

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED ELDORET-KITALE 132KV TRANSMISSION LINE



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Otieno Odongo & Partners Consulting Engineers a registered firm of experts by the National Environment Management Authority, confirm that the contents of this report are a true representation of the Environmental and Social Impact Assessment of the proposed Eldoret-Kitale 132 kV Transmission Line

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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 achieve this, the transmission lines network are being considered for construction and upgrading which will have 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 Eldoret – Kitale Power Transmission, comprising the following:

- 132 kV line Eldoret – Kitale, 65 km

The proposed line will serve the Kitale town and its surrounding environment. The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction, operations and decommissioning stages. Otieno Odongo & Partners Consulting Engineers (OOP) was 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 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 132kV Transmission Line from Eldoret – Kitale.

Study Objectives

The main objective of KPLC is to construct a 132kV electricity transmission line from the Eldoret sub-station to Kitale in order to meet the increasing demand for electricity in the Kitale town and its surrounding environment while attaining the objectives of vision 2030. The specific objectives of this project include the following;

- 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.

Otieno Odongo & Partners Consulting Engineers (OOP) was assigned by The Kenya Power & Lighting Company Limited to conduct an Environmental and Social Impact Assessment (ESIA) study for the proposed 132kV transmission line from Eldoret to Kitale. This is in compliance with the legal requirements stipulated in the Environmental Management and Coordination Act of 1999 and its subsequent Legal supplements that require a proponent of a proposed project to assign a Lead expert or Firm of Expert to undertake an ESIA study.

The objective of this E&SIA study is to evaluate the potential environmental and social impacts of the proposed project and develop mitigation measures that aim at minimizing the negative impacts of the project while optimizing the positive impacts. The ESIA study findings cumulated into this ESIA report and a RAP document produced as a separate report.

KPLC's main function in the energy sector is to transmit, distribute and retail electricity to the end users. The electric power is sourced from power generating companies such as the Kenya Electricity Generating Power Company (Kengen) a governmental body and

Independent Power Producers such as the AGGRECO, Uganda Electricity Transmission Company (UETCL) located in Uganda among others.

Project Objective and Justification

According to the Least Coast Power Development Plan, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150 MW. The national economic growths have 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 4,852 GWh in 2003 (with sales of 3,801 GWh) to 5,195 GWh in 2004 (sales of 4,090 GWh). Maximum energy demand was projected at 5,641 GWh in 2006 and 24,957 GWh by year 2026. This overview gives a strong justification for the proposed Eldoret – Kitale 132 Kv transmission line. However, environmental and social implications as outlined under this report will give a detailed of environmental and social impact assessment and their integrated into the project design.

The main objective of KPLC is to construct a 132kV electricity transmission line from the Eldoret sub-station to Kitale in order to meet the increasing demand for electricity in the project area while attaining the objectives of vision 2030.

The Objective of undertaking the ESIA study is to:

- Identify and assess potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the proposed project and recommend measures for mitigation measures;
- Verify compliance with the environmental regulations and industry's standards;
- Generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle;
- Recommend cost effective measures to be implemented to mitigate against the expected impacts;
- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and 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; and
- To provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project

The ESIA objectives were met by the team of experts while undertaking the study and during documentation of the findings.

Project Description

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

- Extending the transmission of new 132 kV line from Eldoret – Kitale, as well as new and reinforced transmission 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 project proponent with considerations on the environmental and social impacts of the project as proposed.

The proposed project involves construction of approximately sixty five kilometers (65 km) stretch of a high voltage transmission line from Eldoret to Kitale. The proposed transmission line traverses through six districts namely Wareng, Eldoret North, Uasin Gishu, Lugari, Trans Nzoia West and Trans Nzoia East as shown on the way leave map under. The installation of the proposed line will require a way leave of about 60m throughout its stretch. The proposed way leave will be expropriated from the community members as no public land exists in the project area to meet the requirements of the proposed project. The area of land to be acquired from the community members' measures about 420 hectares (1050acres).

The electricity to be transmitted will originate from the Lessos Substation which gets its power from several power generators located both within the country and in neighbouring countries. The project development will include installation of components such as pylons/steel towers, dumpers, conductors, optical fibre, and circuit breakers among others. The project equipments to be used during construction will include crow

bars, spanners and ropes, mixer, vibrators, compressors and drills. These equipments will depend on manpower, batteries or fossil fuels to power them.

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.

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 desktop study involving the analysis of project maps and proposed line route, as well as literature review of previous studies along 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 project proponent has therefore commissioned this study in line with the provisions of EMCA, 1999.

Environmental Scoping: The screening 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 the 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:

- 346 household interviews were conducted along the project corridor
- In-depth interviews were held with district heads of departments, provincial administration, NGOs, CBOs and Faith based Organizations.
- Evaluation of the project setting and baseline conditions;
- Consultative Public Participation in Kipkaren, Kamagut, Kipkenyo, Chemalal, Soy, Mukunga, Moi Bridge, Waitaluk and Kapkoi
- 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;
- Report writing;
- Submission of Project Report to NEMA;

Study Team

As required by the Environmental Regulations (2003), this ESIA study was conducted by a NEMA-registered 'Firm of Experts' – Otieno Odongo & Partners Consulting Engineers. NEMA Reg. No. 0033. 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.

Study Findings

Land Use: The site walk assessment and surveys indicated that, the proposed transmission line traverse approximately 65km of land currently under different uses. The major land use traversed by the proposed line is privately owned agricultural land.

Other land uses in the project area included private and governmental institutions, schools, trading centers, public infrastructure among other uses. It was noted that the individuals with large parcels of lands including agricultural land can still put their land under the same purpose or other project friendly purposes after the installation of the transmission line.

Sensitive biological environmental: Environmental receptors identified within the project area during the site visits were rivers, springs, dams, swamps and resident birds. Site walks revealed that the project impacts on the sensitive environment will be minimum as the water bodies were small and they could be avoided during construction. The Karara swamp on river Nzoia was located over 900m away from the alignment of the proposed project and was separated from the project with existing settlements. No forests reserves were seen in the project area apart from small scale private forests and individual trees on private farms.

Public Consultations: The consultants held discussions with stakeholders including various head of departments in the districts relevant to the proposed project, the district administration and the community members. The objective of the discussions was to collect the stakeholders views on the proposed project. The discussions evaluated in depth the proposed project sites, the project impacts and mitigation measures for the project impacts. The general response of the stakeholders was that the proposed project is good for the economic development of the area. Despite that, they also gave their opinion on issues they would like prevented or mitigated against in order to ensure sustainability of the project. The issues requiring consideration according to the stakeholders included land expropriation and compensation; vegetating the project area, soil erosion prevention and rehabilitation/reinstallation of public amenities affected by the project.

Alternative project routes: According to the field survey, over 80% of the selected route for the transmission line was within farm land. This is an indication that the project will not in total displace or relocate PAPs in those areas. It was also noted that the route avoided sensitive environmental receptors as much as possible. Despite the aforementioned, the field observation and public consultation indicated that some project sections will require re-routing and these sections were:

Dense settlement area: - Community members residing in dense settlement areas which were also peri-urban and economic centres of the project area suggested that the lines traversing those areas be re-routed. After field surveys and consultations, the consulting team noted that the settlers in the densely populated areas occupy very small parcels of land which they also use for trading activities. In addition it was noted that the

residents in those areas especially those of the vulnerable age have lived in the area for several years thus it would be hard for them to settle elsewhere. To mitigate against resettlement and loss of livelihoods, the community members suggested that, the proposed line be re-aligned away from the peri-urban and trading centres to areas with farm lands. Areas with dense settlement and where relocation was of main concern are: Longisan, Kamagut, Matunda and Mois Bridge trading centres. The residents of the first two centres suggested that the line be moved further into Emkuen village while residents of the last two suggested that the line be moved away from the town.

Sensitive Production area and areas of special activities: The Kenya Ordnance Factory Corporation (KOFC) under the Department of Defense (DOD) one of the key stakeholders and who is also likely to be affected by the project suggested that the proponent observes a minimum distance of about 3km from the institutions boundary. The main reason of setting the condition on the minimum distance is because the institution produces sensitive ammunition products which are likely to cause explosions if it's surrounding is excessively charged. The management of the institution also added that they are located along a lightening path and location of the line within a 3km radius from the institution will increase chances of fire related accidents. The need of realigning the route of the proposed transmission line due to sensitive or special activities was also raised by 9KR another institution under the DOD. The organization stated that, the existence of the line within their compound shall affect their training activities/programmes.

Potential Environmental Impacts Evaluation

The study team evaluated the anticipated potential and likely impacts of the project on the bio-physical and the socio-economic environment. The impacts were categorised as positive or negative and their level of effect on the environment were also gauged. In general the study findings indicated that the positive project impacts shall outweigh the negative impacts if the mitigation measures aimed at minimizing or eliminating the negative impacts are implemented. Below is an outline of the anticipated project impacts which have been categorized into either positive or negative. The impacts have further been grouped according to the phase in which they are likely to occur in the project's life cycle namely construction or operation phase.

Anticipated Positive Impacts during Construction

- Creation of employment
- Creation of markets for project development materials
- Increased business opportunities for local traders
- Increased revenue to the Government through tax and duty payment

Anticipated Negative Impacts during Construction

- Interference with local infrastructure including access routes, power lines, water supply lines among others;
- Increase in fossil fuel consumption;
- Increase in emissions ; for example, noise, Green House Gases (GHG);
- Risks of fossil fuel spills and leaks from project vehicles and equipments;
- Increased exposure to risks and accidents;
- Loss of incomes due to interference with socio-economic activities;
- Loss of properties including land and housing;
- Loss of vegetation including crops, shrubs, trees;
- Relocation and separation of communities;
- Degradation of cultural practices;
- Increase in social vices and infectious disease including HIV/AIDS, STI's; and
- Increase in demand of materials including ballast, gravel among others

Anticipated Positive Impacts during Operation

- Creation of employment
- Increase in electricity supply
- Development of the project area for example opening of industries, increase in ICT use, use of irrigation among others
- Provision of cleaner sources of energy to the Kenyan market
- Improved micro-climate and, consequently improve in health, increased food security and rejuvenation of water catchment areas.

Anticipated Negative Impacts during Operation

- Increased exposure to Electromagnetic fields (EMF)
- Impacts on resident birds
- Risks of fire
- Electromagnetic interference with radio telecommunications systems
- Corona effect/Noise (Humming) and Ozone Emissions

Proposed Mitigation Measures

The proponent has committed efforts to ensure that the impacts of the proposed project are maintained within the acceptable standards. The mitigations measures for the anticipated impacts have been analyzed separately as those for socio-economic; EHS and Bio-Physical impacts. The mitigation measures for the Bio-Physical impacts have been further categorized as those related to avian, vegetation and air quality. To ensure

sustainability of the project, the proponent proposes to undertake the following mitigation measures:

Socio-Economic Mitigation

- Work within the acquired way leave in order to reduce spillover effects of the project to surrounding community member's property and existing social facilities;
- Work in collaboration with relevant government representative in the project area;
- Reinstall or rehabilitate social infrastructure removed or damaged due to the project development;
- Develop appropriate benefits for non-beneficiary community members residing in the project area. Benefits to be taken into consideration to include energy supply, installation of transformers, employment by giving the locals priority in terms of job allocations especially for activities requiring non-skilled labour;
- Compensate land and property owners for acquired land and/or measurable disturbance;
- Route the line to traverse less dense areas in order to minimize impacts on property loss, resettlement and destruction of cultural setup;
- Institute developed Resettlement Action Plan (RAP) and communicate project plans in acceptable time frame to all stakeholders;
- Conduct workshops at community level to facilitate impact monitoring on the environment, socio-economic and socio-cultural aspects;
- Enhance security in project area through community policing in collaboration with local community members;
- Develop Information Education and Communication (IEC) programmes on the projects social impacts and train community members to conduct awareness and training programmes with the help of the project team; and
- Develop programmes to enhance cohesion between project employees and the local communities for example development of sports activities.

Environment, Health and Safety Mitigation and EMF

- Employ trained and certified workers to install, maintain and repair electrical equipment;
- Employ trained and qualified machine handlers and drivers;
- Ensure work concerning handling of live wires is conducted by trained workers with strict adherence to safety standards;
- Avoid developing in areas of weak soil structure such as river riparian;
- Ensure strict access and controls to the electricity power lines and enforce way leave requirements for power lines;

- Deactivate and ensure live power distribution lines are properly grounded before maintenance work commences;
- Ensure that structures are tested for integrity prior to commencing work; and
- Implement fall protection programmes that include training in climbing techniques and the use of fall protection measures.

Bio-Physical Mitigation Measures

Avian collision and Electrocutation

- Install lines in horizontal circuit as opposed to vertical circuit;
- Maintaining a 1.5 meter spacing between energized components and grounded hardware;
- Install visibility enhancement objects such as marker balls, bird deterrents or diverters; and
- Schedule maintenance activities to avoid nesting sessions.

Vegetation and Soils

- Control soil erosion through timely clearing of excavations from project area; develop erosion control structure and excavate new areas only after finishing work at opened segments among other measures; and
- Develop afforestation programmes in collaboration with the community members.

Air Quality and Aquatic Environment

- Use clean fuels or catalytic convertors for project vehicles and equipments dependent on fossil fuels;
- Create awareness among drivers and machine operators on practices aimed at reducing emissions;
- Avoiding clearing in riparian areas and developing on them;
- Avoid using machinery in the vicinity of watercourses;
- Observe manufacturer machinery and equipment guidelines, procedures with regard to noise as well as oil spill prevention and emergency response; and
- Use technological measures during installation to abate against corona effect during operation. Technological measures to implement during construction include; observation of the recommended distance between conductors; use of dampers to reduce vibration among other measures.

Environmental Management and Monitoring Plan

The consultants have developed an Environmental Management and Monitoring Plan (EM&MP) to guide the project team in eliminating or reducing the project impacts to

acceptable minimum/ standards. The EM&MP is based on good environmental practices of project implementation and safety of the operations. The proposed EM&MP can be improved through continuous monitoring and audits during project implementation. The plan is provided in this report and it identifies the anticipated impact; proposes measures to be undertaken; states monitoring indicators; states the party to implement the measures or control the indicators and states the estimated cost likely to be incurred to undertake the measures.

Conclusions and Recommendations

The consulting team's opinion is that the project is important for the economic development of the area and for its success; the proponent is advised to balance environmental and, social considerations and benefits through implementation of the proposed mitigation measures. It is recommended that preventive measures be given first consideration in order to reduce costs of undertaking the mitigation measures and at the same time reduce the overall project impacts. It is also recommended that, the project impacts be continuously monitored, and the monitoring results be documented, analyzed and reviewed against recommended standards to enable take appropriate action in good time.

Table of Contents

EXECUTIVE SUMMARY	3
List of Annexes.....	21
List of Annexes.....	21
LIST OF ABBREVIATIONS.....	21
LIST OF TABLES.....	Error! Bookmark not defined.
CHAPTER 1 INTRODUCTION.....	24
1.1 Project Background	24
1.2 Institutional Arrangements.....	25
1.3 Esia Study.....	25
1.4 Study Objectives.....	26
1.5 Scope of the Study.....	27
1.6 Study Approach.....	27
1.7 Study Methodology.....	27
1.7.1 Environmental Screening:.....	27
1.8 Data collection tools and equipments	28
CHAPTER 2 POLICY, LEGAL AND INSTITUTION FRAMEWORK.....	32
2.1 Introduction.....	32
2.2 NATIONAL POLICY AND LEGAL FRAMEWORK	32
2.2.1 Policy.....	32
2.2.2 Legal Framework	33
2.2.3 The Environment Management and Co-ordination Act, 1999	33
2.2.4 The Environmental (Impact Assessment and Audit) Regulations, 2003.....	34
2.2.5 The Occupational Health and Safety Act, 2007.....	34
2.2.6 Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009.....	35
2.2.7 Draft Environmental Management and Coordination (Air Quality) Regulations, 2008.....	36
2.2.8 The Water Act 2002	36
2.2.9 The Lakes and Rivers Act Chapter 409 Laws of Kenya.....	36
2.2.10 The Wildlife Conservation and Management Act, Cap 376	36
2.2.11 The Public Health Act (Cap. 242).....	37
2.2.12 Waste Management Regulations (2006)	37
2.2.13 Physical Planning Act (Cap286)	37
2.2.14 Occupiers Liability Act (Cap. 34).....	38
2.2.15 Way Leaves Act (Cap. 292)	38
2.2.16 Land Acquisition Act (Cap. 295).....	38
2.2.17 Public Roads and Roads of Access Act (Cap. 399).....	39
2.2.18 The Limitations of Actions Act (Cap. 22)	39
2.2.19 The Registered Land Act Chapter 300 Laws of Kenya:.....	39
2.2.20 The Land Adjudication Act Chapter 95 Laws of Kenya.....	40
2.2.21 The Standards Act Cap 496	40
2.2.22 The Antiquities and Monuments Act, 1983 Cap 215	40
2.2.23 The Civil Aviation Act, Cap 394	40
2.2.24 The Environmental Management and Co-Ordination (Conservation of.....	41

Biological Diversity And Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006.....	41
2.2.25 Environmental Management and Coordination (Controlled Substances) Regulation, 2007, Legal Notice No. 73.....	41
2.2.26 Environmental Management and Coordination, Fossil Fuel Emission Control Regulation 2006.....	41
2.2.27 Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009.....	42
2.2.28 Local Authority Act (Cap. 265).....	42
2.2.29 Penal Code Act (Cap.63).....	42
2.2.30 Energy Act, 2006.....	42
2.3 ADMINISTRATIVE FRAMEWORK.....	43
2.3.1 The National Environment Council.....	43
2.3.2 The National Environment Management Authority.....	43
2.3.3 The Standards and Enforcement Review Committee.....	43
2.3.4 The Provincial and District Environment Committees.....	43
2.3.5 The Public Complaints Committee.....	44
2.4 INTERNATIONAL ENVIRONMENTAL GUIDELINES.....	44
2.5 WORLD BANK'S SAFEGUARD POLICIES.....	45
2.5.1 World Bank Safeguard Policy 4.01-Environmental Assessment.....	45
2.5.2 Bank Safeguard Policy 4.04-Natural Habitats.....	46
2.5.3 Bank Safeguard Policy 4.36-Forests.....	46
2.5.4 Bank Safeguard Policy 4.09-Pest Management.....	46
2.5.5 Bank Safeguard Policy 4.11-Physical Cultural Resources.....	47
2.5.6 Bank Safeguard Policy 4.12-Involuntary Resettlement.....	47
2.5.7 Bank Safeguard Policy 4.12-Indigenous People.....	47
2.5.8 Bank Safeguard Policy 4.37-Safety of Dams.....	48
2.5.9 Bank Safeguard Policy 7.50-Project on International Waterways.....	48
2.5.10 Bank Safeguard Policy 7.50- Project in Disputed Areas.....	48
2.5.11 World Bank Safeguard Policy BP 17.50- Public Disclosure.....	48
CHAPTER 3: DESCRIPTION OF THE PROJECT.....	50
3.1 GENERAL.....	50
3.2 PROJECT OBJECTIVES.....	50
3.3 PROJECT JUSTIFICATION.....	50
3.4 DESIGN CONSIDERATIONS.....	51
3.4.1 Project Components.....	51
3.4.1.1 Conductors.....	51
3.4.1.2 Overhead Earth Wires (OPGW).....	52
3.4.1.3 Support Structures.....	52
3.4.1.4 Conductor Configuration.....	52
3.4.1.5 Foundations.....	52
3.4.1.6 Grounding.....	53
3.4.1.7 Insulator Strings.....	53
3.4.1.8 Circuit Breakers.....	53
3.4.1.9 Lightning Arresters.....	53
3.4.1.10 Pylons/Steel towers.....	53
3.4.1.11 Dampers.....	54
3.5 Project Activities.....	54

3.6 Site Ownership.....	54
3.7 Proposed Budget.....	55
3.8 Project Location.....	55
3.9 Description of Project Area Environment.....	60
3.10 Conclusion and Recommendations for the Proposed Transmission Line.....	66
Routes and Alternatives.....	66
3.11 Description of the Project’s Construction Activities.....	67
3.11.1 Seclusion of Project Way leave and Clearing.....	67
3.11.2 Excavation for Foundation Works.....	67
3.11.3 Structural Steel Works and Installations.....	68
3.11.4 Stinging and Tensioning.....	68
3.11.5 Landscaping.....	68
3.12 Description of the Project’s Operation Activities.....	68
3.12.1 Way leave Clearance and General Maintenance.....	68
3.12.2 Waste Management.....	68
3.13 Description of The Project’s Decommissioning Activities.....	68
3.13.1 Demolition works.....	68
3.14 Analysis of Project Alternatives.....	69
3.14.1 No project.....	69
3.14.2 Project Alternatives.....	69
3.14.2.1 Land.....	69
3.14.2.2 Alternative Technology.....	70
CHAPTER 4 PUBLIC PARTICIPATION.....	72
4.1 Legal Requirement.....	72
4.2 Objectives of Public Consultations.....	72
4.3 Methodology and Data Collection.....	72
4.4 Responses from the Public Consultations and Socio-Economic Survey.....	75
4.4.1 Response of Departmental Heads on the Proposed Project.....	75
4.4.2 Response of Local Administration on the proposed project.....	87
4.4.3 Response of Local Community on the Proposed Project.....	89
4.4.4 Socio-Economic Survey and Findings.....	92
4.5 Major Environmental and Social Concerns Raised.....	97
4.5.1 Land Acquisition and Compensation.....	97
4.5.2 Human Resource /Employment Opportunities.....	98
CHAPTER 5 BASELINE INFORMATION OF THE STUDY AREA.....	99
5.1 Introduction.....	99
5.2 Geographical Location and Size.....	99
5.2.1 Trans Nzoia District.....	99
5.2.2 Larger Uasin Gishu District.....	99
5.2.3 Lugari District.....	100
5.3 Land Use.....	100
5.3.1 Trans Nzoia District.....	100
5.3.2 Uasin Gishu District.....	100
5.3.3 Lugari District.....	101
5.4 Topography, Drainage and Hydrology.....	101
5.4.1 Trans Nzoia District.....	101
5.4.2 Uasin Gishu District.....	101
5.4.3 Lugari District.....	102
5.5 Soils and Geology.....	102

5.5.1 Trans Nzoia District.....	102
5.5.2 Uasin Gishu District.....	102
5.6 Climate conditions	103
5.6.1 Trans Nzoia District.....	103
5.6.2 Uasin Gishu District.....	103
5.6.4 Lugari District.	103
5.7 Biological Diversity.....	104
5.7.1 Trans Nzoia District.....	104
5.7.2 Uasin Gishu District.....	104
5.7.3 Lugari District.	105
5.8 Social Setting 105	
5.8.1 Trans Nzoia District.....	105
5.8.1.1 Settlement Patterns	105
5.8.1.2 Poverty Status.....	105
5.8.1.3 Health Aspect	105
5.8.1.4 Economic Activities	105
5.8.1.5 Gender and Equality	106
5.8.1.6 Tourism, Trade and Industry	106
5.8.1.7 Social Services and Community Facilities	106
5.8.1.8 Road Network and Water Supply.....	106
5.8.2 Uasin Gishu District.....	107
5.8.2.1 Settlement Patterns.....	107
5.8.2.2 Poverty Status.....	107
5.8.2.3 Health Aspect.....	107
5.8.2.4 Economic Activities	108
5.8.2.5 Education and Training.....	108
5.8.2.6 Social Services and Community Facilities.....	108
5.8.2.7 Road Network and Water Supply	108
5.8.3 Lugari District	108
5.8.3.1 Settlement Patterns	108
5.8.3.2 Poverty Status.....	109
5.8.3.3 Health Aspects.....	109
5.8.3.4 Economic Activities	109
5.8.3.5 Gender and Equality	109
5.8.3.6 Tourism, Trade and Industry	110
5.8.3.7 Social Services and Community Facilities	110
5.8.3.8 Road Network and Water Supply.....	110

CHAPTER 6 ANTICIPATED POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS..... Error! Bookmark not defined.

6.1 Introduction.....	111
6.2 Assessment of Impacts of the Proposed Development.....	111
6.3 Potential Positive Impacts	115
6.4 IMPACTS ON THE BIOPHYSICAL ENVIRONMENT.....	115
6.4.1 Terrestrial Habitat Alteration.....	115
6.4.1.1 Construction phase	115
6.4.1.2 Operation and Maintenance.....	116
6.4.2 Alteration of Aquatic Habitats.....	116
6.4.3 Wildlife Species/	116
6.4.3.1 Construction	116

6.4.3.2 Power line associated avifauna mortalities.....	117
6.4.4 Soil.....	117
6.4.4.1 Construction.....	117
6.4.5 Air Pollution.....	117
6.4.5.1 Construction.....	117
6.4.6 Water Quality.....	118
6.4.6.1 Construction and Operation.....	118
6.4.7 Hazardous Substances.....	118
6.4.7.1 Construction.....	118
6.4.7.2 Operation.....	118
6.4.8 Fire Risk.....	118
6.4.8.1 Operations.....	118
6.5.1 Noise.....	119
6.5.1.1 Construction.....	119
6.5.1.2 Operation.....	119
6.5.2 Aircraft Navigation Safety.....	119
6.5.2.1 Construction and Operation.....	119
6.5.3 Electromagnetic Fields (EMFs).....	120
6.5.3.1 Operation.....	120
6.5.4 Maintenance of Transmission Line System.....	120
6.5.4.1 Construction and Operation.....	120
6.5.5 Electrocutation from Live Power Lines.....	120
6.5.5.1 Operation.....	120
6.5.6 Physical Hazards.....	121
6.5.6.1 Construction and Operation.....	121
6.6 SOCIO-CULTURAL IMPACTS.....	121
6.6.1 Community Public Participation.....	121
6.6.2 Data Collection Methodology.....	122
6.6.3 Perceived Challenges to the proposed project.....	123
6.6.4 Visual Amenity.....	124
6.6.4.1 Operation.....	124
6.6.5 Spread of Disease.....	124
6.6.5.1 Construction.....	124
6.6.6 Induced Settlement.....	124
6.6.6.1 Construction.....	124
6.6.6.2 Operation.....	124
6.6.7 Land Acquisition and Resettlement.....	125
6.6.7.1 Construction and Operation.....	125
CHAPTER 7 IMPACT MITIGATION MEASURES.....	127
7.1 Introduction.....	127
7.2 MITIGATION MEASURES: BIOPHYSICAL ENVIRONMENT.....	127
7.2.1 Terrestrial Habitat Alteration.....	127
7.2.1.1 Construction.....	127
7.2.1.2 Operation and Maintenance.....	127
7.2.2 Aquatic Habitat Alteration.....	127
7.2.2.1 Construction.....	127
7.2.3 Wildlife (Power line-associated Avifauna Mortalities).....	127
7.2.4 Soil.....	128
7.2.4.1 Construction.....	128

7.2.5 Air Pollution.....	128
7.2.5.1 Construction.....	128
7.2.6 Solid Waste.....	128
7.2.6.1 Construction.....	128
7.2.7 Hazardous Substances.....	128
7.2.7.1 Construction.....	128
7.2.8 Fire Risk.....	129
7.2.8.1 Operations.....	129
7.3.1 Noise.....	129
7.3.1.1 Construction and Operation.....	129
7.3.2 Maintenance of Power Line Rights-of-way.....	129
7.3.2.1 Construction and Operation.....	129
7.3.3 Electrocutation from Live Power Lines.....	129
7.3.3.1 Operation.....	129
7.3.4 Falls from Height.....	130
7.3.4.1 Construction and Operation.....	130
7.3.5 Physical Hazards.....	130
7.3.5.1 Construction and Operation.....	130
7.4 MITIGATION MEASURES: SOCIO-CULTURAL.....	131
7.4.1 Visual Impact.....	131
7.4.1.1 Operation.....	131
7.4.2 Spread of Disease.....	131
7.4.2.1 Construction.....	131
7.4.3 Land Acquisition and Involuntary Resettlement.....	131
7.4.3.1 Construction and Operation.....	131
 CHAPTER 8 ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING.....	 133
8.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT.....	133
8.2 MONITORING ENVIRONMENTAL AND SOCIAL PERFORMANCE.....	133
8.3 Project design and Construction.....	134
8.3.1 Design and Construction Phase.....	135
8.3.2 Operations and Maintenance Phase.....	139
8.3.3 Decommissioning Phase.....	142
8.4 DECOMMISSIONING PHASE.....	144
8.4.1 Impact Analysis – Decommissioning Phase.....	144
8.5 CAPACITY BUILDING AND TRAINING.....	145
8.6 Training Objectives.....	146
9.1 INTRODUCTION.....	148
9.2 GENERAL MITIGATION AND INTERVENTION MEASURES.....	148
9.2.1 General Conclusions.....	148
9.3 General Recommendations.....	149
9.3.1 Mitigation.....	149
9.3.2 Compliance Monitoring.....	150
9.3.3 Effects Monitoring (Evaluation).....	150
9.3.3.1 Monitoring Guidelines.....	150
9.4 Reporting.....	152
References.....	153

List of Annexes

- Annex 1: Wayleave Map
- Annex 2: Samples of Questionnaires administered during the study and response to questionnaires by head of departments
- Annex 3: Minutes and List of attendants to the public consultation forums
- Annex 4: Report on Important Bird Areas within the proposed project area
- Annex 5: Copy of the Physical Planning Report for the proposed Kipkaren-Lesseru Road (Eldoret-Kampala Bypass) and road map

- Annex 6: Environmental Guidelines for Contractor

LIST OF ABBREVIATIONS

Abbreviation	Description
ASAL	Arid and Semi Arid Lands
ASL	Above Sea Level
BP	Bank Procedure
BOD	Biological Oxygen Demand
BOQ	Bill of Quantities
CAC	Catchment Area Committee
CBO	Community Based Organisation
CO₂	Carbon Dioxide
CTC	Child-to-Child
DCO	District Children's Officer
DC&SO	District Culture and Social Officer
D.O	District Officer
DEO	District Environment Officer
EA	Environmental Assessment
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMF	Electromagnetic Field
EMC	Electromagnetic Capability
EMS	Environmental Management System
ERC	Electricity Regulatory Commission
E&SMMP	Environmental and Social Management and Monitoring Plan
GHG	Green House Gases
HIV/AIDS	Human Immuno-Deficiency Virus/Acquired Immune Deficiency Syndrome
IBA	Important Bird Area
IEC	Information Education and Communication
IP	Indigenous People
IPM	Integrated Pest Management
IPP	Indigenous Peoples Plan
ISO	International Standards Organisation
IVM	Integrated Vector Management
Ha	Hectares
KENHA	Kenya National Highway Authority
KFS	Kenya Forestry Services
KOFC	Kenya Ordinance Factory Corporation
KPLC	Kenya Power and Lighting Company
KCC	Kitale County Council

Abbreviation	Description
KP	Kenya Police
Kshs.	Kenya Shillings
KWS	Kenya Wildlife Services
Km	Kilometre
LA	Local Authority
LO	Labour Officer
M	Metres
MoH	Ministry of Health
MoL	Ministry of Labour
MoR	Ministry of Roads
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisations
9KR	Nine Kenya Rifles
NO	Nitrogen monoxide
NZOWASCO	Nzoia Water and Sewerage Company
OHS	Occupational Health and Safety
OHSO	Occupational Health and Safety Officer
PC	Public Consultation
PD	Public Disclosure
PH	Public Health
PIA	Project Implementing Agent
RAP	Resettlement Action Plan
RO	Road Officer
RTS	Recruitment Training School
RSC	Resettlement Steering Committee
SA	Social Assessment
TO	Traffic Officer
TOR	Terms of Reference
UNEP	United Nations Environment Programme
USD	United States of America Dollars
VAT	Value Added Tax
VCT	Voluntary Counseling and Testing
WHO	World Health Organization
WRMA	Water Resources Management Authority
LVNWSB	Lake Victoria North Water Service Board
WSP	Water Service Provider

CHAPTER 1 INTRODUCTION

1.1 Project Background

Kenya Power and Lighting Company Limited (KPLC), also referred to as the project 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 65 Km of single circuit 132 kV transmission line between Eldoret – Kitale, comprising the following:

- 132 kV line Eldoret – Kitale, 65 km

The registered office and contact addresses of the Proponent are:

Kenya Power and Lighting Company

Stima Plaza, Kolobot Road

P. O. Box 30099

00100 – NAIROBI.

Tel. 254 20 3201000

E-mail: jguda@kplc.co.ke

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 construction and upgrading with 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 Eldoret – Kitale. 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)

1.2 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 of 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)

1.3 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.

Otieno Odongo & Partners Consulting Engineers, 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 of 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 provided detailed information on the scope of the studies and the expected outputs.

1.4 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/minimize 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 specific 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.

1.5 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 132kV Transmission Line from Eldoret - Kitale.

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.

1.6 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 project site areas, desktop studies, public consultations with members of the community in the project areas, survey, photography, and discussions with the project Proponent.

1.7 Study Methodology

1.7.1 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 project proponent therefore commissioned this study in line with the provisions of EMCA, 1999.

The consultants used screening, scoping and detail analysis methodology for the ESIA study. The approach and methodology applied during the study enabled collection of both primary and secondary data. The consultant used both qualitative and quantitative methods to obtain the primary data. Qualitative data was obtained through field visits/site walks, photography, and stakeholders' consultation while quantitative data was obtained through the use of predefined questionnaires.

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholder including the project proponent, community members, administrative authority, opinion leader and district departmental heads. The consultations were based on the proposed project, site planning and the project implementation plan;
- Physical inspections of the proposed project area which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

1.8 Data collection tools and equipments

Several data collection tools were used to document available data during the study these included use of checklists, photography, geographical positioning systems (GPS), questionnaires and computers among others. All data collected were analyzed for production of the ESIA report. Samples of the questionnaires used during the study are provided under Annex of this report.

The main steps undertaken to meet the objective of the study were as follows:

Step 1: Environmental Screening

Screening of the project was undertaken to evaluate the need of conducting an EIA study and the level of study. The screening stage was concluded based on the requirements of the second schedule of EMCA which requires transmission lines to undergo an EIA study.

Step 2: Environmental Scoping

The project scoping stage which followed the screening stage was applied to narrow down the project issues to that requiring detail analysis. The process involved

conducting discussions with the proponent on the project issues and, collection of primary and secondary data. The primary data was collected through the qualitative and quantitative methods of data collection. Qualitative data was collected through field visits/site walks, public and stakeholders consultation while quantitative data was collected through the use of sampled questionnaires. The secondary data was collected through literature review which included study of the following documents:

- Policies, Acts and Regulations;
- District Development Plans;
- Project area topographical and cadastral maps;
- Previous project study documents; and
- Literature materials on project including those on IBA, Plant Species, Culture, Power Project Installation and Management among other project parameters.

Step 3: Desk study

Desktop studies were conducted through review of secondary data to establish the following:

- Legal Policies, Legislative and Institutional Framework governing the proposed project;
- Licenses and permits requirements and conditions;
- Project area baseline information including documented sensitive environmental receptors;
- Types of waste to be generated, proposed management and disposal methods; and
- Potential positive and negative impacts.

The secondary data was obtained by reviewing several literature materials including:

- Policies, Acts and Regulations
- District Development Plans for Uasin Gishu District
- District Development Plan for Trans Nzoia District
- District Development Plans for Lugari District
- State of Environment for Uasin Gishu District
- State of Environment for Trans Nzoia District
- State of Environment for Lugari District
- The Feasibility Study of the proposed project under energy scale up report
- Environmental Impact Assessment Scoping Report for the Proposed Eldoret-Kitale 132kV Transmission line
- The Sectoral Environmental Impact Assessment Study, August 2009
- Project area cadastral and topographical maps

Step 4:-Field Assessment and baseline survey

Detailed field surveys for this study were undertaken within the proposed project area and its surrounding from the 24th September to 7th October 2009. This involved conducting systematic field traversing to quantify perceived impacts on:

- Land ownership, usage and conflicts;
- Vegetation cover of the area;
- Underground and surface waters;
- Waste management; and
- The general environment and its sensitive receptors found within the project area.

The EIA study experts traversed the whole project area and identified the status of the environment and socio-economic indicators which included the following:

- Baseline data on the bio-physical environment
- Socio-economic and cultural environment;
- Project Affected Persons (PAP) and Project Affected Households (PAH);
- The level of project impact on affected persons and the environment;
- The opinion of the stakeholders including the local communities and on the proposed project; and
- The project alternatives routes

Site walks also indicated that the proposed line will traverse areas of different land uses including agricultural land, schools, trading centres, public land owned by institutions, road reserves among other areas.

Step 5: Public Consultations

Detailed stakeholders consultations for this study were also undertaken from the 24th September to 7th October 2009. These consultations were conducted in the form of:

- Focus group discussions (FGDs):- FGD were conducted with men, women and the youth. The composition of the groups were determined after consultation with the Chiefs and Assistant Chiefs of the areas;
- Key Informant Interviews and Semi-Structured Interviews:- These interviews were conducted with the District Officers (DOs), Chiefs, Assistant Chiefs, Councilors and Village Elders;

- Open-ended and Pre-coded questionnaires: -These questionnaires were administered to target groups in order to obtain their views on the proposed project and its perceived impacts.

The main target groups were the PAPs along the proposed transmission line way leave and to some extent the households surrounding the proposed project area. The PAPs were picked systematically for interviews with the aim of reaching up to 100% of those within a radius of 100m of the proposed line. The general public was also interviewed and this involved reaching communities members with property outside the way leave area through random sampling. For those households which were on the proposed transmission line and were not reachable to be interviewed, the Chiefs and Assistant Chiefs gave the team an estimated number of households, names and the villages. The names of all those interviewed during the consultation are found under public consultation chapter of this report too.

Public Barazas which were organized by the D.Os and Chiefs; and transect walks were also done to confirm the information from the discussions and observations were made on physical and environmental conditions. In addition to constant briefing of the client, this environmental impact assessment project report was prepared. The contents were presented for submission to NEMA as required by law.

CHAPTER 2 POLICY, LEGAL AND INSTITUTION FRAMEWORK

2.1 Introduction

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

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

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

2.2 NATIONAL POLICY AND LEGAL FRAMEWORK

2.2.1 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.

2.2.2 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 licenses. Most of these statutes are sector-specific, covering issues such as public health, soil erosion, protected areas, endangered species, water rights and water quality, air quality, noise and vibration, cultural, historical, scientific and archaeological sites, land use, resettlement, etc.

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

2.2.3 The Environment Management and Co-ordination Act, 1999

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

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

2.2.4 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.

2.2.5 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 & vapors, 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 advises 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.

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

These Regulations determine that no person or activity 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 vibrational 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 documenting an effort to comply with the provisions of the Regulations.

2.2.7 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.

2.2.8 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.

2.2.9 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 the requirements of this Act shall be observed by the Proponent to ensure protection of such water bodies and associated flora and fauna.

2.2.10 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.

2.2.11 The Public Health Act (Cap. 242)

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

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

2.2.12 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 /minimization /avoidance of adverse impacts arising from the Project activities.

2.2.13 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.

2.2.14 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 Way leave along the transmission line corridor. The Proponent shall endeavor to ensure that the management of health and safety issues is of high priority during the operational phase of the project.

2.2.15 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.

2.2.16 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.

2.2.17 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.

2.2.18 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.

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

2.2.20 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 area

2.2.21 The Standards Act Cap 496

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

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

2.2.22 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.

2.2.23 The Civil Aviation Act, Cap 394

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

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

2.2.24 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 License issued by the Authority under the Act.

The Proponent has commissioned this environmental assessment study and seeks to obtain an EIA License 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.

2.2.25 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 labeled 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.

2.2.26 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.

2.2.27 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 utilization 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. The Proponent shall comply with the provisions of the Act in protecting wetlands, preventing and controlling pollution and Siltation in rivers.

2.2.28 Local Authority Act (Cap. 265)

Under this act, the Local Authority is the custodian of Trust Land and has to authorized 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 authorizations from the Local Authorities as stipulated in the Act.

2.2.29 Penal Code Act (Cap.63)

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

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

2.2.30 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.

2.3 ADMINISTRATIVE FRAMEWORK

2.3.1 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.

2.3.2 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.

2.3.3 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

2.3.4 The Provincial and District Environment Committees

The Provincial and District Environmental Committees also contribute to decentralized 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.

2.3.5 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.

2.4 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 stabilizing 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 as discussed below.

2.5 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)

2.5.1 World Bank Safeguard Policy 4.01-Environmental Assessment

The environmental assessment process provides insights to ascertain the applicability of other WB safeguard policies to specific projects. This is especially the case for the policies on natural habitats, pest management, and physical cultural resources that are typically considered within the EA process. The policy describes an environmental assessment (EA) process for the proposed project. The breadth, depth, and type of analysis of the EA process depend on the nature, scale, and potential environmental impact of the proposed project. The policy favours preventive measures over mitigatory or compensatory measures, whenever feasible.

The operational principles of the policy require the environmental assessment process to undertake the following

- Evaluate adequacy of existing legal and institution framework including applicable international environmental agreements. This policy aims to ensure that projects contravening the agreements are not financed.
- Stakeholder consultation before and during project implementation
- Engage service of independent experts to undertake the environmental assessment
- Provide measures to link the environmental process and findings with studies of economics, financial, institutional, social and technical analysis of the proposed project.
- Develop programmes for strengthening of institutional capacity in environmental management

The requirements of the policy are similar to those of EMCA which aims to ensure sustainable project implementation. Most of the requirements of this safeguard policy have been responded to in this report by evaluating the impact of the project, its alternatives, existing legislative framework and public consultation.

2.5.2 Bank Safeguard Policy 4.04-Natural Habitats

This safeguard policy requires that the study use precautionary approach to natural resources management to ensure environmental sustainability. The policy requires conservation of critical habitat during project development. To ensure conservation and project sustainability the policy requires that:

- Project alternative be sought when working in fragile environment areas;
- Key stakeholders be engaged in project design, implementation, monitoring and evaluation including mitigation planning.

The requirements of this policy were observed as much as possible during the EIA study. The consulting team engaged several stakeholders during project impact evaluation and those consulted included the KWS, WRMA, KFS and Nature Kenya among others. This policy was not triggered by the proposed project as the project area has no protected forest and wildlife conservation areas. Despite this, the line shall traverse several areas with swamps, rivers and streams though the field visits indicated that the project impact on them will be minimal. This is because it was seen that the lines will traverse over the wetlands and the proponent has proposed not to install pylons on the wetlands riparian. The wetland like the Karara Swamp in Mois Bridge is located about 900m away from the area earmarked for the installation of the power transmission line.

2.5.3 Bank Safeguard Policy 4.36-Forests

This safeguard policy provides measures for protection of forests through impact evaluation and conservation of forest during project development. This policy is not triggered because the proposed project area does not have natural forest. The area is fully settled with various land uses but a few community members have privately owned tree plantations along the proposed project alignment; for example at Lumaiyet village in Soy and Ex-Cullen village in Mois Bridge. It is advisable that the trees be preserved as much as possible as the sections neighbouring the trees are open land that can be used to re-align the route of the transmission line. If other project factors necessitate the harvesting of the trees, then it is recommended that rehabilitation programmes be developed.

2.5.4 Bank Safeguard Policy 4.09-Pest Management

This policy promotes the use of ecologically based biological or environmental pest management practices. The policy requires that procured pesticides should meet the WHO recommendations and not be among those on the restricted list of formulated products found in the WHO Classes IA and IB or Class II. This policy is not triggered since routine maintenance of project line will not involve the use of pesticides or

agrochemical materials to control vegetation growth. In practice clearance of vegetation growth along way leave is done using mechanical methods especially slashing of grass.

2.5.5 Bank Safeguard Policy 4.11-Physical Cultural Resources

This policy assists in preserving physical cultural resources and helps reduce chances of their destruction or damage. The policy considers Physical Cultural Resources (PCR) to be resources of archeological, paleontological, historical, architectural, and religious (including graveyards and burial sites), aesthetic or other cultural significance. The project shall traverse several homes in rural Kenya thus it shall stumble onto several burial sites within the affected homesteads; since the tradition of burying the deceased within the homesteads is practiced in the project area. The community members likely to be affected by the project have suggested that such sites should be avoided as much as possible through consultations with individual home owners before project implementation to enable develop appropriate mitigation measures.

2.5.6 Bank Safeguard Policy 4.12-Involuntary Resettlement

Resettlement due to infrastructure development is not a new phenomenon in Kenya but the government has no Policy Document or Act that aims at ensuring that persons who suffer displacement and resettlement arising from such development activities can be compensated adequately for their losses at replacement costs. The proponent plans to implement the World Bank's Operational Policy 4.12 which has been designed to mitigate against impoverishment risks associated with Involuntary Resettlement and the restoration or improvement of income-earning capacity of the Project Affected People (PAP). The policy requires full public participation in resettlement planning and implementation and describes the conditions that borrowers are obliged to meet in operations involving involuntary resettlement.

The proposed project triggers resettlement and relocation in the project area especially for community members with small parcels of land. The scope of study included development of a Resettlement Action Plan (RAP) as an integral part of the EIA study in order to facilitate evaluates the project impacts holistically.

2.5.7 Bank Safeguard Policy 4.12-Indigenous People

This policy requires project to be designed and implemented in a way that fosters full respect for Indigenous Peoples' dignity, human rights and cultural uniqueness and so that they receive culturally compatible social and economic benefits and do not suffer adverse effects during the development process. This policy is not triggered as the proposed project area is not occupied by IP who identifies with the areas.

2.5.8 Bank Safeguard Policy 4.37-Safety of Dams

This policy aims to assure quality and, safety in the design and, construction of new dams and, the rehabilitation of existing dams and in carrying out activities that may be affected by an existing dam. This policy is not triggered as the alignment of the proposed project was seen to leave an existing dam about 200m to the South West. The local administration stated the dam has not been in use for over ten (10) years. It was seen the construction of the power line will not affect the dam as the area have vast sections of open land which can be acquired and used for line installation.

2.5.9 Bank Safeguard Policy 7.50-Project on International Waterways

This policy applies to the international waterways that forms boundaries or flows between two or more states that can be bank members or not. The policy lists projects that require its observation. The policy is not triggered by the project as the proposed project is not listed under sub-section 2 (a) of the OP as projects required to observe the safeguard policy. Despite that, the project will traverse across River Nzoia at some points; a tributary of Lake Victoria a water body shared by several countries thus appropriate measures of conservation should be developed and implemented to reduce impacts of river siltation, destruction of aquatic habitats among other impacts.

2.5.10 Bank Safeguard Policy 7.50- Project in Disputed Areas

It is known that projects in disputed areas may raise a number of delicate problems affecting relation not only between the bank and its member countries, but also between the countries in which the project is carried out. In order to reduce this impact, it is recommended any dispute over area earmarked for project development should be dealt with at the earliest possible stage. This policy is not been triggered by the proposed project as the project areas are not shared by any other country to grant such disputes.

2.5.11 World Bank Safeguard Policy BP 17.50- Public Disclosure

This BP encourages Public Disclosure (PD) or Involvement as a means of improving the planning and implementation process of projects. This procedure gives governmental agencies responsibility of monitoring and managing the environmental and social impacts of development projects particularly those impacting on natural resources and local communities. The policy provides information that ensures that effective PD is carried out by project proponents and their representatives. The BP requires that Public Involvement should be integrated with resettlement, compensation and indigenous

peoples' studies. Monitoring and grievances address mechanism should also be incorporated in the project plan.

The proposed project incorporated public participation and stakeholders' consultation as part of the E&SIA studies in order to collect the views of the local communities and their leaders for incorporation in the project mitigation plan. The consultation was successful and the community members gave a number of views that have been considered in the mitigation plan.

CHAPTER 3: DESCRIPTION OF THE PROJECT

3.1 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.

3.2 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.

3.3 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 200,000 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 hence the proposed project.

3.4 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.

3.4.1 Project Components

The proposed project will involve development of a 65km 132kV transmission line between Eldoret and Kitale. To ensure efficient functionality of the proposed line the following components will form part of the project installations; pylons/steel towers, dumpers, conductors, optical fibre, circuit breakers and lightening arrestors. All the project components will be installed using the best electrical engineering practices. The section below discusses on each of the project components in brief.

3.4.1.1 Conductors

The conductors recommended for the various sub-project options are Aluminum 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 aluminum alloy conductors (AAAC) will be considered to minimize pole sizes.

3.4.1.2 Overhead Earth Wires (OPGW)

According to KPLC practice, 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.

3.4.1.3 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 emphasizing 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.

3.4.1.4 Conductor Configuration

KPLC current practice 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.

3.4.1.5 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.

3.4.1.6 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.

3.4.1.7 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.

3.4.1.8 Circuit Breakers

The operation of circuit breakers causes switching surges that can result in interruption of inductive current, energization of lines with trapped charges, and single-phase ground fault. Modern circuit breakers, operating in two steps, reduce switching surges to 1.5–2 times the 60-Hz voltage.

3.4.1.9 Lightning Arresters

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

3.4.1.10 Pylons/Steel towers

Different transmission structures have different material and construction costs, and require different right-of-way widths, distances between structures (span length), and pole height. These issues also vary with different voltages. In areas where single-pole structures are preferred, weak or wet soils may require concrete foundations for support. Where a transmission line must cross a street or slightly change direction, large angle structures or guy wires may be required. Poles with guy wires impact a much larger area. Steel structures are used in transmission structures wood structures are used for distribution structures. Pylons/steel towers are preferred due to their longer life span.

3.4.1.11 Dampers

The conductors are protected by dampers which prevent the vibrations from reaching the conductors at the clamps or supports. There are three types of vibrations; simple swinging, low frequency vibration and high frequency oscillations.

3.5 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 aluminum 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 to be 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 metres this will depend on clearance from KCAA.
- Modes and quantity of transport vehicles employed in the project will be approximately five Lorries and four 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 hard 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 and a 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.

3.6 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.

3.7 Proposed Budget

It is estimated that the project will cost a total of **10 Million US Dollars** such as to include the following items:

- Lease of land,
- Various operational licenses and permits,
- Professional services,
- Equipment procurement (importation, local procurements, installation costs, etc.),
- Construction (materials and labour),
- Miscellaneous overheads.
- The Resettlement Action Plan (RAP) study provides an estimate of Kshs. 66 Million for the process of land acquisition and resettlement for the Project Affected People.

3.8 Project Location

The proposed line has two alternative routes from Eldoret to Kitale. It was noted that, the alternatives were not straight paths as they crisscrossed the project area including the main tarmac roads found in the area. The project line was seen to cross the Eldoret-Webuye highway at Emkuen village between points D-E and point B1-B2. The line also crossed the Eldoret-Kitale Highway between points B2-B3, E-F and L-M. Tables 3.2 below gives a list of coordinated provided in the Environmental Impact Assessment (EIA) Scoping Report and their physical interpretation in the project area. The locations were traced by the help of a GPS set in metric units and ARC DATUM 1960 system.

Alternative I Eldoret-Mois Bridge-Kitale A-B-C-D-E-F-G-H-I-J-K-L-M-N

Table 3.2 (a) Physical Location of Project Alternative I Area Corresponding to GPS Coordinates

Point	Northing	Easting	Location	Farm Owner/Institution	District
A	751741.207	55649.442	Kipkaren village, Pioneer location, Kapseereti Division	KPLC Substation in Rivatex, Eldoret and Samuel Cherunya	Wareng
B	750389.250	55982.653	Western View Farmers village, Pioneer location, Kapseereti Division	Samuel Cherunya, Municipal Council of Eldoret	Wareng
C	745763.806	61270.487	Kipkenyo village, Pioneer location, Kapseereti Division	Mugombes farm	Eldoret West
D	744401.175	63691.539	Sosiani, Kaptinga, Chemalal, Lesseru villages, Kamagut Location	Mr. Daniel Kibet Ngelel	Eldoret West
E	741691.523	70326.780	Emkuen, Kamagut location	Trading Centre	Eldoret West
F	740886.594	73016.169	Barracks, Kamagut	9KR Moi Barracks	Eldoret West
G	740690.253	75475.957	Sheiwe and Lamayuet village Soy near Soy Dam	Kipgosgei Arap Kanus	Eldoret West
H	740216.321	76170.473	Msalaba Yellow, Ziwa, Soy	Msalaba Yellow	Eldoret West
I	740414.479	80465.931	Msalaba Yellow Soy	Msalaba Yellow	Eldoret North
J	738534.071	84547.473	Nangili village, Kongoni sub-location Likuyani division	Mukunga B., Private Farm	Lugari
K	738136.739	89655.700	Mukunga A village Kongoni sub-location Likuyani division	Fredrick Kibayi	Lugari
L	737255.033	93289.815	Matunda , Moiss Bridge	Gabriel Muchangi and Henry Nyongesa	Uasin Gishu
M	733843.497	98715.691	Sokomoko village, Sonoko location, Likuyani	Railway Reserve and Private Farms	Lugari

Point	Northing	Easting	Location	Farm Owner/Institution	District
N	728080.029	107197.78	Kebuluet village Kapkoi Sisal sub-location, Waitaluk Division	Charles Ripto /Lamp Lighter School	Trans Nzoia West

Alternative II Eldoret-Mois Bridge-Kitale B1-B2-B3 and A1-A2-A3-A4-A5-A6-A7-A8

Table 3.2 (b) Physical Location of Project Alternative II Areas Corresponding to GPS Coordinates

Point	Easting	Northing	Location	District
B1	743858.534	64655.675	Chememalal, Sisal sub-location, Kamagut	Eldoret North
B2	743568.293	68591.166	Emkuen, KOFC	Eldoret North
B3	741575.365	70716.754	Brotherhood Farm, Sambut, Kamagut,	Eldoret North
A1	736992.482	94371.969	Mountain View, Mois Bridge	Uasin Gishu
A2	737385.910	95994.360	Meja, Mois Bridge	Uasin Gishu
A3	737170.653	99258.825	Ex-Cullen, Mois Bridge	Uasin Gishu
A4	734173.100	100943.412	Kaptien, Village, Waitaluk Division	Uasin Gishu
A5	733546.014	102704.968	Potwa/Kablamai villages in Cherengani	Trans Nzoia East
A6	732215.402	106442.811	Wekhoya/Toro Farm Waitaluk	Uasin Gishu
A7	729561.441	111637.340	Bikeke, Waitaluk	Uasin Gishu
A8	727652.248	112412.332	Naisambu Kibomet	Trans Nzoia West



Plate 1: Proposed line crossing on River Sosian



Plate 2: Local community traversing project area between point B and C



Plate1: Building Structure located between point B-C



Plate 2: River Sosiani Riparian Vegetation located between point C-D



Plate 4: Group of cranes seen at Chemalal village in Kamagut around points D and B1



Plate 5: Type of land use planning in the general Kanagut area



Plate 6: Lone standing housing structure on 100 acres of land in Soy near point H



Plate 7: Soy dam neighbouring vast open lands for transmission line installation



Plate 8: Housing structure at point A3 in Ex-Cullen



Plate 9: Land with wattle tree plantation at point A3 in Ex-Cullen

3.9 Description of Project Area Environment

This section of the report gives details of the various ecosystems and socio economic facilities that are found along the proposed transmission line project areas.

Alternative I Eldoret-Mois Bridge-Kitale A-B-C-D-E-F-G-H-I-J-K-L-M-N

Table 3.2 (c) Details of Project Environment for Alternative Line I

Section of the Line	Areas Traversed by the line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the vicinity of the Project Area
A-B	Eldoret Rivertex Sub-station, Kipakaren and Western View villages	agricultural, settlement and institutional	None	- Power plant -Factories -Jinja-Lessos high voltage power line -Several other power lines	-School -Police station -Mosque
B-C	Kipkenyo village	settlement, trustland, agricultural	River Sosiani, spring resident birds locally known as <i>Chepkwakwa</i>	Nairobi-Eldoret Oil pipeline wayleave, Eldoret (Quarry Sewage) Treatment Plant, Waste dumping site	
C-D	Kaptinga, Simat Kurisiet and Chemalal villages	settlement, agricultural and institutional	River Sosiani	Boundary Sewerage Plant, Kaptinga Quarry settlement Scheme, Lesseru railway station Kengen Sosiani Hydropower Generation Station	-Schools -Churches
D-E	Emkuen and Sambut villages	settlement, agricultural industrial and institutional	-Cranes - water logged sections -Lightening path	-Kamagut Trading Centre, -Eldoret-Webuye Road -KOFC -Above ground water pipeline	-Department of Defense (DOD)- KOFC -Brotherhood Priests

Section of the Line	Areas Traversed by the line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the vicinity of the Project Area
E-F	Emkuen, Longisan, Kamagut, and Soy	settlement, agricultural, commercial and institutions	-Lightening path	-Longisan Trading Centre -Power lines -9 KR Borehole pump house - Eldoret-Kitale Highway	-Kamagut Primary School - - RTS Barracks - DOD 9 KR Moi Barracks
F-G	Sheiwe, Soy and Lamaiyet villages	Institution, settlement, commercial, agricultural	Chepkoilel River, Soy Dam private forests	-Sewarage works DOD -Soy Town - power lines	-Schools -Area administration offices
G-H	Soy and Musalaba Yellow	Institution, settlement, commercial and agricultural	-	-	-
H-I	Musalaba Yellow	Settlement and agricultural	Chemichemi River	-	-
I-J	Likuyani and Nangili	settlement, institutional and agricultural	Sergoit River	-	-Schools
J-K	Mukanga B village	settlement, agricultural and institutional	-	-	-Boarding Schools
K-L	Mukanga A village	settlement, and agricultural	-Matunda River - Steep terrain	-Matunda Town -Powerlines	-Schools -Area administration offices

Section of the Line	Areas Traversed by the line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the vicinity of the Project Area
L-M	Maendeloe, Milimani, Sokomoko and Bwayi villages	settlement, commercial, institutional and agricultural	Eluji stream, Nzoia River	-Railway line - Eldoret-Kitale Road -Mois Bridge Town - several power lines - Kapkoi Trading -Stone chipping site	-Railway line -Boarding Schools, -Matunda Police Station
M-N	Amagoro Farm, Waitaluk, Keringet, Siritiet and Kebuluet villages	settlement, institutional and agricultural	-	-Telecommunication mast	-Lamp Lighter Boarding School

Alternative II Eldoret-Mois Bridge-Kitale B1-B2-B3

Table 3.2 (d) Details of Project Environment for Alternative Line II

Section of the Line	Areas Traversed by the Line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the area
A-B-C-B1	Same as for A-B-C in table 3.2 (c) above including Lesseru village	Same as for A-B-C in table 3.2 (c) above	Same as for A-B-C in table 3.2 (c) above	Same as for A-B-C in table 3.2 (c) above	Same as for A-B-C in table 3.2 (c) above
B1-B2	Emkuen, Kamagut	Industrial, agricultural and settlement	-Lightening path	KOFC	Kenya Ordinance Factory Corporation (KOFC)

Section of the Line	Areas Traversed by the Line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the area
B2-B3	Sambut	Institution, agricultural and settlement	-Lightening path	Eldoret-Kitale Highway	KOFC, Brotherhood Brothers
B3-E-F-G-H-I-J-K-L-A1	Same as for E-F-G-H-I-J-K-L in table above in addition traverses Matunda Mountain View Ziwa/Jaribu Kokoto Bwayi A and Bwayi B villages	Institution, agricultural, Commercial and settlement	-Hill	-Hill -Manual Quarry Chips harvesting by locals	Mois Bridge Trading Centre,
A1-A2	Mountain View Meja/Tuyabei and Bwayi	Commercial, agricultural and settlement	-	Dense settlement	-
A2-A3	Ex-Cullen	Agricultural, institutional, commercial and settlement	-Nathan stream -Wattle tree plantation	- Mois Bridge-Cherengani-Kazibora Road	Mois Bridge town, Cereal Board, AIC Kilimo church, AIC Tenai Primary School, Shopping centre with a clinic, Mois Bridge-Cherengani-Kazibora Road
A3-A4	Kaptein village	Agricultural, institutional and settlement	River Sabwani Nzoia River Karara swamp (900m away from point)	-	-
A4-A5	Karara village Potwa and Kabla Mai	Agricultural and settlement	River Sabwani	-	-
A5-A6	Kitongoria, Toro and Wekhoye	Agricultural and settlement	-	-Maili Saba Road all	-

Section of the Line	Areas Traversed by the Line	Land Use	Sensitive Environmental Receptor	Special Features	Institutions in the area
				weather road	
A6-A7	Wekhonye, Bikeke and Kimila villages	Agricultural, institutional and settlement	-Several streams	-	Machungwa school, Bikeke market
A7- A8	Kibomet, Naisambu	Agricultural, institution and settlement	-several streams	Chereangni - Kitale road - densely populated area	Kibomet School,

3.10 Conclusion and Recommendations for the Proposed Transmission Line Routes and Alternatives

It is recommended that, the land acquisition process be completed before the proposed project commences. The main constraint that are likely to affect the project and those requiring streamlining during project designs are discussed as follows:

- Section A-B has several power lines including the Jinja-Lessos line traversing the area. The Eldoret-Nairobi Oil Pipeline also traverses the area and its way leave is marked with beacons. It is recommended that the distance between the lines and existing facilities be observed according to law in order to reduce project impacts on them and the environment in general.
- At point C a non-sanitary waste dumping site was sited which is likely to attract birds, cause fire and generate leachate. It is recommended that the line pass on the western side of the dump site to enable mitigate on the impacts of the dump site. Technological factors like use of parallel circuits can help mitigate against the birds since other resident birds also exist in the area. Inter-departmental agreement can also be developed on relocation of the dump site or cessation of its use or converting it to a sanitary dump site.
- Between point D-F reservation was met since the proposed line was seen to traverse through a trading centre which had a school behind it. Routing the proposed line at this section might be delicate since the DOD department which is located opposite to the trading centre, also had reservation on using their territory for the project; this is sections B1-B2 and E-F according to the tables above. An alternative will be to consider passing the line further west after crossing the Eldoret-Webuye Road this is traversing deep into Emkuen village after point D or B1 where communities have relative bigger farms. It was gathered that the Ministry of Roads has proposed to develop a by-pass for the A104 Road on the existing Kipakaren Road and sections of the proposed power line alignment. Between point D and F. Discussions with the District Roads Officers (Regional Manager-Kenya National Highway Authority, Kenya Rural Roads Authority and Urban Roads Authority) and the District Physical Planner stated that the design road can be altered to pave way for the power line. A copy of the area master plan and design of the proposed road has been annexed to this report under Annex 5.
- At the section E-F along RTS the area is open and the management had no objection to the proposed line passing within their compound but the 9KR who neighbours the institution had reservations on the line passing through their compound as they stated it might interfere with their training activities. It is

recommended that this section of the line be re-aligned to pass on the eastern side of the road through farms.

- Several facilities exist between point E-F this include a borehole pump house, the Chepkoilel River and the Barracks Sewerage Plant. It was recommended by the Barracks management that, this section be re-aligned to avoid the infrastructure. The sewage plant pipeline stretch for about 1km east of the plant to the ponds.

3.11 Description of the Project's Construction Activities

The main activities during the construction phase will be excavation of materials, installation of steel towers, conductors and their support components.

3.11.1 Seclusion of Project Way leave and Clearing

The acquisition of way leave will be carried out before the implementation of the project commences. Land acquisition will be followed by site preparation which will include bush clearing to pave way for the installations.

3.11.2 Excavation for Foundation Works

The project area is made of different types of soils and varying geological conditions. The excavations will be conducted to create holes for erecting or installing the pylons. After excavation, foundations will be constructed for supporting the pylons. The excavation and construction of the foundations shall involve the use of hand tools like crow bars, mixers, vibrators, trappers but in case of rocky areas compressors and drills will be used.

The equipments to be used in project construction will require various forms of energy which will include manpower, charged battery or fossil fuel. The manual equipments to be used in the development project include crow bars, spanners and ropes. Fuel based equipments to be used will include mixer will include mixer, vibrators, compressors and drills.

The construction of the foundations will involve masonry work and related activities. General masonry and related activities to be undertaken will include concrete mixing, construction of foundations, erection of steel tower and curing of fresh concrete surfaces. These activities shall utilize labor from the neighborhood to supplement some machinery works such as that by the concrete mixers. Thus creating employment for the local population.

3.11.3 Structural Steel Works and Installations

The project will involve handling steel structures for the towers. The steel components will be purchased as parts from the manufacturer for bolting at the project site to make a complete steel tower/pylon.

3.11.4 Stinging and Tensioning

The conductors will be installed using a trolley to unwind them from the cable holders.

3.11.5 Landscaping

After successful completed the project construction work the project contractor should rehabilitate the project sites that could be subjected to clearing by planting indigenous plant species.

3.12 Description of the Project's Operation Activities

3.12.1 Way leave Clearance and General Maintenance

Activities undertaken during the project operations phase are minimal which will include clearing of overgrown vegetation and repairs of any defect that can be detected along the transmission line.

3.12.2 Waste Management

The project proponent will be required to manage the waste generated during the operation phase of the project appropriately. This can be done by providing facilities for temporary storage or handling of the solid and liquid waste generated during the maintenance period.

3.13 Description of the Project's Decommissioning Activities

3.13.1 Demolition works

Upon decommissioning, the components of the transmission will be uninstalled. This will produce a lot of solid waste, which can be reused for other project and construction works or if not reusable, disposed off appropriately by a licensed waste disposal company.

3.13.2 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

3.14 Analysis of Project Alternatives

This section analyses the project alternatives in terms of site, technology scale and waste management options.

3.14.1 No Project Alternative

The No Project Option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses in opportunities both to the community and the country as a whole. The no project option is the least preferred option from the socio-economic and partly environmental perspective due to the following factors:

- Exploitation of cleaner energy sources will not take place and this will in turn mean continuous destruction of the environment
- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under utilized.
- Reduced business development due to lack of initiative by regulating authorities to existing opportunities
- Reduced technology advancement in the country and interaction both at local, national and international levels.
- No employment opportunities will be created for thousands of Kenyans who will work in the project area.
- Increased poverty and hence insecurity in Kenya.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, the government of Kenya and East African region as a whole.

3.14.2 Project Alternatives

3.14.2.1 Land

The EIA study for the proposed Eldoret-Kitale transmission line indicated that alternative routes for the line need to be considered for some sections of the line.

Sections that will need re-alignment consideration include:

- Section traversing the KOFC – It is recommended that the line be re-aligned to pass on the western side of the Eldoret-Kitale road around Emkuen and Longisan villages.

- Sections traversing through the Kamagut Trading Centre, Longisan Trading Centre, sections of Matunda and Mois Bridge town. It is recommended that the line avoids these sections and pass through farming areas which have vast parcels of land.

The project has proposed two alternative lines which might both be installed; if two parallel lines with vertical arrangement of conductors are develop this will lead to need of more land and will be more expensive in terms of land requirements and displacement of PAPs. It is recommended that one line of 132kV be installed or one line of a higher voltage in order to minimize the impacts of land acquisition. Every reasonable effort should be made to minimize the resettlement of homesteads by comparing route alternatives.

3.14.2.2 Alternative Technology

3.14.2.2.1 Safety

All technological measures concerning safety should be observed during the designed and construction phases of the project in order to reduce anticipated negative impacts during the operation phase. Alternatives to be evaluated with the aim of enhancing safety should include the following:

- Use of double or single circuit- Double circuit lines are known to be safer than single circuit lines but the former is known to be more costly to develop as it requires more conductors. The double circuits are considered safe as they are visible and chances of not noticing them are low. Since the proposed project is a least cost project, the client aims to develop a single circuit line but it is recommended that project monitoring be conducted to enable gauge the need of enhancing safety in future.
- The height of the proposed line should meet the minimum requirements in order to ensure safety. Adequate tension should be provided to prevent sagging of lines.
- In areas with birds habitats use of horizontal circuits is encouraged in order to reduce incidences of bird's electrocution which is common in areas where parallel lines or vertical circuits are used. The use of double circuit towers will increase the visual impact and cause a greater risk for bird collisions. Other measures to increase visibility in bird areas include use of ball markers, bird deterrents, or diverters.

3.14.2.2.2 Corona Effects

Corona effect is induced when conductor are close to each other and when the conductors vibrate due to interaction of EMF. It is recommended that the minimum recommended distance between conductors be observed in order to reduce the humming noise or the corona effect. In addition dumpers should also be installed on the conductors in order to reduce vibration and hence reduce corona effects.

3.14.2.2.3 Installation Techniques

Cables can be installed underground or above the ground. Installation of underground cables can be used as an alternative in areas where EMF radiation is likely to affect other activities in the project area for example at KOFC. Installation of underground cables reduces or enhances the project impacts. Negative impacts reduced by underground installations include;

- Far less visual damage after installation;
- No physical obstacle to human, animals or birds.
- Minimum interference with land use
- Minimum effect on landscape and visual impact
- Minimum interference on geology and soils
- Minimum interference with water resources

The major positive impact of the underground cables is in the ability to engineer external fields to almost zero and minimal magnetic fields beyond 10 meters from the cable. The main challenge of using underground cable is that during repairs the line will have to be unearthed which leads to several environmental impacts.

It is recommended that the proponent take into consideration the project alternative during the project planning phase in order to ensure sustainable operation of the project. For instance underground cables can be considered when working in areas with large populations of resident birds and even human population.

CHAPTER 4 PUBLIC PARTICIPATION

4.1 Legal Requirement

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all E&SIA Studies undertake Public Consultation (PC) as part of the study. The aim of the PC is to ensure that all stakeholders interested in a proposed project (including project beneficiaries and the general public in the vicinity of the proposed project) be identified and their opinion considered during project planning, design, construction, operation and decommission phase.

In compliance to the requirements of the regulations, the consulting team conducted PC from 24th September 2009 to 7th October 2009 consulting community members in the whole project area.

4.2 Objectives of Public Consultations

The main objective of the PC was to:

- Inform the local administration (District Commissioners, District Officers, Chiefs, Assistant Chiefs, Councilors and Village Elders) on the proposed project and collect their views on the same.;
- Provide an opportunity to all the stakeholders and communities in the proposed project area to raise issues and concerns pertaining to the project;
- Conduct socio-economic survey; and
- Identify alternatives for the proposed project

4.3 Methodology and Data Collection

The public consultation for the proposed project was conducted simultaneously with the field work targeting the various groups of stakeholders. The consultations were conducted through use of questionnaire and public forums/*barazas*. The consultants developed several formats of questionnaires to target the various groups of stakeholders which included the community members, the local administration and departmental heads.

The key stakeholders were interviewed through holding consultative discussions and administration of questionnaires. Samples of questionnaires administered are annexed to this report. Consultation of community members was done both at household and communal level. List of names of all those consulted is also annexed to the report.

The household interviews were conducted in form of socio-economic survey by data enumerators who managed to interview over 85% of households located within the proposed project route using pre-developed questionnaires. The interviewers also targeted the general public residing in the vicinity of the proposed project route. Data collected during the PC included data on the particulars of the community members and their opinion on the proposed project.

Public forums were also held with the assistance of the local leaders in several locations within the proposed project area. The agenda of the meetings were divided into five sections namely:

- Project Introduction
- Questions and discussion sessions
- Project Socio-Economic and Environmental Impact Discussions
- Questions and discussion sessions
- Closing of the meeting

First section namely project description was conducted by the experts who introduced the proposed project stating its aim, components, length and locations as described in the Terms of Reference. After the project introduction phase, the community members were given chances to comment on the proposed project.



Plate 10: Community members attending a public consultation forum at Kamagut location, Eldoret North District



Plate 11: Community members viewing project area map during public consultation at Kamagut location, Eldoret North District



Plate 12: Local administrator address community members during a public consultation forum at Kimila in Kibomet location, Trans Nzoia West Disitrcct



Plate 13: Community members discussing during a public consultation forum at Kimila in Kibomet location, Trans Nzoia West Disitrcct

The socio-economic survey was conducted by data enumerators through the use of pre-defined questionnaires targeting the PAP. The data enumerators covered over 85% of the 65 kilometer project corridor by interviewing about 300 likely PAP's. The stakeholders were identified and consulted with the objective of understanding the existing socio-economic conditions of the area of influence and the immediate surroundings of the proposed project. The Project Affected Persons were grouped into four broad categories namely:

- PAP's whose land were entirely within the proposed project corridor this included the farms and housing structures
- PAP's whose land and farms will be partially acquired excluding the housing structures
- PAP's whose land and farms will partially be acquired including housing structures
- PAP's who will be entirely affected due to acquisition

The data obtained from the survey was analysed to provide the following:

- A summary of relevant baseline information on affected populations;
- All categories of project impacts which includes direct and indirect impacts of physical and/or economical nature on the people and the general environment.

The responses received from the local community, the local administration and departmental heads from the public consultation and socio-economic survey are represented in tables below of this report.

4.4 Responses from the Public Consultations and Socio-Economic Survey

The following sections present the views of the stakeholders on the proposed project. The views are presented as issues requiring clarification, the anticipated benefits of the project, its negative impacts and proposed recommendations to abate the negative impacts or enhance the project benefits. The views are presented in a tabular form indicating dates and locations at which the discussions were held and, the names of persons interviewed and their views.

4.4.1 Response of Departmental Heads on the Proposed Project

This section presents the views collected from the key stakeholders in the project area which includes departmental heads representing the various ministries in the district.

Table 4.4.1 Stakeholders Response to Proposed Project

Date	Department/ Representative	Name	Location	Contacts	Views
29/9/2009	Division Environment & Land Development Officer	David W. Wanyonyi	Sirikwa House Eldoret- Cherangani- Kitale Road, Ziwa Sirikwa	Soy Division P. O. Box 95 ELD 0734-444794, 0720-535816	-Recommended that effects of project on Agriculture be observed and maintained at minimum
29/9/2009	District Crops Officers	Mr Orwa	District Headquarters		<p>Positive Project will boost:</p> <ul style="list-style-type: none"> - agro-based industries -energy supply - employment creation <p>Recommendation</p> <ul style="list-style-type: none"> -Develop water harvesting structure - improve roads -develop markets for agricultural produce
29/9/2009	District Agricultural Officers	James Kemei	District Headquarters		<p>Positive Project will boost:</p> <ul style="list-style-type: none"> - agro-based industries -energy supply especially in up scaling urban centres - employment creation <p>Negative Impacts</p> <ul style="list-style-type: none"> -Foregone agricultural activities and related incomes -Loss of fertile land thus might affect food security due to

Date	Department/ Representative	Name	Location	Contacts	Views
					<p>reduced crop production</p> <ul style="list-style-type: none"> -Reduction in flora diversity as only low growing vegetation will be allowed to grow for example, grass will be allowed to grow and not trees <p>Recommendation</p> <ul style="list-style-type: none"> -Provide attractive compensatory rates for acquired land , destroyed crops and trees -Develop water harvesting structure - roads improvement through community empowerment -develop health facilities and market centres for agricultural produce
29/9/2009	District Livestock Marketing Officer		District Headquarters, Eldoret	0720792058	<p>Positive</p> <p>Project will:</p> <ul style="list-style-type: none"> -Promote micro food processing industries for example milk processing and increase livestock rearing -Propel pump based irrigation - Open up the area by developing factories, schools <p>Negative</p> <ul style="list-style-type: none"> -Exposure of soil to erosion due to vegetation clearing -Open holes will be dangerous for animals -Reduced vegetation due to cutting down of trees -Lead to evacuation of people -Broken wires may harm people and livestock <p>Recommendation</p> <ul style="list-style-type: none"> -Positive impacts outweighed negative impacts -Negative impacts should be minimized

Date	Department/ Representative	Name	Location	Contacts	Views
29/9/2009	Eldoret Water and Sewerage Company (ELDOWAS) - Sewer Manager Eldoret; Ag. Personnel and Administration Officer	Mr. Raymond Kurumei,	Sumali Road, Eldoret Town	P. O Box 8418-03100Eldoret info@eldowas.org www.eldowas.or.ke Phone: 0532063403/1915, 2061915; fax 206355 Mobile : 0724255538	<p>Positive Impacts</p> <ul style="list-style-type: none"> -Increased power supply <p>Recommendation</p> <ul style="list-style-type: none"> -Contractors to minimise solid waste and provide adequate water at site -Re-plant destroyed trees -Regulate noise and dust -Provide adequate drainage for storm water -Treat waste water to reduce risks to human health using open water bodies in project area -Price supplied power appropriately for all to access
29/09/2009	District Environment Officer Eldoret	Mr. Komen	Forest Department Eldoret	0722441545	-Will comment once EIA is submitted to NEMA and exact project area identified
29/09/2009	District Forest Officer	Mr. P. N. Karanja	Forest Department Eldoret	P. O Box 41 Eldoret 0722-265029	<p>Positive Impacts</p> <ul style="list-style-type: none"> -Improvement of roads and water projects -Employment of skilled and unskilled labour <p>Negative Impacts</p> <ul style="list-style-type: none"> -Displacement and diminished livelihoods -Acceleration of soil erosion

Date	Department/ Representative	Name	Location	Contacts	Views
					<ul style="list-style-type: none"> -Water erosion due to surface run-off -Air pollution due to exposed soils -Reduced crop production -Reduced livestock production due to loss of pasture -Loss of habitat and nesting sites -Loss of vegetation - Project to reduce forest cover in area <p>Recommendation</p> <ul style="list-style-type: none"> -Provide compensation -Project important as will spur economic growth
30/9/2009	District Environment Officer DEO Trans Nzoia District		Forest Department Kitale	0728312964	<ul style="list-style-type: none"> -Work for Saboti and Trans Nzoia -No forests reserve in project area
30/9/2009	District Agriculture Officer	Josphat Leing'ang'a	Ministry of Agriculture , Kiltale		<ul style="list-style-type: none"> -Agriculture has different department namely Home Economics, Agribusiness, Soil and, Environment, Technology Transfer and Mechanisation will discuss with all staff and give input -There is no Gazette Notice on agricultural rates for compensation -The department need to conduct baseline survey to come up with data as farming system in the area have changed over the years -Earlier farms were large and based on one crop -The department had been contacted by KPLC to provide

Date	Department/ Representative	Name	Location	Contacts	Views
					compensation rates for the area
30/9/2009	District Livestock Assistant Officer	Mr. Araka	Ministry of Agriculture , Kitalale	07229752555	-Project will boost development in the area
30/9/2009	Kitale Municipal Council Assistant Roads Engineer		Kitale		Kibomet area planned to be under Municipal but currently still under the County Council
	Administrator	Sammy Okema Barnabas Mutimba	Kitale		
30/9/2009	NZOWASCO- Area Manager	Mr. Joseph Maloba	NZOWASCO Offices, Kitale Town	0723626818	<ul style="list-style-type: none"> -Have treated water supply line in Kibomet, Wekhoya, Bikeke, Waitaluk, Sirende, Amagoro plus other several connection along main pipeline upstream -Amagoro last point of supply is along Kitale-Eldoret line -Has a treatment plant in Waitaluk -Water is rationed and supplied between 6-9pm in alternating days Negative Impacts -Vandalism of water pipes -Breakage of water lines -Destruction of crops during line installation
	Technical Manager	Mr. Kavogi			

Date	Department/ Representative	Name	Location	Contacts	Views
					<p>-May affect resident birds</p> <p>Positive Impacts</p> <p>-Empowerment of youths</p> <p>Recommendation</p> <p>-Sensitize community on power use/hazards</p> <p>-Conduct project with minimum interference on crops, waterlines and aquatic life</p> <p>-One NZOWASCO company employee to be seconded to the project team to show areas installed with pipeline within the project area</p>
30/9/2009	Works Officer County Council of Kitale (CCK)	Mr. Wasike	Kitale		<p>Negative Impacts</p> <p>-Reduced land for cultivation of crops</p> <p>-Will lead to vegetation clearance</p> <p>Recommendation</p> <p>In overall project is good but should incorporate following remarks</p> <p>-Provide appropriate compensation</p> <p>-Rehabilitate and reinstall water pipelines</p>
	Billing Office County Council of Kitale (CCK)	Monica Akinyi		0715098993	-Project is good
30/9/2009	Sub-Regional Manager Water Resources	Mr. Wafula	WRMA Offices, Kitale Town	0734424585	<p>-Project impact on water are minimum but clearing of trees will affect catchment and rainfall patterns</p> <p>-Before constructing near catchment there is need to discuss with WRMA on depth of excavations</p>

Date	Department/ Representative	Name	Location	Contacts	Views
	Management Authority				
30/9/2009	Water Resources Management Authority Catchment Management Officer,	Mr. Nyangweso			- Serves the Larger Trans Nzoia namely Bungoma, Mount Elgon, Teso and Pokot Districts -Boundary ends at Mois Bridge with Uasin Gishu district
30/9/2009	District Water Officer-Lake Victoria North Water Service Board	Mr. Mudachi	Lake Victoria North Water Services Board, Kitale Town		-As discussed with NZOWASCO
30/9/2009	District Roads Engineer-Trans Nzoia West	Eng. Kiogothe			-Project will affect three districts each with its roads engineer
30/9/2009	District Roads Engineer-Kwanza	Eng. Callistus Khaemba Mamwalwa		0722422956	
30/9/2009	District Roads Engineer-Trans Nzoia East	Joseph M. Gachohi		0722992649	

Date	Department/ Representative	Name	Location	Contacts	Views
1/10/2009	Ministry of Lands-Lands Officer	Ms. Keziah		0722344514	-Land sub-division has taken place in the area reducing land acreage
	Land Valuer	Ms. Magret		0722166528	-Could only give estimates of land value as each individual has property of different value on the land
1/10/2009	Kenya Power & Lighting Company- Transmission Officer	John Omija Transmission Engineer		0720843723	Recommendation -Project requires wayleave of about 60m (150ft) -Project has minimum negative impacts
1/10/2009	Public Health Department – District Medical Officer	Dr. Lubanga M.B		P.O Box 5665 Eldoret Tel: 0532062711	Positive Impacts -Improved livelihoods for business and homes due to viable electricity supply -Creation of employment and empowerment of local communities through un-skilled manpower Negative Impacts -Displacement of population may affect livestock and crop production -Degree of deforestation may be exercised with the project Recommendations -Generally the positive impacts outweighs negative impacts thus project is viable
2/10/2009	Managing Director KERA	Eng. Shachile Laban	Eldoret	0721672619	-Plans to decongest town by developing a by-pass still sourcing for funds estimated at 1.5B as development plan is ready -Need to compensate locals as existing road reserve not

Date	Department/ Representative	Name	Location	Contacts	Views
					adequate for class A road requires 60m while existing road is class E with reserve of 20-25m -Suggest need to harmonise road and powerline projects with district physical planned to avoid double compensation
5/10/2009	Physical Planner Trans Nzoia West	Beatrice Wangila	Kitale Town	0722458282	Recommendations -There are planned markets at Sirende and Waitaluk; markets have power and difficult to plan them as the power line traverse them -Currently market made of semi-permanent materials -Most of project area were settlement schemes and each had a plot for trading centre -Appropriate market land use plan is currently undergoing development -Suggest market should be avoided as they are the only public land available -Looking for alternative public land for market is difficult
5/10/2009	Physical Planner Uasin Gishu	Job Ngetich	Eldoret	0722804524	-Eldoret-Kampala by-pass proposed to pass through Kapsereet and Kapinga -Proposed plan for the road can be altered or harmonised with powerline project
29/9/2009	Department of Defense (DOD)-Kenya Ordnance Factory Corporation		Kamagut	Managing Director, Kenya Ordnance Factory Corporation,	Recommendation -Suggest line not to pass near institution compound as area has high charges and institution deals with explosive -Area is prone to lightening and dangerous as area will be more charged due to the presence of the line

Date	Department/ Representative	Name	Location	Contacts	Views
	(KOFC)			P. O Box 6334-003100 <u>ELDORET</u>	-Have allocated land near Maili Tisa junction for development of the Eldoret West District Headquarters
1/10/2009	Department of Defense (DOD) Recruitment Training Centre	Colonel Kendagor A.K Adjutant Unit Staff Office/Recor	Kamagut	P.O Box 6334-003100 <u>ELDORET</u>	-Has three different institutions specializing in three areas namely KOFC, 9KR and RTS Recommendation -Project to be flexible to avoid damaging pump house at 9KR -Prefer line not to be on the side of the road neighbouring the institution -KOFC water pump house at Likuyani should not to be interfered with -No activity is recommended within 3km of KOFC due to the presence of explosives manufactures there -Project to mitigate against interfering with road users, pylons be installed away from road and conductors should not hang
5/10/2009	9KR (Kenya Rifles)				Negative Impact -Line will affect training activity Recommendation -Re-align line to pass opposite to the organization
9/10/2009	KPLC Rivertex Eldoret Sub-Station	Bendard Wasike-Transmission Technician	Pioneer Eldoret	0721153239	Positive Impacts -Enhance power supply Negative Impacts -Long lines prone to breakdown

Date	Department/ Representative	Name	Location	Contacts	Views
					-Clearance of vegetation might increase soil erosion Recommendations -New line to move parallel to existing one to reduce impact on vegetation -Overall positive impacts exceeds negative impacts
15/10/2009	Municipal Council of Eldoret- Director of Environment	Joseph Chelule	Eldoret Town	P.O Box 40 <u>ELDORET</u> Tel:053- <u>2032585</u> Mobile: 0725762915	Positive Impacts -Supply of electricity in project area Negative Impacts -Project might interfere with trees along the road reserve Recommendation -Proposed project is good as community will benefit from the project-

4.4.2 Response of Local Administration on the proposed project

This section presents the views of the local administration, community opinion leaders and village elders on the proposed project.

Table 4.4.2 Local Administration Responses to Proposed Project

Date	Representative	Name	Location	Contacts	Views/Remarks
27/9/2009	Chief and Assistant Chief	Phillip Komen	Kipkareen	Chief's Office Pioneer	-They are ready to assist as much as possible by taking consultants through the project area in their jurisdiction and introduce consultants to other chiefs in neighbouring areas -Discussed project with community members and community has no objection as long as their property is appropriately compensated
27/9/2009	Chief	Joseph Cheruyot	Kamagut Location, Turbo division, Eldoret West.	0721676266	-Area starts after Toro farm near the foot bridge on Sosiani River to Chepkoilel river near Soy town -What benefits will they get; community needs to see transformers installed for them. -Eldoret-Kampala pipeline is proposed to pass through the area
27/9/2009	Village Elder	Paul Lagat	Kipkenyo village	0202339747	-Project is good so long as community property is compensated at market value
29/9/2009	Village Elder	Simon Sitienei	Chemalal Trading Centre	0724141997	-Proposed project is good but community would also like to know the benefits they will get
29/9/2009	Assistant Chief	Mr Chelule	Soy Location	0723713445	-Project is good and will sensitise community on it -Soy Division is shared with Western Province – Sections of Soy is in Lugari District and Rift Valley separated by the Eldoret-Kitale tarmac road -Soy division starts form Chepkoilel/Segoit River to

Date	Representative	Name	Location	Contacts	Views/Remarks
					Kipsangui River -Borders Lugari with tarmac road. -Will organize for a public <i>baraza</i> near Soy Dam on 1/10/2009 in order to address community
29/9/2009	Chief	Charles Banda	Soy Location Lukuyani Division	0722235834	-According to map project does not traverse the Soy in Western Province -Visit chief of the Soy in Rift Valley
29/9/2009	Community Opinion Person	Hannington Agoi Lusiola	Mukunga A	0714575285	- River at Mukunga A marks boundary of Lugari and Uasin Gishu District -Community also needs to benefit from project as they had applied for power supply
29/09/2009	Chief	Willson Sirma	Mois Bridge	0722970624	- Area of jurisdiction starts from Matunda bridge to Mois Bridge -Agreed to organize meetings at Maendeleo -The railway line marks the border with Lugari - Scheduled meetings for Maendeleo, Milimani, Bwayi and Sinoko village on 2/10/2009
29/9/2009	Chief	Samuel Biwot	Waitaluk location	0722780878	-Located at DO's office compound -Area stars at Bwayi area near Mois Bridge to Village Inn -Scheduled meetings for Kapkoi, Kaptien, Kimoson villages at Kapkoi Trading Centre on 5/10/2009 at 2pm

4.4.3 Response of Local Community on the Proposed Project

This section gives the responses the community members gave during the public forums held for discussing the proposed project.

Table 4.4.3 Views of Community Members on the Proposed Project

Date	Location	Findings and Discussions
30/9/2009	Pioneer chief camp	No attendance chief postponed meeting as was attending to IDP's
1/10/2009	Soy	No attendance as community members choose to attend a micro finance promotion meeting despite being informed by the chief of the project meeting ; chief postponed meeting to 3/10/2009
1/10/2009	Emkuen village , Kamagut	<ul style="list-style-type: none"> - Meeting attended by over 50 people -Agenda was based on: -Proposed project -Alcoholism -Youth -New community village elders -Proposed project <p>Meeting Conclusion community had no objection to the project and decision will be made during further consultations</p>
2/10/2009	Bwayi and Sinoko	<ul style="list-style-type: none"> -Meeting attended by over 50 people -Agenda was based on: -Increased accidents due to over speeding motor bikes -Need of health facilities -Proposed project -Increased insecurity -Registration of persons especially those born at home <p>Meeting Conclusion -On the project community members stated that:</p>

Date	Location	Findings and Discussions
		<ul style="list-style-type: none"> -They need to receive power -Project should avoid areas where land parcels are small especially in trading centre and its immediate environment -Valuation process of project should be representative
2/10/2009	Kimila Schewe, Hill School	<ul style="list-style-type: none"> -Meeting was representative as attended by opinion leaders and Agricultural Officer <p>Concerns Raised</p> <ul style="list-style-type: none"> -Community members stated costs of electricity connection was high -Wanted clarification on the form of compensation to be given and what happens to land ownership after compensation <p>Meeting Conclusion</p> <ul style="list-style-type: none"> -Community supports the project
3/10/2009	Soy	<ul style="list-style-type: none"> -Community reserved about meetings but are waiting for the project to commence so as to discuss details
5/10/2009	Maendeleo and Milimani	<ul style="list-style-type: none"> -Meeting attended by over 50 people -Agenda was based on: <ul style="list-style-type: none"> -Increase accidents due to over speeding motor bikes -Need of health facilities -Proposed project -Increased insecurity -Registration of persons especially those born at home <p>Meeting Conclusion</p> <ul style="list-style-type: none"> -On the project community stated that: <ul style="list-style-type: none"> -They need to receive power - Project should avoid areas where land parcels are small especially in trading centre and its immediate periphery -Valuation process should be representative
5/10/2009	Kapkoi Centre	<ul style="list-style-type: none"> -Main agenda was on the proposed project and electricity supply in the area

Date	Location	Findings and Discussions
		<ul style="list-style-type: none"> -Community mainly raised questions in regards to the proposed project -On project benefits and power supply in the area, they raised the following questions: -Will they get power? -What about those living deep in the villages -What happens when trees are cut; will they be compensated What happens to owners of parcel as small as 0.1Ha -Does this mean ongoing power supply projects will stop? -Does this mean cost of power application will go down? -What can CDF do to reduce costs connection of power

4.4.4 Socio-Economic Survey and Findings

This section provides summary of the baseline information on the findings of the socio-economic survey which includes the relevant socio-economic circumstances of the PAPs; key issues likely to be faced in terms of land acquisition and compensation; quantification and criteria of vulnerable PAP's and, options and strategies for minimizing impacts on current land use activities or cultural heritage.

The consultants have developed an electronic database containing all socio-economic data collected during the survey. The survey has managed to bring out the following details:

- Name and family details
- Demographic information on social classification, education and occupation of each family member
- Skill base/ education level for each member
- Total family income (from all sources)
- Identification of vulnerability (women-headed household, family with physically and mentally challenged members, family with aged members, family with income below poverty line and family losing more than the economic threshold of their land through acquisition/ negotiation)

Socio-economic survey was conducted with two hundred and forty six (246) PAPS in the project areas which included households, commercial and institutional entities. The table below gives the dates the different project areas were surveyed and a summary of the relevant baseline information on affected populations deduced from the study findings

Socio-Economic Survey Study Area and dates of Study

Date	Area
26/09/2009	Farms Pioneer Location, Kipkaren, Kaptinga
27/9/2009	Pioneer and Kipkenyo
28/09/2009	Soy and Kamagut,
29/09/2009	Chemical, Msalaba Yellow, Nangili to Mukunga A-B
30/09/2009	Naisambu, Kibomet, Bikeke, Machungwa, Wekhoya Toro, Mois bridge, Toro, Maili Mbili, Matunda Police towards Moi's Bridge

Date	Area
1/10/2009	Kitongoria, Kapkoi, Matunda, Maua, Lamayuet, Sheiwe

Summary of the socio-economic survey findings depicting the characteristics of the respondents and project area

Variable	Characteristics	Percentage
Gender	Male	62.3
	Female	37.7
Marital Status	Married	90.4
	Single	4
	Divorced	0.6
	Widowed	5
Age of household head	20 and below	1.7
	21-30 years	20
	31-40 years	25.1
	41-50 years	19.4
	51-60 years	19.4
	61-70 years	11.4
	Over 70 years	2.9
Total number of dependants	3 and below	8
	4 to 7	47
	8 to 11	29
	12 to 15	15
	Over 15	1
Occupation/ Employment of the household head	Farmer	39
	Government/public sector	19
	Private sector	15
	Casual labour	16
	Self-Employed	11
Family Structure	Nuclear family	75
	Extended family	14
	Polygamous family	11
Income of the household head	5,000 and below	17
	Kshs 5,001-10,000	22
	Kshs 10,001-15,000	13
	Kshs 15,001-20,000	17
	Kshs 20,001-25,000	5
	Kshs 25,001-30,000	6

Variable	Characteristics	Percentage
	Over Kshs 30,000	22
Education level for head	Secondary	45
	Primary but cannot read	11
	Primary and able to read	33
	No education	11
Religion	Christian	99
	Islam	1
Number of Houses Per Homestead	One	60
	two	15
	three	9
	Four	6
	>Four	10
Socio-Economic Activities	Crop Farming	94
	Livestock Keeping	3
	Poultry	2
	Business	1
Sources of Income	Farming	89
	Employed	6
	Unemployed	4
	Pensioners and Retirees	1
Types of Farming	Subsistence	22
	Commercial	6
	Both Subsistence and Commercial	86
Response on measures needed to improve locals living standards	Improve on farming	42
	Start a business	29
	Need either loan or grant	26
	Government to Create Employment	3
Relation to property	Own residential property	98
	Rented	2
Number of years have resided in the area	0 to 10	25
	11 to 20	19
	21 to 30	18
	31 to 40	15
	41 to 50	23
Property Characteristic	Blocks, iron sheets and wood wall	73.3

Variable	Characteristics	Percentage
	Iron sheets roof	6.7
	Wooden walls and iron roofs	20
Land Ownership	Freehold	83
	Not specified	7
	Traditional	6
	Leased	4
Water Sources	Borehole	68
	Piped Water	26
	Rivers	6
Sources of Energy	Wood	61
	Electricity	20
	Paraffin	17
	Gas	1
	Solar	0
Estimated number of people to be resettled from household		
	1-3	21
	4-7	34
	8-11	30
	12 and above	15
Resettlement Preference	Resettling with community members	81.3
	Resettling without community members	18.6
Preliminary Resettlement	No Response	62
	In the same district	21
	People to be resettled near their present homes	7
	Not considered yet	5
	Identify rich Agricultural land first	5
anticipated project impacts on household	Electricity use	56
	Loss of agricultural land	21
	Loss of culture	16
	Indifferent	7
anticipated project impacts on socio-economic activities		
	Relocation	33.3
	Noise	16.7
	Loss of job	8.3
	Boost business	16.7
	Reduce income	25
Potential adverse impacts	Malnutrition from low	24

Variable	Characteristics	Percentage
on vulnerable groups.	farm output in a family	
	Schooling of children affected	27
	Loss of employment	13
	Health hazards from material used in project construction	4
	Loose their ancestral land which has sentimental values for old people	25
	Loose their ancestral land which has sentimental values for old people	6
Anticipated impacts of resettlement on commercial entities		
	Loss of customers	66.7
	Compensation will boost income	16.7
	Loss of business	8.3
	Loss of income	8.3
Anticipated impacts of resettlement on households		
	Compensation for property destroyed	
	Give money to start business	
	Youths to be given casual jobs	
	Relocate the aged a few meters from area	
	Resettlement to be in areas with adequate facilities	
	Project to be environmentally friendly	
Alternative consideration to proposed project and resettlement		
	No resettlement, only compensate	44
	Use idle land and road reserves	19
	Underground cables to be used	11
	Pass the line on cultivation land and not homesteads	10
	Power line to bypass another location	8
	Use other sources of	3

Variable	Characteristics	Percentage
	energy e.g solar energy	
	Not considered yet	3
	Relocate on the same piece of land	2
Issues Likely to hinder resettlement of PAP	Social dynamism	33.3
	Means of Transport	22.2
	Nature of Business	11.1
	Tribalism	33.3
How collective decision is made in the area	Through Chief Baraza	33.3
	Through Women Group	8.3
	Informal groups	25
	Land lords and tenants	8.3
	Welfare groups	25

- Source: data from the Field analysis

4.5 Major Environmental and Social Concerns Raised

In general the response to the project was positive where the community members and their representatives stated the overall project objectives are good for the economic development of the area. Despite that the stakeholders raised some issues that they would like the proponents to incorporate in the project during project design and planning.

4.5.1 Land Acquisition and Compensation

The community members were concerned about the land acquisition and the compensation procedure. Those with large farms had no problem with the project as the project will leave them with adequate space and not affect their daily activities which include mainly farming. Despite that they added they should be adequately compensated on land acquisition.

The community members with small parcels of land stated that to reduce resettlement and relocation they would like the line relocated to areas where communities have large land parcels. This was a major concern especially near towns and trading centres like at Kamagut, Longisan, Matunda, Mois Bridge and Kapkoi. The studies showed that the community members in these sections had small pieces of land others smaller than 0.1 hectare.

The DOD institutions found in the project area also raised concerns on the need of line re-alignment to avoid the institutions.

The consultants recommend that the proposed line be re-aligned and moved from the sections of concern in order to minimize project impacts such as resettlement, interference with organization activities among other impacts.

4.5.2 Human Resource /Employment Opportunities

The community members would like that the locals be considered for employment before immigrants are brought in to uptake the jobs positions that would be created. They emphasized non-skilled labour like bush clearing, excavation works, clerical works including socio-economic survey should be done by the locals. The consults supporter the opinion of the community members and added that the proponent is known to have always given local communities in project area employment consideration. This was attested by others who have lived in areas where high voltage lines have been installed.

CHAPTER 5 BASELINE INFORMATION OF THE STUDY AREA

5.1 Introduction

This section gives the baseline information of the project area based on available literature materials. During the study it was noted that the administrative structure of the project area had changed and several new districts had emerged due to sub-division of the older districts. The baseline information provided in this report is based on data available for the larger districts.

The Eldoret-Kitale line currently traverses six districts namely Wareng, Eldoret North, Uasin Gishu, Lugari, Trans Nzoia East and Trans Nzoia West. The six districts were initially three districts namely Uasin Gishu, Lugari and Trans Nzoia currently referred to as the larger districts. The districts are located in Rift Valley Province apart from Lugari which is located in Western Province.

The baseline information provided is based on the three larger districts as literature material representing the newly formed districts are still compiled. The new districts still share several governmental departments with their former head offices.

5.2 Geographical Location and Size

5.2.1 Trans Nzoia District

The larger Trans Nzoia District covers a total area of 2,487.3 Km² and, extends between latitude 0°38' and 1°18' north of the equator and longitudes 34° 38' and 35° 23' east in the western part of Kenya in Rift Valley Province. The district is currently referred to as the larger Trans Nzoia district since it has been sub-divided into four districts of which two are traversed by the proposed project namely Trans Nzoia West and East.

5.2.2 Larger Uasin Gishu District

The larger Uasin Gishu District covers a total area of 3,327.8 km² and, extends between longitudes 34° 50' and 35° 37' east and 0° 03, and 0° 55' north. The district shares common borders with Trans Nzoia to the north, Marakwet and Keiyo Districts to the east, Koibatek District to the South east, Kericho District to the south, Nandi District to the west and Lugari District to the North West. The larger district has been sub-divided into three districts namely Wareng, Eldoret West and Uasin Gishu. All the three districts are traversed by the proposed project.

5.2.3 Lugari District

Lugari District was carved out of the larger Kakamega District in 1998. It is one of the eight districts in Western Province. The district occupies an area of 670.2 km² and has four divisions of which one namely Lukuyani is within the project area.



Plate 14: Mountain View Hill in Moi Bridge, Uasin Gishu District



Plate 15: Swampy section in Kamngut, Eldoret North District

5.3 Land Use

5.3.1 Trans Nzoia District

There are four main land uses within the district namely agriculture, industrial, commercial/residential use and other uses including road. The district has experienced a significant change in land use. Land was initially mainly under agricultural use but due to increase in population most farms have changed use to commercial and residential. Land is a big issue in the district that has resulted in intermitted conflicts. The once large farms have been subdivided and fragmented as more and more people are in need of it. This has impacted on the settlement pattern such that there are more people settling on uneconomical pieces of land especially around the major roads and near market centers. Pressure on land has also led to the destruction of forest farmland, clearance of catchment areas and wetlands thus impacting negatively on the environment.

5.3.2 Uasin Gishu District

Land use in Uasin Gishu is mainly agriculture followed by industrial mainly within Eldoret. Agricultural practices include crop production which is the main source of

livelihood, livestock production and fisheries production. Fish farming is limited since it's a new idea being adopted in the district, the community being non-fish eaters.

5.3.3 Lugari District

There are four main land uses within the district namely agriculture, industrial, commercial/residential use and other uses including roads. Agricultural practices include livestock production, poultry keeping and crop production which is the main source of livelihood since the district is a high potential agricultural zone.

5.4 Topography, Drainage and Hydrology

5.4.1 Trans Nzoia District

The district's relief ranges from 1,800-2,000m with three important topographical features; Mt.Elgon, the Cherang'any hills and the River Nzoia. The river drains the district with its major tributaries Ewaso, Rongai, Koitobos and Ainomaget rivers. These rivers flow into Lake Victoria through River Nzoia while Suam River drains into Lake Turkana.

Most rivers flow all year round causing some flooding in Namanjalala and Endebess due to vegetation cover depletion.

5.4.2 Uasin Gishu District

Uasin Gishu is in the Lake Victoria catchment zone and all the rivers in the district drain into Lake Victoria. Major rivers in the district include; Sosiani, Kipkaren, Kerita, Kipkuner, Nderuget, Daragwa, Sambu, Moiben, Little Nzoia, Nzoia, Sergoit, Ellegerine and Endoroto.

The rivers found in proposed project area are Sosiani, Kipkaren and Sergoit



Plate 16: Sections of Sosiani River in Kamagut location, Uasin Gishu District



Plate 17: Communal dam in Kibomet Trans Nzoia District one of the water likely to be used during project implementation

5.4.3 Lugari District

The topography varies with altitude ranging from 1250m to 2000m above sea level. The Nandi escarpment forms a prominent feature in the district rising from general elevation of 1600-2000m. The Nzoia River Systems also flows through Lukuyani Division in Lugari District.

5.5 Soils and Geology

5.5.1 Trans Nzoia District

The rocks in the district are mainly sediments, grits, sand stones, shale's and limestone's which have formed from metamorphosis of series of shale's and calcareous, shale sand stone and limestone enabling the resultant gneisses. The south east section of the district consist of well drained dark red, deep red friable clay, dark sandy loam derived from the basement rock complex. Towards the north the soils are of low fertility, on the mountain foot soils are dark brown with acid humid top soils. These soils have moderate to high fertility.

5.5.2 Uasin Gishu District

Soils in the district are classified as red loam, brown clay and brown loam, and are as indicated in the table below.

The soil types are distributed as follows:

Soil Types	Distribution	Remarks
Red loam	Turbo, Mois Bridge, Lower Moiben	Within project area
Red clay	Soy, Upper Moiben	Within project area
Brown clay	Upper Plateau areas	Out of project area
Brown loam	Ainabkoi and Kapsabet locations.	Out of project area

It can therefore be concluded that the soil types in the project area are red loam and clay

5.6 Climate conditions

5.6.1 Trans Nzoia District

Rainfall is fairly well distributed throughout the year with an average annual precipitation of 1,296.1mm. The district experiences bimodal rainfall pattern with the long rains falling from April to June while the short rains fall from July to October. The temperature ranges between 10 degrees Celsius to 37 degrees Celsius with the mean temperature at 18.6 degree Celsius.

5.6.2 Uasin Gishu District

Rainfall in the district is high, reliable and evenly distributed. The average rainfall ranges between 900mm-1200mm. It occurs between the month of March and September with two district peaks in May and August. The wettest areas are found in Ainabkoi, Kapsaret and Kesses divisions. Turbo receive average rainfall while Moiben and Soy relatively low rainfall. The dry spells begin in November and end in February temperatures range between 8.4°C and 26°C with an average of 18°C.

5.6.4 Lugari District

General climate and rainfall pattern of Lugari District are of equatorial type. Temperatures vary between 6°C and 23°C in the high altitude areas and between 18°C and 24°C in low altitude areas. The rainfall pattern is bimodal with long rains occurring in March to September while the short rains are experienced in October to November. The average annual rainfall is between 1000mm and 1600mm.

5.7 Biological Diversity

5.7.1 Trans Nzoia District

Flora and Fauna

The Fauna components include reptiles, mammals, birds, amphibians, insects and mollusks. Of the importance are the mammals and avian life forms. Due to rapid habitat destruction most of the fauna has disappeared. There are diverse vegetation types found within the ecosystem, which comprise of the indigenous trees, bamboo, moorland, shrubs, grassland, herbs, lianas, mosses, lichens and exotic forest plantation.

Aquatic Ecosystems

Most of the wetlands in the district are riverine permanent edges of rivers and edges of tributaries of river nzoia. Most of the wetlands though have been encroached to create room for agriculture. Saiwa Swamp National Park is found within Saiwa swamp which covers an area of 2.9 km sq. the species found in the park include crowned cranes, water birds, and de' Brazza monkeys. Sitatunga antelope are threatened species and endemic to the swamp.

5.7.2 Uasin Gishu District

Flora and Fauna

The district is endowed with several natural resources, the most important natural resources being the land, forests, wildlife and rivers. The area has several forest types including; montane, bamboo, bush land and grassland with a total area of 29,801.92ha. The major forests in the district include Nabkoi, Timboroa, Kipkurere, Lurenge, Singalo and Kapsaret forests. The project area was found to have no forests or plants of endangered species.

Aquatic Ecosystems

Wetlands which are home to many macrophytes like papyrus, reeds, Cyprus among others; some contain fish e.g. the mudfish but in insignificant numbers. microphytes like spirogyra can be found in parts of wetlands. Birds, frogs, snakes and a variety of insects like butterflies are found in the aquatic ecosystem.

5.7.3 Lugari District

The district consists of three exotic forest plantations including Turbo 2612.2ha, Nzoia 3619.1ha and Lugari 2163ha. Other flora include bush land found mainly at the ridges. There is no major wildlife in the district save for monkeys and butterflies all the major wildlife species have migrated to Malava forest.

5.8 Social Setting

5.8.1 Trans Nzoia District

5.8.1.1 Settlement Patterns

The district has a population of 575,662 of which 286,836 are male and 288,826 are female. There are a total of 116,122 households in the district and a population density of 231 persons/km². Central division has the highest density of 562 persons/ km² with Endebess having the lowest density of 90 persons/ km². The district has a population growth rate of 3.8% and a dependency ratio of 100:104. Waitaluk division within the project area has a population of about 70,000 people.

5.8.1.2 Poverty Status

The national baseline survey of 1997 indicates that 44% of the people living in the district live below poverty level. This represents over 250,000 people in the district.

5.8.1.3 Health Aspect

The main diseases experienced include HIV/AIDS with a prevalence rate of 14%; water borne diseases (diarrhea, typhoid, amoeba, and skin diseases); vector borne (malaria which is common among children of 5 years and below and pregnant women) and respiratory diseases.

5.8.1.4 Economic Activities

The district has four main industries: agriculture, business and, manufacturing, tourism and civil service employment. The district is agricultural based and the sector employees the largest number of the economically active population and contributes about 60 per cent of the total income of the district.

5.8.1.5 Gender and Equality

There are fundamental challenges of gender equality within the district. The district is mainly agricultural and women provide most of the agricultural labour. However they do not have control or access to the benefits realized from the sale of crops. Women have little say over what happens in the farms as men are the main land owners. Domestic and social burden also fall on the women. Off-farm income generating activities by women can be developed when deliberate efforts are made to create more shopping centers in the rural areas where majority of them live. Such efforts should centre on the provision of basic infrastructure such as roads, electricity, telephone, banking institutions among others.

5.8.1.6 Tourism, Trade and Industry

Tourism, trade and industry sector is important in the district as it generate income and creates employment. The income generated from this sector is invested in farming activities to provide food and more income to the people thereby reducing poverty. About 25% of the district population derives their livelihood from this sector. The increase in electricity availability will enable the communities develop their dependent industries and even open other economic venues like food processing.

5.8.1.7 Social Services and Community Facilities

The project area covered in the district namely Waitaluk and Kibomet locations in Central Division have several social facilities including small-scale trading centres, schools both boarding and day, clinics and dispensaries, mobile telephone communication reception, tarmac roads and local access roads. The areas were seen not to have financial facilities in their immediate areas but were within reach in Kitale town.

5.8.1.8 Road Network and Water Supply

Waitaluk is easily accessible form the Eldoret-Kitlae highway and local access through all weather roads. Kibomet is also accessed through the same highway in addition to the Kitale-Cherengani road. Kibomet connects Trans Nzoia West to East through the Cherengani Road while Waitaluk connects the districts through the Maili Mbili earth road.

There is a problem in the availability of water in the interior rural areas though Kibomet is connected to water supply by NZOWASCO. In general the community has to travel long distance to the nearest water point. Water demand has gone up considerably surpassing the supply status. Water is needed both for domestic use and for industrial use in town. Catchments areas mostly degraded by farming, trees felling and cattle grazing in those areas.

The quality of water for various users is below standards. This is especially where there is piped water in the rural areas. Water quality changes from fair to worse from the source to downstream in case of a river. Water pollution is serious as you move down stream and very serious in rivers that originate from the town. The average distance to the nearest portable water point is 1 km.

5.8.2 Uasin Gishu District

5.8.2.1 Settlement Patterns

Turbo and Kapsaret divisions are densely populated while Moiben Division is sparsely populated, the former attributed to high urbanization rate while the latter case is due to the existence of large farms in the area.

5.8.2.2 Poverty Status

There exist some pockets of poverty in the highly populated areas of Huruma (Turbo Division) and Langas (Kapsaret Division) where urbanization has led to emergence of slums. In Moiben Division, Meibeki location, poverty especially during dry seasons is attributed to harsh climatic conditions. Although the District ranks as a major food producer in the country, poverty incidence is still high. Rural food poverty was estimated at 42.92% of the population in 1997 as compared to an estimate of 37.04% in 1994. Urban food poverty was estimated at 26.89% in 1994 and increased to 37.98% by 1997. Thus, urban food poverty in the district is lower than food poverty levels in rural areas. Those vulnerable to poverty in the district include the persons with disabilities, the elderly, women, (particularly female headed-households), the landless, the youth, unemployed, orphans and children in difficult circumstances.

5.8.2.3 Health Aspect

The three most prevalent diseases in Uasin Gishu district are Malaria, respiratory infections and water borne diseases. There are two government hospitals in the district and seven private hospitals. The ratio of doctor to population is 1:10,034 in the district.

5.8.2.4 Economic Activities

The district has four main industries: agriculture, business and manufacturing, tourism and civil service employment. The district is agricultural based and the sector employs the larger number of the economically active population and contributes 60 per cent of the total income of the district. As income levels decline people tend to take any form of economic activities regardless of their impact on the environment. The district is characterized by high level of unemployment, high living costs and low income.

5.8.2.5 Education and Training

The district is well served with education facilities and is home to Moi University and several private Universities have recently been opened in the area. The district also holds one of the national polytechnics namely Eldoret polytechnic.

5.8.2.6 Social Services and Community Facilities

The demand for housing is high in Eldoret town and its surrounding due population influx caused by high commercial activities in the areas. Eldoret municipality is partially served with sewerage systems. Other centers use pit latrines or the septic tanks for sewage disposal. Health facilities are well spread in the district, with big hospitals like the Moi Referral hospital.

5.8.2.7 Road Network and Water Supply

Road network is good and transport facilities are reliable in most areas of the district. Most of the population in Eldoret town is served with piped water while the rural population utilizes other water sources.

5.8.3 Lugari District

5.8.3.1 Settlement Patterns

About 90 per cent of the district's population lives in rural areas. Matete Division has the highest population density but Likuyani Division accounts for the largest share (42.25%) of the population. The district has a population growth of 3.8%. The table below shows population density by division.

Table 5.8.3.1 Population Distribution and Density for Lugari District

Division	Population	Density
Likuyani	99074	328
Lugari	87041	327
Matete	48421	475
Total	234536	350

Source: Population and Housing Census, CBS, 1999

5.8.3.2 Poverty Status

The poverty level in Lugari District is about 57.37 per cent. The division with the highest incidence of poverty is Matete. There are pockets of the poor in Lugari and Likuyani Divisions. The poor are mainly the squatters, landless and households headed by children and women. The dependency ratio in the district is 100:104 which is relatively high.

5.8.3.3 Health Aspects

The three most prevalent diseases in district are Malaria, respiratory infections and water borne diseases. There are two government hospitals in the district and seven private hospitals. The ratio of doctor to population is 1:10,034 in the district.

5.8.3.4 Economic Activities

The district depends on agriculture for its livelihood. It is the main source of income and employs about 90 per cent of the labour force. Therefore to exploit the full potential of the sector, efforts should be made to strengthen the delivery of services to farmers and improved infrastructure.

5.8.3.5 Gender and Equality

There are many beliefs that hinder the advancement of women relating to land ownership, control and access to productive resources, sharing of household chores and selling of the farm produce. The determinants of gender disparities in the district may include; culture, environment, economy and government policies among others. The

gender concern in the district includes heavy workload for women and girls, and discrimination on land ownership by women and discrimination on access to credit facilities by women and youth.

Women generally have a heavy workload and work for longer hours than men. Women till the land but men get the proceeds. When the income of household is not properly utilized, this discourages the women and the family may lapse into poverty.

5.8.3.6 Tourism, Trade and Industry

Most of the existing social facilities lack basic services such as water, sanitation, electricity and solid waste disposal. The situation is particularly grim in the informal settlement. Social facilities such as schools are inadequate.

5.8.3.7 Social Services and Community Facilities

Due to mushrooming informal settlements in Mutamu, Kipkaren and Turbo pressure on the provision of social amenities has risen. The district has limited amenities like health and water facilities.

Most market centres have no public latrines hence a serious environmental health. This include; turbo, Mautuma, Kaburengu, Chimoï and Kipkaren. most slaughter slabs in the area are inadequate and lack pits for disposing there wastes.

5.8.3.8 Road Network and Water Supply

Road network in the district is inadequate with community served with minimum access roads.

CHAPTER 6 ANTICIPATED POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

6.1 Introduction

This chapter focuses on the impacts likely to occur as a result of the proposed construction works on the Eldoret – Kitale 132 kV 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

6.2 Assessment of Impacts of the Proposed Development

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

Table 6.1 Matrix of the Potential Project Impacts and Mitigation Measures

Environmental & Social Impact	Negative /Positive	Direct/Indirect	Temporary/Permanent	Major/Minor	Occurrence	
					Construction	Operation
Socio-Economic Impacts						
Electricity supply	Positive	Direct	Permanent	Major		X
Creation of employment	Positive	Direct & indirect	Temporary/Permanent	Major	X	X
Security	Positive	Direct	Permanent/Temporary	Major	X	X
Revenues to Government	Positive	Direct	Permanent	Major	X	X
Development of Business opportunities	Positive	Direct	Temporary/Permanent	Major	X	X
Growth of agro-based industries	Positive	indirect	Temporary/Permanent	Major	X	X
Interference with cultural set-up	Negative	Direct	Permanent	Minor/Major	X	X
Interference with socio-economic activities due to relocation & resettlement	Negative	Direct & indirect	Temporary/Permanent	Major/Minor	X	X
Loss of property	Negative	Direct	Temporary/Permanent	Major/Minor	X	X
Interference with radio, television and	Negative	Direct	Temporary/Permanent	Major/Minor	X	X

Environmental & Social Impact	Negative /Positive	Direct/Indirect	Temporary/Permanent	Major/Minor	Occurrence	
					Construction	Operation
telecommunication frequency						
Visual Impact	Negative	Direct	Temporary/Permanent	Major/Minor	X	X
Biophysical Impacts						
Micro-climate	Positive	Indirect	Permanent	Major		X
Clearance of vegetation cover	Negative /Positive	Direct	Temporary	Major	X	X
Increased solid waste	Negative	Direct	Temporary	Minor	X	X
Interference with water quality	Negative	Direct	Temporary	Minor	X	
Increased demand of sanitation	Negative	Direct	Temporary	Major	X	
Natural habitats	Negative	Direct	Permanent/Temporary	Minor	X	X
Health and Safety Impacts						
Air pollution GHG	Negative	Direct	Temporary	Major/Minor	X	X
Noise and Vibrations	Negative	Direct	Temporary	Major/Minor	X	X
Dust	Negative	Direct	Temporary	Minor	X	X
EMF Public Health and psychological perception	Scientifically impacts on health not established and psychological impacts will be relative depending on project understanding					

Environmental & Social Impact	Negative /Positive	Direct/Indirect	Temporary/Permanent	Major/Minor	Occurrence	
					Construction	Operation
Increase in social vices	Negative	Direct	Permanent/Temporary	Major/Minor	X	X
Injuries and accidents to animals and workers	Negative	Direct	Temporary/Permanent	Major	X	X
Clean Energy	Positive	Direct	Permanent	Major		X
Development of other sector such as health, education, industries among others	Positive	Direct/ Indirect	Permanent	Major		X

6.3 Potential Positive Impacts

- Possibility of connecting more households and institutions to the national grid;
- The major impacts of the transmission line will be reduced poverty and improved living standards within and beyond the district served. These will result from employment creation (direct and indirect) and increased investments especially in value addition processing of primary products.
- Improved incomes and poverty reduction will also occur through provision of opportunities to invest in heavy industries and facilitate direct and indirect employment
- 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 Kshs. 250 to 800 per day
- Boost the economy through investment and expansion of businesses and income generation opportunities. This will increase productivity and competition
- Connect more households and institutions with electricity thereby providing household level lightning system. This will in effect create market for electronic goods
- Reduce power problems/outages especially Kitale town and its neighbourhood.
- Improve security in the beneficiary communities through better lighting.

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

6.4 IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

6.4.1 Terrestrial Habitat Alteration

6.4.1.1 Construction phase

The construction of transmission line rights-of-way will result in alteration and disruption to terrestrial habitat, including impacts to avian species and an increased risk of forest fires. Right-of way construction activities will transform habitats, depending on the characteristics of existing vegetation, topographic features, and installed height of the transmission lines. Examples of habitat alteration from these activities includes fragmentation of forested habitat; loss of wildlife habitat, including for nesting; establishment of non-native invasive plant species; and visual and auditory disturbance due to the presence of machinery, construction workers, transmission towers, and associated equipment. The construction phase is also expected to be associated with woody species removal along the proposed way-leave area resulting in destruction of species habitat or its simplification. 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 transmission line is passing through partially settled areas which do not possess 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.

The habitat through which the transmission line passes is widespread and well represented within the landscape and therefore cannot be termed critical. Therefore, the construction of the transmission line will not have injurious effects to the habitat owing to its widespread nature and similarly will not have significant impacts to wildlife and human communities dependent these habitats. In summary the proposed project will not affect the integrity and ecological functions of the habitats traversed by the transmission line

6.4.1.2 Operation and Maintenance

Unchecked growth of tall trees and accumulation of vegetation within rights-of-way may result in a number of impacts, including power outages through contact of branches and trees with transmission lines and towers; ignition of forest and brush fires; corrosion of steel equipment; blocking of equipment access; and interference with critical grounding equipment. Regular maintenance of rights-of-way to control vegetation will involve the use of mechanical methods, such as mowing or pruning machinery that may disrupt wildlife and their habitats, in addition to manual hand clearing

6.4.2 Alteration of Aquatic Habitats

6.4.2.1 Construction

The route of the proposed transmission line crosses several rivers and streams. Soil erosion from construction activities may result in siltation of watercourses. This impact is however expected to be minimal and the removal of riparian vegetation temporary. 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.

6.4.3 Wildlife Species

6.4.3.1 Construction

The construction phase is not expected to have significant negative impact on wildlife owing to the short width of the way-leave and low wildlife density in the line route. Most of the wildlife in the general area is well protected in near-by conservation areas under the management of Kenya Wildlife Service and the County Councils. The behaviour of wildlife

species in this area precludes any significant negative impacts although some species may be affected during the construction phase.

6.4.3.2 Power line associated avifauna mortalities

Studies have shown that power line collision victims are birds of prey, ravens and thermal soars. Although power line designs have been suggested to be related to the possibility of collision accidents, there are no data available to support the hypothesis (Janss, et al., 2000). However, design of power line and pylons are important in determining the risk of avifauna death from electrocution, where for instance non-conductive pylons having less mortality incidences compared to metal pylons. Collision and electrocution incidences are species specific and depend on the species behaviour. Raptor 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. Flight performance is an important factor determining the chances of collision with power line where for instance birds with low wing loading are less exposed to electrocution risk, due to their agility. Poor visibility increases possibility of collision and electrocution accidents.

6.4.4 Soil

6.4.4.1 Construction

During the construction phase, the contractor is expected to loosen the soil along the way-leave for the pylons which may lead to soil erosion. Similarly, the way-leave 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. The soil problems may be exacerbated by topography of some areas, especially across riverine and dry river-beds, mainly during the wet season.

6.4.5 Air

6.4.5.1 Construction

During the process of construction, some dust will be generated from the few project vehicles (5 lorries and 4 off-road vehicles) as they make their way through the mainly murram roads leading to project sites. 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 where the transmission line will pass close to houses and the road surface is murram which is in just a

fair condition (The foundations for the lattice structures shall be dug manually and so will be the concrete casting for their bases.

6.4.6 Water Quality

6.4.6.1 Construction and Operation

The proposed project will not affect local water resources during both construction and operation phases of the project. During construction, water demand will be minimal.

6.4.7 Hazardous Substances

6.4.7.1 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 authorized garages and not on site. The impact during construction will not be significant.

6.4.7.2 Operation

Highly-refined, mineral insulating oils are 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 (SF₆) will also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines, and transformers. However, the use of SF₆, a greenhouse gas with a significantly higher global warming potential (GWP) than CO₂, should be minimized. In cases the gas is used for applications involving high voltages (>350 KV), equipment with a low leakage- rate (<99 percent) should be used.

6.4.8 Fire Risk

6.4.8.1 Operations

During operations, voltage power can cause a fire risk in the event of electrical faults with equipment.

Bat and bird collisions with power lines may result in power outages and fires. Also, if underlying growth is left unchecked, or slash from routine maintenance is left to accumulate within right of way boundaries, sufficient fuel can accumulate and as such promote forest fires.

6.5 IMPACTS ON HEALTH AND SAFETY

The health and safety impacts of the presence of high-voltage power lines are detailed briefly in the following sections.

6.5.1 Noise

6.5.1.1 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' neighborhoods. The noise from compressors will only be significant where hard ground breaking is carried out close to settlements. Noise from the motorized chain saws will only be experienced in the wooded areas but it will not be a significant impact since the density of settlements is not very high. Impacts of noise include noise-induced hearing loss for the project employees and nuisance for the affected settlements.

6.5.1.2 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 will be insignificant as it involves the installation of 132kV voltage lines.

6.5.2 Aircraft Navigation Safety

6.5.2.1 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 there are about 10-15 airstrips within the study area; additionally there could be military installations also.

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; clarification needs to be obtained through an official request by the Proponent to the Director General.

6.5.3 Electromagnetic Fields (EMFs)

6.5.3.1 Operation

Perhaps the greatest fear expressed by people living in very close proximity to high-voltage power lines is exposure to EMFs. Scientific research on the effects of EMFs 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 40-40m is less than what one would ordinarily be exposed to in a domestic setup. In this context, prudent avoidance is recommended.

6.5.4 Maintenance of Transmission Line System

6.5.4.1 Construction and Operation

The rights-of-way require annual maintenance to remove bush and tree growth beneath power lines so that towers and lines can be maintained. No 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 include physical hazards such as injuries sustained from the tools/equipment, ergonomical problems from poor working posture, dust inhalation, among others.

6.5.5 Electrocutation from Live Power Lines

6.5.5.1 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. Hazards most directly related to power transmission lines and facilities 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.

6.5.6 Physical Hazards

6.5.6.1 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, 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.

6.6 SOCIO-CULTURAL IMPACTS

6.6.1 Community Public Participation

The Public consultation process involved visiting the areas along the 65 kilometers stretch along which the Way leave 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.

Public consultations were conducted from 24th September to 7th October 2009. 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, D.Os, Chiefs, Assistant Chiefs, Councilors, 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.

6.6.2 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 and area along the proposed 65 kilometer transmission line would pass. These included:

- A detailed desk study to establish and describe the socio-economic conditions of Wareng, Eldoret North, Uasin Gishu, Lugari, Trans Nzoia West and Trans Nzoia East 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, Councilors 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. 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 organized 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.

Generally, all those consulted had no prior knowledge of the proposed project. The majority of the people consulted along the project corridor have positive attitude toward the project and approved the proposed project for they recognize the importance of electricity in development. The local leaders and other opinion leaders also gave the project their support. Majority want to know when it will start because they see an opportunity to gain financially due to the current harsh economic situations. 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
- Supplying both unskilled and skilled labour for the project
- Providing market for the electricity
- Reporting electric faults and vandalism
- Creating awareness among community members on dangers of electricity and tempering with electricity lines

The key issues specifically raised by the stakeholders consulted are as follows

Timeframe of the project

- Compensation process and values of property
- Need for adequate awareness creation and social engineering before and during project construction
- Employment of the local youth
- Putting appropriate signs “Danger” on each electric installation for information to residents
- Diversion of roads during construction which may reduce business
- Design route of the project to follow, as much as possible, uninhabited areas to ensure minimal disturbance, relocation, costs and electricity related accidents
- Clearance corridor required for the transmission line which is about 15m on either side of the centre line totaling to 30 meters. Each post will require 3mx3m for the foundation, each being 10 feet apart while depth of towers will go 2m depending on the soil type.
- How communities will benefit from the project in other ways other than power supply
- Compensation procedures and legal redress procedures through the land tribunal
- For those who will be relocated, what security will the people have over the new property that they will move to as some influential people may claim the property and fence it off
- The actual beneficiary to be compensated and documents required
- Actions to be taken if the transmission line crosses public facilities such as schools
- The dangers of having the power line pass near your home or on your land and the compensation provided if injured by the power line
- How will such the project affect the environment?
- Is there alternative power planned for provision before the proposed transmission line is completed

6.6.3 Perceived Challenges to the proposed project

The correspondents mentioned the following as being the challenges that the proposed project may be faced during construction, commissioning and operation:

Challenges during construction:

- Poor topography
- Inaccessibility and transportation of materials
- Land disputes in the acquisition process
- Inadequate skilled manpower
- Clearing of vegetation
- Language barrier
- Poor weather

Challenges during commissioning:

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

6.6.4 Visual Amenity

6.6.4.1 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.

6.6.5 Spread of Disease

6.6.5.1 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.

6.6.6 Induced Settlement

6.6.6.1 Construction

During construction works, there will be some direct employment opportunities for both skilled and unskilled labour. Furthermore, indirect employment opportunities are bound to arise from the provision of services to the construction teams. Construction teams have the potential to cause natural resource degradation in terms of accelerating tree felling, and vegetation clearance at the location, sewage, solid and oil/petroleum wastes are also usually produced at the camps.

6.6.6.2 Operation

The improved power supply will lead to further economic growth particularly in North West Kenya region; this will be coupled with subsequent growth in settlement in the area. There are a number of environmental and social issues that emanate from such increase in population, such as erection of unplanned structures, increased demand for sanitation and water supply, cultural disruption, among others.

6.6.7 Land Acquisition and Resettlement

6.6.7.1 Construction and Operation

The identified line route will lead to physical displacement of people, loss of shelter, assets, income sources and livelihood, and restriction of access to economic resources. World Bank OP 4.12 - Involuntary Resettlement is triggered by this project and therefore requires the preparation of a Resettlement Action Plan (RAP).

- Involuntary resettlement under development projects, if unmitigated, will give rise to severe economic, social, and environmental risks;
- Production systems will be dismantled;
- Relocated groups will face impoverishment when their productive assets or income sources are lost, especially if relocated to environments where their productive skills may be less applicable and the competition for resources greater;
- Community institutions and social networks will be weakened, kin groups will be dispersed; and
- Cultural identity, traditional authority, and the potential for mutual assistance will be diminished or lost.

The Proponent is in the process of developing a Resettlement Action Plan (RAP) for the proposed 132kV transmission line. The RAP study has so far identified those persons within the project area who may be displaced as a result of the project, and those persons who may have to relinquish their land to the project.

The RAP outlines the guiding principles to be followed when involuntary land acquisition is undertaken, in order to minimize the adverse impacts to PAPs and enhance positive impacts. It applies to all displaced persons regardless of the total number affected, the severity of the impact and whether or not they have legal title to the land.

The RAP aims to promote participation of displaced people in resettlement planning and Implementation, and assists displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. This is in 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”.

CHAPTER 7 IMPACT MITIGATION MEASURES

7.1 Introduction

This chapter focuses on measures that can be incorporated into the design, and taken during the improvement works and operation stages of the project in order to mitigate the negative environmental impacts and enhance the positive ones described in chapter 6.

7.2 MITIGATION MEASURES: BIOPHYSICAL ENVIRONMENT

7.2.1 Terrestrial Habitat Alteration

7.2.1.1 Construction

- 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
- Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the way-leave
- Give the community priority on use of the removed vegetation for wood-fuel, construction or any other purpose.

7.2.1.2 Operation and Maintenance

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

7.2.2 Aquatic Habitat Alteration

7.2.2.1 Construction

- Minimizing clearing and disruption to riparian vegetation.

7.2.3 Wildlife (Power line-associated Avifauna Mortalities)

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,)

7.2.4 Soil

7.2.4.1 Construction

- 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.

7.2.5 Air Pollution

7.2.5.1 Construction

- Regular maintenance of construction vehicles, plant and equipment to reduce emissions
- Control speed of construction vehicles to minimize generation of dust on access roads
- Prohibit idling of vehicles on site to reduce emissions.

7.2.6 Solid Waste

7.2.6.1 Construction

- The engineer should ensure that the contractor disposes any remaining solid wastes such as metals, paper, plastics, etc. away from the site to an approved disposal site.

7.2.7 Hazardous Substances

7.2.7.1 Construction

- 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.

7.2.8 Fire Risk

7.2.8.1 Operations

- Carry out routine thinning, slashing, and other maintenance activities, within and adjacent to Rights-of-way in order to minimize the risk of fire.

7.3 MITIGATION MEASURES: HEALTH AND SAFETY

7.3.1 Noise

7.3.1.1 Construction and Operation

- 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.

7.3.2 Maintenance of Power Line Rights-of-way

7.3.2.1 Construction and Operation

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

7.3.3 Electrocutation from Live Power Lines

7.3.3.1 Operation

- 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 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.

7.3.4 Falls from Height

7.3.4.1 Construction and Operation

- Testing structures for integrity prior to undertaking work;
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures;
- Inspection, maintenance, and replacement of fall protection equipment;
- 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;
- Installation of fixtures on tower components to facilitate the use of fall protection systems;
- Provision of an adequate work-positioning device system for workers. Connectors on positioning systems should be compatible with the tower components to which they are attached;
- Hoisting equipment should be properly rated and maintained and hoist operators properly trained;
- Safety belts should be of not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident;
- When operating power tools at height, workers should use a second (backup) safety strap;
- An approved tool bag should be used for raising or lowering tools or materials to workers on structures

7.3.5 Physical Hazards

7.3.5.1 Construction and Operation

- 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

7.4 MITIGATION MEASURES: SOCIO-CULTURAL

7.4.1 Visual Impact

7.4.1.1 Operation

- To mitigate the visual impact of power distribution projects, the following mitigation measures should be implemented:
- Extensive public consultation during the planning of power line and power line right-of-way locations;
- Location of high-voltage transmission and distribution lines in less populated areas, where possible.

7.4.2 Spread of Disease

7.4.2.1 Construction

- Provide counseling 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 like condoms
- Avail condom dispensers to construction staff.

7.4.3 Land Acquisition and Involuntary Resettlement

7.4.3.1 Construction and Operation

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 commissioned for the proposed project. The RAP has been carried out 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. Surveys are being conducted to establish which properties (land and buildings) lie within the zone affected by the proposed project. The exact number of PAPs affected and the types of properties affected will be determined. In addition, potential sites for the relocation of the PAPs will be identified, and an estimation of the total cost for the RAP obtained. The resettlement plan or resettlement policy framework shall include measures to ensure that the displaced persons are:

- 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.

CHAPTER 8 ENVIRONMENTAL & SOCIAL MANAGEMENT AND MONITORING

8.1 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 Supervising Engineer, 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.

8.2 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 Supervising Engineer and Contractor and during operation by the Proponent, 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.

The tables below overleaf summarize the ESMP for the proposed project. It describes parameters that can be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action.

8.3 Project design and Construction

The necessary objectives, activities, mitigation measures and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the project equipment installation and operational phases are outlined in table below

8.3.1 Design and Construction Phase

Potential Impact	Proposed Mitigation	Monitoring Means and frequency	Responsibility for Monitoring	Performance Indicator	Cost (Ksh)
Terrestrial Habitat Alteration	<ul style="list-style-type: none"> • Re-vegetation of disturbed areas with native plant species; • Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the way-leave 	Routine inspection	Supervising Engineer and Contractor	Re-vegetation of disturbed areas	Re vegetation approx. 100 per sq m.
Aquatic habitat alteration	<ul style="list-style-type: none"> • Minimizing clearing and disruption to riparian vegetation. 	Inspection, routine	Design Engineer and Contractor	-Siltation of soil in rivers from construction activities. -Physical water quality	Routine Inspection Internal cost
Power line related avifauna mortalities	<ul style="list-style-type: none"> • 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 	Inspection	Design Engineer, Supervising Engineer	Physical structures	Wire markers @ 5000 Platforms @ 5000
Soil erosion	<ul style="list-style-type: none"> • 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 • The contractor should avoid steep terrain during the transportation of construction material by using 	Inspection Routine Maintenance	Contractor Supervising engineer	Status of ground cover in constructed areas	Re-vegetation approx. 100/- per sq m.

	<p>alternative routes or use light vehicles where appropriate</p> <ul style="list-style-type: none"> • 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. 				
Air Pollution (dust, fuel emissions)	<ul style="list-style-type: none"> • Control speed of construction vehicles • Prohibit idling of vehicles Water should be sprayed during the construction phase on excavated areas • Regular maintenance of plant and equipment. • Provision of dust masks for use when working in dusty conditions 	Daily inspection	Design Engineer, Supervising Engineer and Contractor	visible particulate matter in the air Increase in upper respiratory tract ailments Number and status of PPE Vehicle service tags	Respiratory protection devices @ 600-200 Vehicle service @ 3,000-10,000
Water Pollution	<ul style="list-style-type: none"> • Maintenance of construction vehicles should be carried out in the Contractor's camp. 	Routine inspection, Maintenance records	Supervising Engineer and Contractor	Water quality	Routine inspection - Internal cost
Management of Solid Waste	<ul style="list-style-type: none"> • Contractor must dispose solid wastes away from the site to an approved disposal site. 	Routine Maintenance	Contractor, Supervising Engineer	Nil visible solid waste heaps on site	Routine maintenance - Internal cost
Management of Hazardous substances	<ul style="list-style-type: none"> • Use of designated areas for repair and maintenance of machinery e.g. garages to avoid fuels and 	Routine Maintenance,	Contractor, Supervising Engineer	Records	Not estimated depends on

	lubricant spills at the camp-site.				vehicle service and repair requirements
Risk of fire	<ul style="list-style-type: none"> Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access. 	Routine maintenance	Contractor, Supervising Engineer	Records	Routine maintenance - Internal cost
Electrocution from Live Power Lines	<ul style="list-style-type: none"> A maintenance system to ensure physical integrity of structures is maintained Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines; Ensuring that live-wire work is conducted by trained Workers should not approach an exposed energized or conductive part even if properly trained unless the worker is : - properly insulated from the energized part with gloves or other approved, insulation; the energized part is properly insulated from the worker and any other conductive object; the worker is properly isolated and insulated from any other conductive object (live-line work). 	Inspection	Supervising Engineer Contractor	Medical Records	PPE @ 5,000 Training of staff @15,000
Working at heights	<ul style="list-style-type: none"> Testing structures for integrity prior to undertaking work; Implementation of a fall protection program that includes training in 	Routine Maintenance Inspection Records	Supervising Engineer Contractor	Medical Records Test records Training records	Climbing equipment @ 25,000 Initial

	<p>climbing techniques and use of fall protection measures;</p> <ul style="list-style-type: none"> • Inspection, maintenance, and replacement of fall protection equipment; • Installation of fixtures on tower components to facilitate fall protection systems; • An approved tool bag should be used for raising or lowering tools or materials to workers on structures • Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects. 				<p>integrity tests 10,000 Training of staff @ 15,000</p>
Spread of Diseases	<ul style="list-style-type: none"> • Education, guidance and counseling on HIV/AIDS and other STDs – construction staff • Avail condoms to construction staff 	Routine examination Records	Contractor Supervising Engineer OHS Manager	Medical Records	<p>screening approx. 1000 Education – approx. 2,000 per person per session Condoms @10/-</p>
Land acquisition and Resettlement	<p>Ensure that the displaced persons are:</p> <ul style="list-style-type: none"> - informed about their options and rights pertaining to resettlement; - consulted on, offered choices among, and provided with alternatives; - provided prompt and effective 	Consultations Records Inspection Meetings	KPLC GoK	Relocation Compensation for loss Compliance with OP 4.12	<p>Approx. 66 M for 1,661 acres of land</p>

	<p>compensation at full replacement cost for losses of assets attributable directly to the project.</p> <ul style="list-style-type: none"> - 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; 				
Visual impact	<ul style="list-style-type: none"> • Extensive public consultation during the planning of power line and power line right-of-way locations; 	Public Consultation	Environmental and Social Manager	Complaints	No associated costs

8.3.2 Operations and Maintenance Phase

Potential Impact/Aspect	Proposed Mitigation	Monitoring Means	Responsibility for Monitoring	Performance indicator	Cost (KSh)
Terrestrial habitat alteration	<ul style="list-style-type: none"> • The selective removal of tall-growing tree species and the encouragement of low growing grasses and shrubs in transmission line rights-of-way. • Removal of alien invasive plant species, 	Annual auditing	Environmental Manager	Vegetation cover	Audit cost approx. 100,000

	<ul style="list-style-type: none"> • Cultivating native plant species; • Avoiding clearing in riparian areas; • Vegetation management should not eradicate all vegetation 				
Risk of Fire	<ul style="list-style-type: none"> • Controlled burning of vegetation in transmission line rights-of-way should adhere to applicable burning regulations, fire suppression equipment requirements, and typically must be monitored 	Routine maintenance	Maintenance Engineer	Records	Routine maintenance Internal cost
Electrocution from Live Power Lines	<ul style="list-style-type: none"> • 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; the energized part is properly insulated from the worker and any other conductive object; the worker is properly isolated and insulated from any other conductive object (live-line work). 	Routine Maintenance Records	Maintenance Engineer OHS Manager	Medical Records	PPE @ 5,000 Training – internal cost
Working at heights	<ul style="list-style-type: none"> • Testing structures for integrity prior to undertaking work; • Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; • Inspection, maintenance, and replacement of fall protection equipment; 	Routine Maintenance Inspection Records	Supervising Engineer Contractor Maintenance Engineer OHS Manager	Medical Records Test records Training records	Climbing equipment @ 25,000 Initial integrity tests 10,000 Training of staff @ 15,000

	<ul style="list-style-type: none"> • Installation of fixtures on tower components to facilitate fall protection systems; • An approved tool bag should be used for raising or lowering tools or materials to workers on structures • Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects. • 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; • Use of helmets and other protective devices will mitigate against scratches, bruises, punctures, lacerations and head injuries due to dropping objects. 				
Rights of Way Maintenance	<ul style="list-style-type: none"> • Provision of appropriate PPE to the workers clearing the way leave (vegetation clearing activities which will involve use of machetes and/or power saws) 	Routine Maintenance Inspection Records	Supervising Engineer Contractor Maintenance Engineer OHS Manager	Records	PPE: Gloves @ 500; Noise protection @ 50; Dust masks @ 20

8.3.3 Decommissioning Phase

Potential Impact/Aspect	Proposed Mitigation	Monitoring Means	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	Nil
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 redesign of work flow	Supervising Engineer	Number of ergonomic-related complaints	Nil
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 offroad vehicles and trucks respectively

8.4 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 Eldoret - Kitale 132 KV Transmission Line Project:

8.4.1 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 CO ₂ , CO, NO _x , and VOCs released by combustion engines during transportation and by obnoxious respirable particles released by speeding trucks during transportation of debris	Low
	Acute/chronic respiratory disease caused by pollutants (cement, caustics, isocyanates – lung sensitizers) released during deconstruction 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
	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	Low

	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.)	
	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
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

8.5 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.

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 are 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.

8.6 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.

Topic modules	Target Group	Estimated Cost per person, per unit (KShs)
<ul style="list-style-type: none"> • 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 	Group A TL Workers	7,500

<ul style="list-style-type: none"> • 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 		
<ul style="list-style-type: none"> • General understanding of legislation in Kenya as relevant to the project • Sensitization 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
<ul style="list-style-type: none"> • 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	2,500

9. CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

9.1 INTRODUCTION

As a result of the ESIA scoping, potentially significant environmental and social impacts have been identified including the need for land acquisition and resettlement. It is our recommendation that a full ESIA and Resettlement Action Plan (RAP) is carried out according to NEMA and World Bank requirements.

9.2 GENERAL MITIGATION AND INTERVENTION MEASURES

9.2.1 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.

9.3 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.

9.3.1 Mitigation

Mitigation is the lessening of negative environmental impacts through:

- Changes in the design, construction practices, maintenance, and operation of a project; and
- 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.

9.3.2 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.

9.3.3 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 organization.

9.3.3.1 Monitoring Guidelines

Continuous observations and assessment is essential for identification of impacts unforeseen during the E&SIA of the project. To ensure success of the project adequate consultation should be undertaken in the project area with the community members.

Monitoring parameters/indicators should be identified and programmes developed for their observation and action. When developing a monitoring programme the following should be considered:

- Frequency of monitoring
- Required personnel -Monitoring should be conducted by trained personnel

- Methods of record keeping
- Availability of calibrated and maintained equipments
- Existence of baseline information
- Data analysis and review

The environmental indicators to be monitored during the project phases namely the construction, operation and decommissioning include those listed in the table below. The monitoring parameters can be revised as the project development proceeds to enable incorporate and foreseen indicators.

Environmental Indicator	Parameter to Monitor
Occupational Health and Safety	-Threshold limits Values -Biological Exposure Indices -Minimum safe working distance -Number of occupational diseases and accidents
Socio-Economic Environment	-Development Projects -Alcoholism -Mortality rate -Trend of infectious diseases for example: HIV/AIDS, STI's -Correlation between project team and local community
Air Quality	-Humming Noise -Ozone -Interference with radio telecommunication waves
Fire	-Right of way vegetation -Waste
Aquatic habitat Alteration	-Existence of vegetation -Water quality and quantity -Water Borne Diseases -Complaint from community members
Vegetation Cover	-Invasive vegetation -Vegetation rate of growth
Waste Management	-Existence of solid waste - Complaint from community members
Soil Erosion	-Gulley formation -Increased sediments - Complaint from community members

Resident Birds	<ul style="list-style-type: none"> -Presence of resident birds -Mortality rate -Existence of nesting sites
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The list of the environmental parameters and their measurable indicators will guide the proponent access the effective level of the EMP and need to modify it for appropriate action.

9.4 Reporting

Constant reporting by the site contractor to the proponent is necessary to ensure the project is executed as per the plans. The safety officer/environment officer should always be available at the site to report any concerns for urgent mitigation. The officer should also ensure enforcement of Environment, Health and Safety requirements as per the relevant legislations. The contractor should always consult the project manager/engineer to maintain a clear understanding of all the project aspects and their mitigation measures.

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