicles where appropriate
- Riverine vegetation should be minimally disturbed during the construction phase to reduce soil erosion and safeguard riverbank protection
- Re-plant degraded areas with local species common in the area to complement natural vegetation regeneration to improve ground cover.

5.2.5 Air

5.2.5.1 Construction

During the process of construction, some dust and exhaust fumes will be generated from the construction vehicles (5 Lorries and 4 off-road vehicles) as they make their way through the mainly dry and perched terrain especially in the project areas in Mwingi and Tana River districts.

The foundations for the lattice structures shall be dug manually and so will be the concrete casting for their bases. The area between Mwingi and Garissa the ground conditions are rocky and therefore there will be need to use a compressor to break hard ground. These processes will lead to dust generation and petroleum exhaust.

The significance of these exposures will only be felt in areas where the line is close to settlements. This dust may not be significant in the low population density areas but may become a nuisance as the vehicles cross the areas of dense settlements such as the sections in Mwingi, Bangale and Madogo where the line will pass close to settlements (in some cases the proposed route is within a 10m distance) and the road surface is murram which is in just a fair condition.

5.2.5.2 Mitigation

- Regular maintenance of construction vehicles, plant and equipment to reduce emissions

- Control speed of construction vehicles to minimise generation of dust on access roads
- Prohibit idling of vehicles on site to reduce emissions.

5.2.6 Hazardous Substances

5.2.6.1 Construction

Use of engines (construction vehicles) and other equipment on site has the potential to lead to spillage of petroleum products. It is however worth noting that the risks of a major oil spillages occurring are minimal because only a few construction vehicles (3-5no trucks and 4no 4WD vehicles) will be needed in the construction of the transmission line. Further, the maintenance of these vehicles will be undertaken at authorised garages and not on site. The impact due to oil and other petroleum products during construction will not be significant.

5.2.6.2 Operation

Highly-refined, mineral insulating oils will be used to cool transformers and provide electrical insulation between live components. They are typically found in the largest quantities at electrical substations and maintenance shops. Sulfur Hexafluoride (SF_6) will also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines, and transformers.

5.2.6.3 Mitigation

- Use of designated areas for repair and maintenance of vehicles (e.g. local licensed garages) and powered machinery to avoid fuel and lubricant spills at the construction site should be enforced.
- The use of SF_6, a greenhouse gas with a significantly higher global warming potential (GWP) than CO_2, should be minimized.

5.2.7 Solid Waste

5.2.7.1 Construction

During the construction period, solid waste will be generated from the actual construction activities (packaging materials, excess materials, recovered materials, among other waste) and from the workforce itself (waste in the form of food, wrappers, bottles, containers, cartons, and other disposable or personal items).

5.2.7.2 Mitigation

The workforce on site at any given time is relatively small (approximately 20no.) however the accumulative impact of waste generation can create a significant problem if mitigation measures are not made available.

- The construction site should have solid waste collection facility (disposal container) for the temporary storage of waste prior to its disposal later at an appropriate and designated location (e.g. the nearest such as council dump site).
- The storage yards should also be provided with solid waste disposal facilities such as waste bins or chutes.

5.3 IMPACTS ON HEALTH AND SAFETY

5.3.1 Noise

5.3.1.1 Construction

There will be noise and vibrations generated during the construction phase but it will be no different from that on any other typical construction site. The noise impact during construction is expected to be negative and short-term. The major receptors are expected to be the construction workers as well as any immediate neighbouring residential premises. Sources of noise will be trucks and the off-road vehicles in transit, use of compressor to break hard ground and the use of motorized chain saws for vegetation clearing.

The noise from the project vehicles is only significant in areas where the proposed line passes through dense settlements such as close to the towns (Mwingi, Garissa and Kitui). The noise from compressors will only be significant where hard ground breaking is carried out close to settlements (Mwingi and Garissa). Noise from the motorized chain saws will only be experienced in the wooded areas such as Mumoni Hills in Mwingi district but it will not be a significant impact since the density of settlements is not very high. Impacts of noise include noise-induced hearing loss for the project employees and nuisance for the affected settlements.

5.3.1.2 Operation

The acoustic noise produced by transmission lines is greater with high voltage power lines; High-voltage power lines (400-800kV) generate discharges producing what is known as a “corona effect” which in turn gives rise to crackling and frying noises that may even be audible in dry weather.

With this project noise impact from the power line will be insignificant as it involves the installation of 132kV voltage lines

5.3.1.3 Mitigation

- Noise reduction technologies - silencers/mufflers and provision of hearing protection devices for workers using equipment such as power saws (for vegetation clearing) and compressors.
- Strict observance of the established way leaves or right of way to avoid unnecessary disturbance to other land users.

5.3.2 Aircraft Navigation Safety

5.3.2.1 Construction and Operation

In Kenya, KCAA gives approval for tower heights to ensure safety of aircraft. Power transmission towers, if located near an airport, air strip, or known flight paths, can impact aircraft safety directly through collision, or indirectly through radar interference.

The tower heights for the tower structures to be erected are approximately 30-40m. Initial consultation with KCAA pointed out that that are about 10-15 airstrips within the study area; additionally there could be military installations also.

5.3.2.2 Mitigation

- Based on consultations with KCAA officials, a full clarification on whether or not the facilities mentioned will be impacted by the project is yet to be established. (The proponent has been informed of the same).
- KCAA advices that they will need to carry out an aerial survey of the proposed transmission line route in order to ascertain that it will not create an obstruction to flights into airstrips in the vicinity. The inspection will be undertaken by KCAA following payment of prescribed inspection fees.

(See correspondence with KCAA in the appendix section of the report)

5.3.3 Electromagnetic Field (EMF) Exposure

5.3.3.1 Operation

Perhaps the greatest fear for the people living in very close proximity to power lines is exposure to EMF. Scientific research on the effects of EMF on public health has not demonstrated clearly the existence of a significant risk, nor has it proven the complete absence of risk.

The finding and conclusions are that the field strength on a 132 kV line at the distance of exposure heights of 30-40m is less than what one would ordinarily be exposed to in a domestic setup.

5.3.3.2 Mitigation

In this context, the risk is insignificant however prudent avoidance is nevertheless recommended.

5.3.4 Maintenance of Transmission Line RoW

5.3.4.1 Construction and Operation

The rights-of-way (RoW) require annual maintenance to remove bush and tree growth beneath power lines so that towers and lines can be maintained. No chemicals (e.g. phytocides) will be used for clearing of vegetation and instead both manual (machetes and slashers) and power saws will be used.

The impacts of these operations therefore include physical hazards such as injuries sustained from the tools/equipment used, ergonomically problems from poor working posture, and dust inhalation, among others.

5.3.4.2 Mitigation

- Workers engaged in the task of clearing vegetation on the RoW should be provided with appropriate and adequate PPE (e.g. gloves, boots, dust masks) to protect against injuries and infections.

5.3.5 Electrocution from Live Power Lines

5.3.5.1 Operation

Lattice structure or conductor cable failure is the most catastrophic event that could occur in the operation of an electricity transmission system. It involves a sudden break in the structure and the rapid, uncontrolled exposure to medium to high currents leading to electrocution or loss of property through fires ignited by the fallen cables.

During maintenance activities, hazards most directly related to power transmission lines and facilities would occur as a result of electrocution 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 during maintenance activities.

The Proponent's maintenance staff are well trained in live work and follow the required occupational safety and health protocols in their routine; mitigation measures are nevertheless recommended.

5.3.5.2 Mitigation

- A maintenance system must be put into place to ensure the physical integrity of structures is maintained lest they give in to vagaries of weather and other physical factors.
- 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 with strict adherence to specific safety and insulation standards.
- Workers should not approach an exposed energized or conductive part even if properly trained unless: the worker is properly insulated from the energized part with gloves or other approved insulation, or the energized part is properly insulated from the worker and any other conductive object; or, the worker is properly isolated and insulated from any other conductive object (live-line work).
- Ensuring that all electrical safety precautions are adhered to and a tier system of authorization to handle or access energized parts will mitigate against accidental electrocution.

5.3.6 Working at Heights

5.3.6.1 Construction and Operation

During construction or maintenance works, workers will be involved in working at heights (on the transmission towers) and accidental falls from great heights can be fatal to the worker or result in incapacitating injury or disability.

The risk of this is minimal, however, because transmission lines rarely need maintenance and they are inspected mainly using aircrafts.

5.3.6.2 Mitigation

- 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;
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 meters above the working surface, but sometimes extended to 7 meters, depending on the activity). The fall protection system should be appropriate for the tower structure and necessary movements, including ascent, descent, and moving from point to point;
- Hoisting equipment should be properly rated and maintained and hoist operators properly trained;
- When operating power tools at height, workers should use a second (backup) safety strap;

5.3.7 Physical Hazards

5.3.7.1 Construction and Operation

The main aspects to be considered in site preparation activities include manual clearing of bushes (using slashers and machetes) for access through which conductor cables will be strung, manual preparations for the foundations of the lattice structures (pylons), stringing and maintenance of conductor cables at heights of approximately 30 - 40m and breaking of hard ground using compressors.

During the manual clearing of vegetation using slashers and machetes, excessive or prolonged use leads to 'white hand syndrome' which affects the palms of the worker to an extent that they are unable to engage in further physical tasks involving the hands. The manual digging for the foundations of the lattice structures is a highly physical and energy sapping activity. Prolonged digging and overexertion will lead to ergonomic issues relating to pains in the lower back and in the joints (of legs and hands/arms). Stringing of conductor cables during construction or maintenance activities is a function of work at height.

Potential injuries may result from slips and falls from heights of between 30 – 40 m which is the average height of the line in this project. Such falls will cause fractures that could lead to loss of ability to use limbs normally and in extreme cases fatalities.

The use of compressors in the areas of hard ground such as the stretch from Mwingi to Garissa, will subject the project employees to whole-body vibrations that may impair functions of the chest, abdominal organs, and musculoskeletal systems, contribute to fatigue and decrease concentration.

5.3.7.2 Mitigation

- Appropriate hand and foot protection (PPE) during the manual clearing of vegetation
- Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa while maintaining a balance with productivity
- Training of workers on how to identify dangerous vibrations of the compressor

5.4 SOCIO-CULTURAL IMPACTS

5.4.1 Public Participation

The Public consultation process involved visiting the areas along the 224 kilometre stretch along which the Wayleave for the transmission line will be sought. The stakeholders were identified and consulted with the objective of describing the existing socio-economic conditions within the proposed project area of influence and the immediate surroundings. This report includes information obtained through the various integrated formal and informal interviews held with project affected persons, development agencies, departmental heads, and other stakeholders.

In total, 170no household interviews (89no during the RAP study and 81no during the ESIA study) were conducted. In addition, 7no consultative Public Participation meetings were held at Thaana Nzau and Kiomo (Migwani division), 2no at Mwingi town (Mwingi Central division), Ngiluni market (Nguni division), Madogo Social Hall (Bangale and Madogo divisions) and Garissa County Council Hall (Garissa central division).

Public consultations were conducted from 13th to 18th October 2009, 26th to 29th November 2009, and again from 10th – 14th December. (See Consultation and Public Participation documentation in Annex III)

The specific objectives of the consultation process were:

- To create awareness on the proposed project
- To ask the local residents especially the Interested and Affected Parties about the problems they anticipate with the project and how these can be overcome
- To consult and gather recommendations from the local administration e.g. DC, DOs, Chiefs, Assistant Chiefs, Councillors, Village Elders and communities that have a stake in the project
- To provide an opportunity to all the communities in the areas where the proposed transmission line is expected to pass to raise issues and concerns pertaining to the project, and allow the identification of alternatives and recommendations.

5.4.1.1 Data Collection Methodology

The social assessment team used both qualitative and quantitative techniques to collect data and information on the social and economic status of the community, these included:

- A detailed desk study to establish and describe the socio-economic conditions within Masinga, Mwingi, Kyuso and Tana River districts. This secondary information was obtained from District Development Plans and the Poverty Reduction Strategy Papers. Most of these plans were drafts for the years 2008-2012.
- Key Informant Interviews and Semi-Structured Interviews were conducted with the DOs, Chiefs, Assistant Chiefs, Councillors and Village Elders.
- Open-ended questionnaires were administered to obtain views about the proposed project and its perceived impacts from households along the proposed transmission line. A cluster-random

sampling approach was used along the proposed Wayleave and also on whose homestead the 30 meters Wayleave would pass. For those households which were on the proposed transmission line and not reachable to be interviewed, the neighbours gave the team an estimated number of households, names and the villages.

- Public Barazas which were organised and chaired by the Chiefs and Assistant Chiefs.
- Transect walks, where possible were conducted to confirm the information from the discussion and observation were made on physical and environmental conditions.
- A check list of the information to collect from each category of the persons to be interviewed guided the collection of data throughout the field exercise. The data was analyzed manually, both at the field work stage as it was collected and at the end of the field work.

5.4.1.2 Summary Outcome of Interviews, Discussions and Public Consultations

These consultations revealed that the residents had no prior knowledge of the proposed project but had positive attitude towards the project and therefore approved it. Further, the project was approved by the local leaders and other opinion leaders.

The local population is willing to participate in ensuring success of the proposed project in a number of ways such as:

- Offering their land in exchange of “good” money whereby they will be adequately compensated at current market values
- Supplying both unskilled and skilled labour for the project
- Providing market for the electricity and ensuring its security by reporting electric faults and vandalism
- Creating awareness among community members on dangers of electricity and tempering with electricity lines

Despite the unwavering support accorded to the proposed project, stakeholders consulted raised red flag that they should be given the timeframe for the project implementation, involved and informed clearly and adequately so as to understand the compensation process and values of property. This calls for an all inclusive and participatory awareness creation and social engineering before and during project construction.

Some of the concerns raised during these meetings included:

- Modalities for land acquisition, compensation including values of property and resettlement
- Project time frame and advance notices especially to the PAPs with majority desiring to know when it will start because they see an opportunity to gain financially due to the current harsh economic situations while others want to prepare for the project consequences
- Need for adequate awareness creation and social engineering before and during project construction
- Employment of the local youth and therefore no need for “Importation” of unskilled and semi-skilled labour
- Putting appropriate signs “Danger” on each electric installation for information to residents

- Design route of the project to follow, as much as possible, uninhabited areas to ensure minimal disturbance, relocation, costs and electricity related accidents
- How communities will benefit other than power and if one can tap power directly from the line
- That an independent compensation committee to spearhead the grievance and verification exercise for each community should be formed.
- The security the PAPs will have over the new property that they will move to as some influential people may claim the property and fence it off
- Actions to be taken if the transmission line crosses public facilities such as schools,
- Why organised groups who applied for connection have not been provided with electricity and ways this project can consider reducing the cost of bringing power to such groups of people.
- The dangers of having the power line pass near home or on your land and compensations if injured during neo be communicated
- What happens to the existing generator (KenGen) at Garissa as it has polluted the area; there is carbon sedimentation on the nearby building
- Need to put measures put in place to control flooding as a result of water released from Kindaruma dam
- The project effects on the environment and alternative power planned for provision before the proposed transmission line is completed.

Public involvement in acquisition and resettlement process was emphasized. The general concern about delayed compensation was highlighted. Undervaluing of the structures, land and crops which was seen to be one of the recipes for grievances during implementation of the project was also discussed.

The PAPs cautioned Proponent against inadequate notices for relocation before project commencement. They recommended to be given 6-12 months notice. The PAPs also gave their views on the preferred mode of compensation (cash/property) and insisted that they would prefer to be settled within their vicinity.

The correspondents mentioned the following as being among the perceived challenges to the proposed project during construction, commissioning and operation:

Challenges during construction:

- Poor topography
- Inaccessibility and transportation of materials
- Land disputes in the acquisition process
- Language barrier
- Wild animals

Challenges during commissioning:

- Conflict over allocation of job opportunities
- Insecurity (vandalism, breakages and theft)

(Refer to Appendix III to see copies of the Public Participation Forms and Minutes of the Community Meetings that were held at various locations along the line route).

5.4.2 Visual Intrusion

5.4.2.1 Operation

Power transmission lines and associated accessories are necessary to transport energy from power facilities to residential communities, but may be visually intrusive to local residents. Visual intrusion as a result of the transmission line and towers was however not a major issue of concern based on the public consultations held with communities in the project areas.

5.4.3 Spread of Disease

5.4.3.1 Construction

During the construction phase of the project, construction personnel brought in from outside the community may be infected with HIV/AIDS and other sexually transmitted diseases, and could introduce these diseases to the community members they interact with.

5.4.3.2 Mitigation

- Provide counselling and testing for HIV/AIDS to incoming construction personnel
- Strengthen advocacy through awareness training in HIV/AIDS and other STDs; encourage the use of preventive measures such as condoms
- Avail condoms to construction staff.

5.4.4 Sites of Cultrual Heritage

5.4.4.1 Construction and Operation

Presently the National Museums of Kenya does not have records in their database of heritage sites in the project area. However, this does not mean that such sites do not exist. What it simply means is that no field survey has been conducted in that area.

Every parcel of land has the potential for heritage sites. Whether or not sites do exist has to be determined by a professional study as stipulated in The National Museums and Heritage Act of 2006, section 5, subsection (1) (n) which mandates the National Museums of Kenya to conduct, subject to provisions of the Environmental Management and Co-ordination Act, an environmental impact assessment of threatened heritage in areas earmarked for development.

5.4.4.2 Mitigation

- NMK advices that the identification of such sites must determined through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5, Subsection (1)(n) which mandates the National Museums of Kenya to conduct, subject to provisions of the Environmental Management and Co-ordination Act, an environmental impact assessment of threatened heritage in areas earmarked for development. NMK proposes that they should carry out a cultural heritage impact assessment survey in the project area. (See Appendix section for a copy of the correspondence).

- In the event that the Contractors or Proponent's staff encounter chance finds of physical cultural resources in the course of duty - during both construction and operational phases of the project - The National Museums of Kenya must be notified immediately and the resource protected from any interference or manipulation of any kind.

5.4.5 Land Acquisition

The transmission line project would lead to acquisition of land and resettlement of those whose structures are overhead traversed or lie within the 30 meters width along the 224 Kilometres. Similarly, access to land over passed by the transmission line will be limited. The project components that would require land acquisition and resettlement under this consideration include the transmission line corridor whose width is 30 meters and a length of 224 Kilometres.

5.4.5.1 Kindaruma – Mwingi 132 kV line Length 32 km:

This section of the proposed transmission line starts at Kindaruma Electricity Power Station (B1-0) in Kyondoni Sub-location (Masinga district), crosses the seasonally dry Kithyoko River near B1-3 before entering Thaana sub-location. The line then crosses the seasonally dry Nzuli River into Kairugu sub-location proceeds to Kiomo sub-location. From Kindaruma to 2Km after crossing Nzuli River, except in few areas, the transmission line pass through a wilderness of thick shrub bushes and cleared well terraced farms. However, within Kairugu and Kiomo sub-locations, the line follows the main road further via Malembo, Kwamasi and Kwakwanya, and further across a saddle point at the southern end of the Kiomo ridge, from where it turns west for the last 2 km up to Mwingi. The section consists of rural villages which rely on subsistence farming. The average household size is 6 with sub-location population density per km^2 ranging from 28 in Kairugu, Thaana 35, Kyondoni 42 and Kiomo (neighbouring Mwingi town) 85.

5.4.5.2 132 kV-line Mwingi - Garissa, 192 km:

This section of the proposed transmission line starts at EW1 a few meters to the North East of Tyaa river bridge. At EW2 the line turns due east towards EW3 6.7 km away and crosses Mwingi-Tseikuru C93 road at Mwingi Cottage Hotel. From this point, the line follows road tracks for over seven kilometres before following the Mwingi-Garissa road alignment to Madogo in Tana River district. This section portrays three settlement patterns:

- The urban sites including Mwingi town and Mutyangombe, Nguni, Ngiluni, Ukasi, Bangale and Madogo markets
- The permanently settled areas between Mwingi and Ukasi
- The uninhabited areas from Ukasi to Madogo

5.4.5.3 Mitigation

Loss of land and crops will be compensated; the Commissioner for Lands determines the amount of compensation to be paid for private land. A Resettlement Action Plan (RAP) study has been undertaken for the proposed project in accordance with the legal framework of the Government of Kenya, and in line with the requirements of the World Bank's OP 4.12 (Involuntary Resettlement) and the IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement as required. The PAPs must be:

- informed about their options and rights pertaining to resettlement;
- consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and
- provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.

5.4.6 Resettlement of Project Affected Persons (PAPS)

5.4.6.1 Construction and Operation

The proposed transmission line will have impacts in the three provinces of Eastern (Masinga and Mwingi districts), Coast (Tana River district) and North Eastern (Garissa district). The socio-economic survey process was undertaken over a period of three months from October – December 2009. The survey team traversed the entire transmission line corridor - a 224 kilometre stretch, where the wayleave for the transmission line will be concessioned.

The stakeholders and project affected persons (PAPs) were identified and consulted with the objective of describing the existing socio-economic conditions within the proposed project area of influence and the immediate surroundings, as well as identifying the extent to which the project would have to deal with human settlement relocation and compensation issues. In general, Project Affected Persons were grouped into four broad categories namely, those:

- Whose whole land, farms and housing structures will be fully acquired
- Whose land and farms will partially be acquired but housing structures remain
- Whose land and farms will partially be acquired including housing structures
- Who will be affected by the changed environment as they co-exist with the transmission line
- Whose businesses and livelihoods will be transformed

From the field survey conducted, it is expected that the Project shall mostly affect through construction of the transmission line, 3no districts, 6no divisions, 8no locations and 11no sub-locations. In effect, a total of 239no households will lose land, 89no will lose dwellings and/or business structures, 23no will lose crops, and 9no will loss businesses.

Following the consultation process on the transmission line corridor, most of the PAPs did not want to be resettled in a common area and instead asked to be compensated in monetary form so that they could purchase land in their preferred areas. Alternatively, they wanted to recommend to the Proponent their preferred areas of choice and let the government develop that land for them.

The Kindaruma-Mwingi-Garissa transmission line project is a linear development that will result in linear resettlement i.e. having linear patterns of land acquisition. In sparsely populated rural areas, a linear project such as the transmission line in subject, may have minimal impact on any single landholder. Linear resettlement contrasts with site specific resettlement because of the problems that frequently arise when resettlement actions have to be coordinated across multiple administrative jurisdictions and/or different cultural and linguistic areas. The administrative areas that will be impacted by the transmission line are presented in Table 12 below.

Table 12: PAPs By Administrative Location and Impacts

District	Division	Location	Sub-location	Number of households faced with various impacts by the project			
				Loss of land	Loss of buildings	Loss of crops	Loss of business
Yatta	Masinga[3]	Kivaa	Kyondoni	17	4	3	-
Mwingi	Nguni	Ukasi	Ukasi	17	1	1	1
			Mbuvu	4	1	1	1
			Mwasuma	25	8	8	-
	Central	Mwingi	Eenziu	3	3	3	-
		Eendui	Kathoka	29	-	-	-
		Kiomo	Kiomo	54	9	6	2
			Kairugu	18	3	-	3
	Migwani	Thaana	Thaana nzau	9	1	-	-
Tana River	Madogo	Madogo	Madogo	52	52	1	2
	Bangale	Bangale	Bangale	11	7	-	-
Total	**6**	**8**	**11**	**239**	**89**	**23**	**9**

Source: Field survey

Mitigation

- Compliance with the World Bank's OP 4.12 which states that: "Where large-scale of population displacement is unavoidable, a detailed resettlement plan, timetable, and budget are required. Resettlement plans should be built around a development strategy and package aimed at improving or at least restoring the economic base for those relocated. Experience indicates that cash compensation alone is normally inadequate. Voluntary settlement may form part of a resettlement plan, provided measures to address the special circumstances of involuntary resettlers are included. Preference should be given to land-based resettlement strategies for people dislocated from agricultural settings. If suitable land is unavailable, non land-based strategies built around opportunities for employment or self-employment may be used".
- A number of efforts will have to be instituted to minimize resettlement including: realigning and/or rerouting the transmission line; hiring existing rental houses instead of establishing camps; and establishing access roads on existing tracks for construction vehicles working on the transmission line. This in effect will significantly reduce disturbance and resettlements and therefore lower the costs for the proposed project.
- Modalities for land acquisition, compensation including values of property and resettlement need to be clearly communicated and adequately understood by the PAPs, who should be involved right from the start. Awareness creation should thus be conducted before and during project construction.
- In order to benefit the local population and meet the objective of poverty reduction in the project areas, the locals should be given first priority in employment of [unskilled] labour.

[3] Currently in Masinga district

- Public involvement in acquisition and resettlement process as well as making prompt compensations should be prioritized, while giving adequate notices in advance.

5.5 ANALYSIS OF IMPACTS

Impacts to the environment could be positive or negative, direct or indirect, reversible or irreversible. The extent of environmental impact is determined by its significance, adversity, temporary or permanent, long-term or short-term, localised or widespread.

Some impact mitigation has already been proactively addressed in the design while others would be undertaken through considered incorporation in the implementation of the project and guided by the Environmental and Social Management Plan developed under this report.

The table below provides a snapshot view of the anticipated impacts (both positive and negative) of the proposed project:

Table 13: Impact Assessment Matrix

Aspect/Impact	Positive (+) Negative (-) Insignificant (/)	Direct (D) Indirect (i)	Permanent (P) Temporary (t)	Major (Mj) Minor (m)	Occurrence	
					Construction	Operation
Job creation	+	D , i	t	Mj	●	
Electricity connection to national grid	+	i	P	Mj		●
Reduced power outages/better capacity	+	D	P	Mj		●
Improved security and lighting	+	i	P	Mj		●
Improved living standard/ reduce poverty	+	i	P	Mj		●
Improved income generating activities / Industry growth	+	i	P	Mj		●
Terrestrial Habitat Alteration	-	D	t	m	●	
Aquatic habitat alteration	/	i	t	m	●	
Wildlife: - avifauna mortalities	-	i	P	m		●
Soil erosion	-	D	t	m	●	
Air pollution (dust, exhaust emissions)	-	i	t	m	●	
Hazardous substances	-	i	t	m		●
Generation of Solid Waste	-	D	t	m	●	
Noise pollution	/	D	P	m	●	●
Aircraft navigation safety	-	i	P			●
EMF exposure	/	i	P	m		●
Maintenance of Rights-of-Way	-	i	t	m		●
Risk of electrocution from live power lines	-	i	t	m		●
Risk from working at heights	-	D	t	m	●	●
Physical hazards	-	D/i	t	m	●	●
Visual intrusion	/	D	P	m		●
Spread of diseases	-	i	t	m	●	

Aspect/Impact	Positive (+) Negative (-) Insignificant (/)	Direct (D) Indirect (i)	Permanent (P) Temporary (t)	Major (Mj) Minor (m)	Occurrence	
					Construction	Operation
Sites of cultural heritage	/				●	
Land Acquisition	-/+	D	P	M	●	
PAP Resettlement	-/+	D	P	M	●	

An analysis of the identified potential impacts was undertaken in order to enable the discrimination of impacts as highly significant, low significance and medium significance.

The table below shows how the basis on which scoring of risk factors was carried out:

Table 14: Scoring of risk factors

Population	Impact to < 50 persons at any instance and location	Impact to 50-100 at any instance and location	Impact to >100 at any instance and location
	1	2	3
likelihood	Not likely at any instance and location	Fairly likely at any instance and location	Certain at any instance and location
	1	2	3
frequency	Occurs rarely at any location	Occurs occasionally at any location	Occurs continuously/routinely at any location
	1	2	3
Severity	requiring one-time mitigation measure	Requiring routine mitigation measures	Requiring ongoing monitoring and mitigation
	1	2	3

The significance of each impact is estimated using the product of the values assigned to the factors. For example, if an impact scores 1 for population, 2 for likelihood, 3 for frequency and 3 for severity – the overall significance is given by the product 1 x 2 x 3 x 3 = 18. The highest possible significance is therefore 81 (all factors scoring 3) and the lowest is 1 (all factors scoring 1). The level of significance to be assigned is given below:

SIGNIFICANCE SCORE	LEVEL OF SIGNIFICANCE
1 - 18	Low
Greater than 18 but less than 36	Medium
Greater than 36	High

Aspect/Impact	Significance
Job creation	high
Electricity connection to national grid	high
Reduced power outages/better capacity	high
Improved security and lighting	high
Improved living standard/ reduce poverty	high
Improved income generating activities / Industry growth	high

Aspect/Impact	Significance
Terrestrial Habitat Alteration	low
Aquatic habitat alteration	low
Wildlife: - avifauna mortalities	low
Soil erosion	low
Air pollution (dust, exhaust emissions)	low
Hazardous substances	low
Generation of Solid Waste	low
Noise pollution	low
Aircraft navigation safety	low
EMF exposure	low
Maintenance of Rights-of-Way	low
Risk of electrocution from live power lines	low
Risk from working at heights	low
Physical hazards	low
Visual intrusion	low
Spread of diseases	low
Sites of cultural heritage	low
Land Acquisition	high
PAP Resettlement	high

6.0 ASSESSMENT OF ALTERNATIVES

6.1 GENERAL

The consideration of alternatives is one of the more proactive sides of environmental assessment - enhancing the project design through examining options instead of only focusing on the more defensive task of reducing the adverse impacts associated with a single design.

The analysis of alternatives should yield a well-informed decision on the optimal project design, based on consultations with stakeholders and experts. This calls for the comparison of feasible alternatives for the proposed project site, technology, and/or operational alternatives. Alternatives may been compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, acceptability by neighbouring land users, among other pertinent factors.

Alternatives usually involve options regarding alignment, routing, construction methods, materials used, landscaping, and so forth, while the basic project concept remains constant. Frequently, two to three alternatives are chosen, and within these there may be several other alternative treatments for specific features, which may also be considered as separate alternatives.

6.1.1 The 'No Action' Alternative

The 'No Action' Alternative maintains the status quo; any social and economic development benefits from the transmission line project would be foregone. The potential adverse impacts associated with the project would however not occur.

6.1.2 The Proposed Option

KPLC has undertaken a feasibility study and has investigated several alternative routes for the development. The proposed route was identified as best for the proposed transmission line through an analysis of alternatives taking into account economic and financial analyses, load forecasts, system analyses, as well as environmental and social impacts. (Norconsult As, 2009).

The implementation of the 132kV Transmission Line from Kindaruma-Mwingi-Garissa is the preferred alternative in improving the performance of the national grid network to cater for the increasing load and demand for power. Although there is justification of the proposed transmission line and the project is recommended for implementation, there are environmental and social issues associated with the construction and operation of the proposed project.

6.1.3 Alternative Line Route

Preliminary assessment of the transmission line revealed that approximately 31no dwelling structures, 7no business structures and 1no social site, were to be relocated to pave way for the project. The ESIA and RAP have since established that the line follows relatively best alternative given prevailing

ground conditions. However, recommendations are hereby being made to avoid or minimize relocation, resettlement and disturbance, by suggesting rerouting sections of the transmission line that have the potential to save approximately KSh. 39,076,400.

The recommended rerouting will affect the sections tabulated here below:

Table 15: Sections for Rerouting the Transmission Line and Justification

Original routing Section	Proposed alternative	Reasons for alternative proposal	Amount of funds saved excluding disturbance costs
80 meters from the road at Kairungu market -	Push the TL to 150-200 meters further from the road alignment	Avoid three shops, Kairungu dispensary and Kairugu Catholic Church	3,128,300
Between B1-7 and EW1, the line crosses Nairobi- Mwingi route twice	Join the two points direct	Avoid three dwelling structures Avoid disturbance to road users Avoid the high potential heavily cultivated land to the south of Tyaa river	-
From Mwingi-Tseikuru road crossing for app. 1 km East along a cattle track	Realign the transmission line 100 meters to the north along the a cattle track	Avoid three major permanent and four low class dwellings and a business structure Avoid a mango farm	8,257,400
Bangale town where the line is about 120 meters from the road alignment	Realign the transmission line 300 meters from the road alignment	Avoid several dwellings and formal and informal business structures Reduce chances for accidents	357,100
Madogo area where the transmission line crosses the town at the centre of the built-up area	The major 132 transmission line to be rerouted 700-1000 meters east of the Garissa-Nairobi road	Avoid displacement of dwelling structures Limit the level of disturbance within the already built up area	27,690,700
Total			39,076,400

Source: RAP Report

6.1.4 Comparison of Alternatives

Table below presents an assessment of all the alternatives mentioned above and makes comparison between their merits and demerits.

Table 16: Comparison of Alternatives

	Merits	Demerits
No Action Alternative	There will be no project implementation and its associated impacts on the biophysical and socio-cultural/economic environment	The objectives of the project and the expected socio-economic benefits that would be achieved by the project implementation would be foregone.

	Merits	Demerits
Proposed Action	The proposed project is expected to contribute to the Government's goal to increase electricity access to rural populations; the project shall lead to an improvement and expansion of the network to meet the growing demand; economic growth will be expected to have a corresponding increase.	The proposed option has the potential to create undesirable environmental and social impacts as described in Chapter 5 of this report. The Proponent shall be required to incorporate various mitigation measures (Chapter 6) in order to minimize/prevent these impacts and ensure sustainable development.
Proposed Alternative	More people will be positive about the project. Resettlement will be reduced by over 12% and social integration maintained. Residents' livelihoods, especially in high potential pocket areas will be left undisturbed.	Project implementation would be delayed to allow for new surveys. There is no guarantee that the recommended re-routing would yield the benefits as stated.

6.1.5 Mitigation for the Proposed Action

In view of the fact that this study identifies environmental and social impacts associated with the project as proposed, mitigation measures, including best environmental management practices have been recommended in this Report. When diligently implemented will help to protect the environment of the affected project area. Commitments included in this Report, as well as the EIA license and other authorisations that would be issued, are designed to avoid environmental damage in accordance with the Environmental Management and Co-ordination Act, 1999 and the World Bank safeguard policies.

7.0 ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING

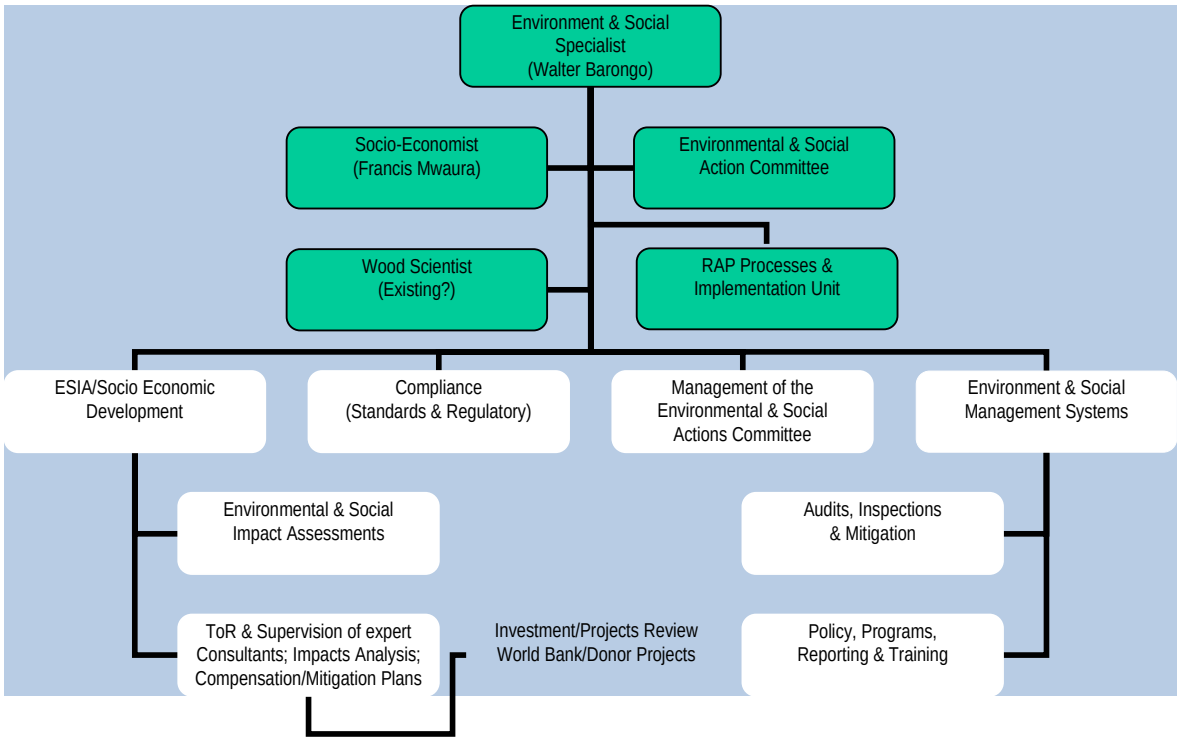
7.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT

Following the desk studies, field investigations and public consultations undertaken in this study, an Environmental and Social Management Plan (ESMP) has subsequently been developed. The ESMP provides a general outlay of the environmental and social aspects, potential impacts, mitigation measures, performance indicators, monitoring means and frequency, responsibility for monitoring and associated [estimate] costs.

The responsibility for the incorporation of mitigation measures for the project implementation lies with the KPLC Environment Unit, who must ensure that the Contractor implements all specified mitigation measures. In order for the Contractor to carry out environmental management activities during construction, the Contractor should draw up an environmental management plan of his own to show how he will address the mitigation measures during the construction period. The Supervising Engineer is responsible for assessing the Contractor's environmental management plan.

The figure below illustrates the organisation and mandate of the environmental unit within the SHE Department of KPLC:

Figure 2: KPLC- Environment and Social Function, SHE Department



Mandates
- Prevent work related injuries and illnesses
- Protect equipments from damage
- Promote environmental conservation
- Comply with relevant requirements

Mission
- To prevent work related injuries, illnesses and damage to equipment; to conserve the environment; and ensure compliance with relevant requirements.

Core values
- Safety conscious
- Customer focus
- Results driven
- Innovation
- Professionalism
- Teamwork

Vision
- To attain a world class safe & healthy work environment for all.

7.2 MONITORING ENVIRONMENTAL AND SOCIAL PERFORMANCE

Monitoring is a long-term process, which should begin the start of construction of the Transmission Line and should continue throughout the life of the project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. Monitoring involves the continuous or periodic review of construction, operation and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

Simple monitoring systems should be set up during construction by the Environment Unit so that potentially environmentally problematic areas can be detected well in advance and the appropriate remedial action taken. This could simply be a checklist of items that need to be inspected as a matter of routine, or periodically, depending on the nature of the aspect. The types of parameters that can be monitored may include mitigation measures or design features, or actual impacts. In some cases, monitoring is fairly straightforward and can be done as part of routine or periodic maintenance. However, other parameters, particularly those related to socio-economic and ecological issues can only be effectively assessed over a more prolonged period of say 3 to 5 years.

7.2.1 Environmental and Social Managment Plan Matrix

The Tables overleaf describe parameters that can be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action.

Table 17: Environmental and Social Management Plan Matrix – Construction and Operations Phase

Potential environmental and social impacts	Mitigation Measures	Responsibilities for implementing the mitigation measures	Responsibilities for monitoring the mitigation measures	Time horizon	Capacity building and training needs	Related cost estimates (KSh)
Terrestrial Habitat Alteration	Re-vegetation of disturbed areas with native plant species;	Contractor	Supervising Engineer	construction		Re-vegetation approx. 100 per sq m.
Terrestrial Habitat Alteration	Use human labour as opposed to heavy machinery	Contractor	Supervising Engineer	construction		Manual labour 200-500 per day
	Selective removal of tall-growing tree species and the encouragement of low-growing grasses and shrubs in transmission line rights-of-way;	Contractor	Supervising Engineer	construction		
	Vegetation management should not eradicate all vegetation; excessive vegetation maintenance may increase likelihood of the establishment of invasive species.	Supervising Engineer	Supervising Engineer	operations		
Aquatic habitat alteration	Minimizing clearing and disruption to riparian vegetation.	Contractor	Supervising Engineer	construction		
Power line related avifauna mortalities	To minimize collision, undertake wire-marking to alert birds to the presence of power line, allowing them time to avoid the collision.	Design Engineer, Supervising Engineer	Supervising Engineer			Wire markers @ 5000
	Build raptors platforms on top of pylons for roosting and nesting	Design Engineer, Supervising Engineer	Supervising Engineer			Platforms @ 5000
	Monitor data on electrocuted avifauna along the proposed transmission line	KWS, NMK, Nature Kenya,	Environment Unit	operations	Birdlife conservation	Research survey/ data/ literature 20,000

Potential environmental and social impacts	Mitigation Measures	Responsibilities for implementing the mitigation measures	Responsibilities for monitoring the mitigation measures	Time horizon	Capacity building and training needs	Related cost estimates (KSh)
Soil erosion	Soils excavated for the erection of towers should be used for re-filling and should not be left exposed to wind or water for long periods	Contractor	Supervising Engineer	construction		watering soil heaps: 1000 per 1000 litres
	Riverine vegetation should be minimally disturbed during the construction phase to reduce soil erosion and safeguard riverbank protection	Contractor	Environment Unit	construction		
	Re-plant degraded areas with local species to improve ground cover.	Contractor	Environment Unit	construction		Re-vegetation approx. 100/- per sq m.
Air Pollution (dust, fuel emissions)	Control speed of construction vehicles	Contractor	Contractor	construction	Occupational safety and health	Training: 5000 per person per day
	Prohibit idling of vehicles	Contractor	Contractor	construction		
	Water should be sprayed during the construction phase on excavated areas	Contractor	Supervising Engineer	construction		Watering soil heaps: 1000 per 1000 litres
	Regular maintenance of plant and equipment.	Contractor	Supervising Engineer	construction		Vehicle service @ 3,000-10,000
	Provision of dust masks for use when working in dusty conditions	Contractor	Supervising Engineer	construction and operations		Respiratory protection @ 100
Hazardous substances	Use of designated areas for repair and maintenance of vehicles and powered machinery to avoid oil spills	Contractor	Supervising Engineer	construction	environmental management	Training in EM: 5000 per person per day

Potential environmental and social impacts	Mitigation Measures	Responsibilities for implementing the mitigation measures	Responsibilities for monitoring the mitigation measures	Time horizon	Capacity building and training needs	Related cost estimates (KSh)
Management of Solid Waste	provide solid waste collection facility (disposal container) for the temporary storage of waste prior to disposal at an appropriate and designated location	Contractor, Supervising Engineer	Environment Unit	construction and operation	environmental management	Waste bin @ 1000
	The storage yards should also be provided with solid waste disposal facilities such as waste bins or chutes	Contractor, Supervising Engineer	Environment Unit	construction and operation		
Noise pollution	Noise reduction / hearing protection devices when working with noisy equipment	Contractor	Environment Unit		occupational safety and health	Noise protection devices @100; Training on OSH: 5,000 per person per day
	The right-of-way or way leave must be strictly adhered to mitigate the effects of the unwanted noise	Contractor	Supervising Engineer			
Aircraft navigation safety	conduct survey to ensure TL does not obstruct flights into airstrips in the vicinity	Design Engineer	Environment Unit	design		KCAA survey 15,000
	Obtain KCAA approval for mast heights	Design Engineer	Environment Unit	design		
Electrocution from Live Power Lines	Ensure physical integrity of structures is maintained	Supervising Engineer	Safety officer	operation		
	Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;	Maintenance Mgr	Safety officer	operation	Occupational safety and health	OHS Training: 5,000 per person per day
	Ensuring that live-wire work is conducted by trained worker only	Maintenance Mgr	Safety Officer	operation	Live line work	Training in live work 5,000 per person per day

Potential environmental and social impacts	Mitigation Measures	Responsibilities for implementing the mitigation measures	Responsibilities for monitoring the mitigation measures	Time horizon	Capacity building and training needs	Related cost estimates (KSh)
	Ensure the worker is properly isolated and insulated from any other conductive object (live-line work).	Maintenance Mgr	Safety officer	operation		PPE @ 10,000
Working at heights	Testing structures for integrity prior to undertaking work;	Maintenance Mgr				
	Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures;	Maintenance Mgr	Safety officer	operation	Tower climbing, fall protection, OHS	Training: 5000 per person per day
	Inspection, maintenance, and replacement of fall protection equipment;	Maintenance Mgr	Safety officer	operation		Initial integrity tests 10,000
	Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects.	Maintenance Mgr	Safety officer	operation		Climbing equipment @ 25,000 ; PPE 10,000
Physical Hazards	Appropriate hand and foot protection (PPE) during the manual clearing of vegetation	Contractor	Contractor	construction		
	Adopting ergonomic work flow designs that fit physical tasks to employees and not vice versa while maintaining a balance with productivity	Maintenance Mgr	Safety Officer	operation	OHS	Training OHS: 5000 per person per day
Spread of Diseases	Education, guidance and counselling on HIV/AIDS and other STDs – construction staff	Contractor	Safety Officer	construction	HIV/AIDS Awareness	Medical screening approx. 1,000; Education – approx. 2,000 per person per session

Potential environmental and social impacts	Mitigation Measures	Responsibilities for implementing the mitigation measures	Responsibilities for monitoring the mitigation measures	Time horizon	Capacity building and training needs	Related cost estimates (KSh)
	Avail condoms to construction staff	Supervising Engineer		construction		Condoms @5/-
Sites of cultural heritage	Conduct a cultural heritage impact assessment survey in the project area. In the event of chance finds of physical cultural resources, notify the National Museums of Kenya immediately - the resource must be protected from any interference or manipulation of any kind.	Socio-economist Contractor, Supervising Engineer	Socio-economist	construction construction		Survey: 20,000
Land acquisition and Resettlement	Ensure that the displaced persons are: - informed about their options and rights pertaining to resettlement; - consulted on, offered choices among, and provided with alternatives; - provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project. - offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living; - provided with development assistance in addition to compensation measures;	KPLC, GoK	Environment Unit	construction		Approx. 114 M for land acquisition

Table 18: Environmental and Social Management Plan Matrix - Decommissioning

Potential Impact	Proposed Mitigation	Monitoring Means and frequency	Responsibility for Monitoring	Performance Indicator	Cost (KSh)
NOISE					
Vehicular	Control of speed	Random checks	Supervising Engineer	Number of Public complaints	Nil
Compressor	Provision of hearing protection devices	Regular inspection	Supervising Engineer	Number of Public complaints	@ 200
PHYSICAL HAZARDS					
Physical Hazards	adopting ergonomic work flow designs that tend to fit the physical tasks to the workers and not vice-versa while maintaining a balance with expected productivity	Regular inspection and re-design of work flow	Supervising Engineer	Number of ergonomic-related complaints	Nil
AIR POLLUTION					
Air Pollution					
Cement Dust	Provide appropriate hand, respiratory and body protective devices	Periodic inventory of personal protective equipment	Supervising Engineer	Number and status of existing PPE	@600 – 200 each for the hand, respiratory and body protection devices for each worker
Vehicular	Proper service of project vehicles	Service schedules e.g. every 5,000 km for off-road vehicles and every 3,000 km for truck	Supervising Engineer	Service tags	@ 5,000 and 10,000 for off-road vehicles and trucks respectively

7.3 DECOMMISSIONING PHASE

The decommissioning phase also known as the "deconstruction," is part of the (eventual/ultimate) reversal phase, which has the additional and often dominant risk factors associated with the materials processed/produced during the life of the project (e.g., toxic and/or explosive chemicals, etc), as well as the potentially decreased structural integrity due to renovations and/or wear and tear.

Similar impacts encountered during the construction phase will be experienced in much the same way when the reverse process is set in motion. The table below gives an analysis of the decommissioning impacts expected in the proposed Kindaruma-Mwingi-Garissa 132 KV Transmission Line Project:

Table 19: Impact Analysis – Decommissioning Phase

Aspect	Health And Safety Impact	Significance Level
Noise	Reduced hearing due to high noise from decommissioning activities – deconstruction such as vehicular noise and site remediation noises	Low
Air Pollutants	Acute/chronic respiratory disease caused by CO2, CO, NOx, and VOCs released by combustion engines during transportation and by obnoxious respirable particles released by speeding trucks during transportation of debris	Low
Air Pollutants	Acute/chronic respiratory disease caused by pollutants (cement, caustics, isocyanides – lung sensitizers) released during de-construction of storage facilities and disassembly of superstructures	Low
Water Pollutants	Public health problems as a result of consuming heavy metal contaminated drinking well water from oils, greases, hydrocarbons deposited on roads sides and leached into drinking water wells by rain water	Low
Water Pollutants	Public health problems due to decommissioning activities that pollute potential drinking water wells	Low
Traffic Accidents	Traffic related mortality and morbidity from transportation activities	Low
Physical Hazards	Injuries resulting from physical hazards such as slips, trips, and falls from a tall cabin, cabin ladder, or trailer; Injuries due to accidental bumping into unguarded rigid parts of truck or cargo; Injuries while performing field repair-work, tire change, unfastening tight bands and ropes, etc.)	Low
Physical Hazards	Injuries resulting from physical hazards encountered by truck drivers such as chemical corrosion by dangerous chemicals such as transformer oil	Low
	Injuries resulting from physical hazards encountered by truck drivers such as explosion of over-inflated tires or car battery	Low
Ergonomic Hazards	Injuries due to poor ergonomic considerations such as pains in the low back and in the joints caused by prolonged driving; Over-exertion while moving or otherwise handling bulky and heavy loads/equipment; visual discomfort and eye problems caused by inadequate illumination and eyestrain; development of lumbago due to poor vehicle suspension/ uncomfortable seat, etc.	Low
Wild animals	Injuries resulting from attacks by wild animals (buffaloes, rhinos, crocodiles etc) as a result of decommissioning activities within the habitat of such animals	Low

Unstringing cables	Injuries/fatalities due to falls from height; puncture to the skin tissue and scratches	Low
Work at height	Injuries due to falls from height while maintaining power lines and base stations	Low

7.4 CAPACITY BUILDING AND TRAINING

The effective implementation of the Environmental Management Plan of the project will require capacity and awareness building. While the Proponent must ensure that capacity and awareness building, mitigation measures and monitoring concerns are implemented, actual training activities should be the responsibility of the Supervising Engineer, who may have to commission external consultants to carry out the training component. This can be achieved by targeting specific groups for the necessary training.

Table 20: Target Groups for Capacity Building and Training

Target Group	Description
Group A	Transmission line (TL) Workers: This group consists of Engineers (Resident, Provincial, Project,) Contractors, Supervisors, Site Agents, Site Managers and the Environmental unit in KPLC. These should ideally comprise the top management staff concerned with the transmission line construction and maintenance.
Group B	TL Workers: Foremen, headmen, skilled and unskilled labourers.
Group C	Maintenance team: For this group of people, working on the TL is their core activity.
Group D	Project Affected People (PAP): area residents, farmers, pastoralists, people who have businesses that can potentially be affected by the TL, or they live close by the line route.

7.4.1 Training Objectives

Training will be based on modules aimed at:

- Developing awareness of the need to consider environmental issues during construction, operation and maintenance of the transmission line
- Creating awareness and understanding of the environmental legal framework pertaining to power transmission lines and energy
- Developing skills for identification and assessment of environmental, social, safety and health impacts of transmission line project
- Incorporation of mitigation measures at all stages of development
- Reviewing EIA reports and incorporating measures into decision making.

Arrangements for training in environmental awareness should be initiated as soon as possible. KPLC will either have to commission a consultant to carry out this training on site, at the Head Office, or personnel could undertake the environmental training and then in turn he/she trains other personnel.

The table below presents the recommended topic modules and costs for each of the four target groups necessary to implement the Environmental Management Plan.

Table 21: Recommended topic modules and costs for each of the target groups

Topic modules	Target Group	Estimated Cost per person, per unit (KSh)
Understanding of legislation in Kenya, as relevant to the project Understanding of the project cycle and how the EIA/incorporation of mitigation measures fits into the cycle Develop awareness of the environmental implications of TL construction and maintenance activities and procedures for assessing them Develop awareness and understanding of the human resource and institutional arrangements for pre-empting and managing environmental impacts Importance of incorporating mitigation measures during planning and design and implementing an environmental monitoring programme Impart skills on environmental monitoring and auditing during construction and maintenance Need for gender balance during recruitment of labourers Cultural aspects of target groups	Group A TL Workers	7,500
General understanding of legislation in Kenya as relevant to the project Sensitisation on health (STDs including HIV/AIDS), littering, solid and liquid waste management Types of environmental, social, occupational safety and health impacts that could be generated by these target groups Cultural aspects of target groups	Group B / C TL Workers / Maintenance Team	5,500
Brief overview of the project cycle Understanding of EMCA 1999 and the EIA process Legal implications of encroachment onto the TL reserve Process for compensation and relocation/resettlement if necessary, (eligibility for compensation, compensation valuation and payment procedures; grievance redress mechanisms)	Group D PAP	2,000

8.0 CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

8.1 GENERAL CONCLUSIONS

- The proposed project is expected to have impacts on various aspects of the environment as well as the socio-cultural/economic status of the project affected parties. These anticipated impacts are discussed in Chapter 5.
- Mitigation of potential impacts (environmental and social) as described in Chapter 6, and implementation of the ESMP presented in Chapter 7 of this report, will help to prevent or avert negative impacts, and enhance the positive outcomes of the project. This will help to achieve project sustainability.
- The responsibility for the incorporation of mitigation measures for the project implementation lies with the Supervising Engineer, who must ensure that the Contractor implements all specified mitigation measures.
- The World Bank's OP 4.12 on Involuntary Resettlement and Government of Kenya guidelines will be followed and used complementarily where applicable to avoid conflict.
- Community participation in planning and implementing resettlement will be encouraged;
- A Compensation and Resettlement Action Plan will be developed addressing land, housing, crops, and other compensation to be provided to the adversely affected population.
- A monitoring and evaluation mechanism for resettlement activities will be carried out.
- Diligence on the part of the contractor and proper supervision by the Supervising Engineer during construction and the initial operation period is crucial for mitigating impacts. However all mitigation measures need to be specified in tender and contract documents, and must be included in the Engineering Drawings, Specifications and Bills of Quantities.

8.2 GENERAL RECOMMENDATIONS

Avoidance of negative environmental impacts should be the Proponent's priority. Impacts can be avoided completely by a "no-project" alternative, but it should be recognized that even existing transmission lines have impacts on their surrounding environment; these impacts can increase over time with economic growth and development, however their effect on the environment may be reduced by maintenance, rehabilitation, design and construction actions.

8.2.1 Additional Surveys to be Conducted

NMK advices that the identification of such sites must determined through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5, Subsection (1)(n) which mandates the National Museums of Kenya to conduct, subject to provisions of the Environmental Management and Co-ordination Act, an environmental impact assessment of threatened heritage in areas earmarked for development. NMK proposes that they should carry out a cultural heritage impact

assessment survey in the project area. (See Appendix section for a copy of the correspondence). In the event that the Contractors or Proponent's staff encounter chance finds of physical cultural resources in the course of duty - during both construction and operational phases of the project - The National Museums of Kenya must be notified immediately and the resource protected from any interference or manipulation of any kind.

KCAA advices that they will need to carry out an aerial survey of the proposed transmission line route in order to ascertain that it will not create an obstruction to flights into airstrips in the vicinity. The inspection will be undertaken by KCAA following payment of prescribed inspection fees. (See Appendix section for a copy of the correspondence).

8.2.2 Minimising Resettlement and Associated Cost

The ESIA and RAP have since established that the line follows relatively best alternative given prevailing ground conditions, however, recommendations have been made in section 6.1.3 to avoid or minimize relocation. The recommended rerouting will significantly reduce disturbance and resettlements and therefore lower the costs for the proposed project. Benefits include:

- More people will be positive about the project.
- Resettlement will be reduced by over 12% and social integration maintained.
- Residents' livelihoods, especially in high potential pocket areas will be left undisturbed.

8.2.3 Mitigation

Mitigation is the lessening of negative environmental impacts through:
a) changes in the design, construction practices, maintenance, and operation of a project; and
b) additional actions taken to protect the biophysical and social environment, as well as individuals who have been impacted adversely by a project.

The extent and timing of mitigative actions should be based on the significance of the predicted impacts. Some aspects of impact mitigation can be incorporated into project design and can largely resolve the threat of impacts before construction commences.

However, many measures require an ongoing implementation plan to ensure that proposed actions are carried out at the correct times, that environmental measures such as planting and slope protection are maintained, and that prompt remedial actions are taken when the initial measures are not fully successful.

Some measures may not be the exclusive domain of the Proponent; Government departments, local authorities, neighbouring communities, businesses, non-governmental organizations, and the legal system may all be involved in their design and implementation of these mitigation measures. Clear definition of responsibilities, funding, and reporting requirements can help to ensure the success of such measures.

8.2.4 Compliance Monitoring

During construction, all mitigative measures designed to reduce the impact of the construction activities should be monitored and enforced by the environmental monitoring authorities. This requires:

- defining the proposed mitigative and compensatory measures;
- specifying who is responsible for the monitoring activity;
- including implementation of mitigative measures in contract specifications;
- making environmental competence one of the selection criteria for contractors; and briefing, educating, and training contractors in environmental protection methods.

Compliance monitoring should not be confined to the right-of-way, but should cover all sites affected by the project, including disposal sites, materials treatment areas, access roads, and work camps.

8.2.5 Effects Monitoring (Evaluation)

After mitigative measures are implemented, effects monitoring or evaluation can test the validity of hypotheses formulated in the environmental impact study; they can also determine if the mitigative measures have achieved their expected results. Evaluation is necessary not only for individual projects, but also to advance methodology, assist in designing future studies, and through lessons learned -contribute to the relevance and cost-effectiveness of environmental protection measures. Responsibility for corrective action to be taken in the event of mitigation failure should be defined clearly within the Proponent's organisation.

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