



KENYA ELECTRICITY TRANSMISSION CO. LTD

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT FOR
THE PROPOSED MENENGAI – RONGAI 400KV TRANSMISSION LINE**



District Officer, Kampi ya Moto Division, addressing a public consultation meeting

| The ESIA Team | Proponent |
|--|---|
| Caleb Mango - Lead EIA /Audit Expert | Kenya Electricity Transmission Co. Ltd |
| Thinguri Thomas - Lead EIA /Audit Expert | 2 nd Floor, Capitol Hill Square, Chyulu Road |
| Ramat Godana - Lead EIA /Audit Expert | – Upper Hill |
| David Moindi –Lead EIA /Audit Expert | P.O. Box 34942 - 00100 |
| Geoffrey Otieno - Environmentalist | Nairobi-Kenya |
| Sarah Kiarie - Land Surveyor | Tel: + 254 20 4956000 |
| Daniel Mukanda – Land Economist | Email: info@ketraco.co.ke |
| Clare Ojode – Socio Economist | |
| Thomas Nyangau – Civil Engineer | |

CERTIFICATE OF DECLARATION AND DOCUMENT AUTHENTICATION

This document has been prepared in accordance with Environmental (Impact Assessment and Audit) Regulations, 2003 of the Kenya Gazette supplement No. 56 of 13th June 2003, Legal Notice No. 101.

LEAD EIA/AUDIT EXPERTS:

Caleb Mango: EIA/Audit Licence No.0260

Signature -----

Date :-----

PROPONENT:

For:

Kenya Electricity Transmission Co. Ltd

P.O. Box 34942 - 00200

Nairobi-Kenya

Tel: + 254 20 4956000

Email:info@ketraco.co.ke

Name.. ENG.(DR). JOHN MATIVO

Designation: CHIEF MANAGER, POWER SYSTEMS, PLANNING & DEVELOPMENT

Signature-----

Date-----

Do hereby certify that this report was prepared based on the information provided by various stakeholders as well as that collected from other primary and secondary sources and on the best understanding and interpretation of the facts by the Environmental Social & Impact Assessors. It is issued without any préjudice.

EXECUTIVE SUMMARY

Introduction

The country's development blue print, the Vision 2030 recognizes the energy sector as one of the infrastructure enablers of the economic, social and political pillars underlying the Vision. The sessional paper No. 4 of 2004 on Energy recognizes that affordable, quality and cost effective energy services is an important prerequisite for attainment of accelerated social and economic growth and development. In view of these considerations, energy sector development is a key policy concern for Kenya's development.

In line with this, KETRACO, a fully government owned institution established by MoE under the Energy Act and mandated to design, develop, operate and maintain new high voltage electricity transmission lines in the country, proposes to construct a 400kV transmission line from Menengai to Rongai (Salgaa) Nakuru County. The transmission line is aimed at evacuating power from the GDC geothermal generated power from the Menengai caldera and inject it to the national grid subsequently increasing the reliability and security of electricity supply, reduce transmission losses and to meet the growing demand for electricity in Nakuru region and surrounding areas.

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. KETRACO has therefore used its in-house man-power consisting of Electrical and Civil Engineers, Socio-Economists, Land Economists, Land Surveyors and Environmental Experts to undertake the ESIA for this transmission line.

This Environmental Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

Study Objectives

The principal objective of this assessment was to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any

adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

Scope

The ESIA study was limited to:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Public participation
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Development of an environmental management plan outline.

Study Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the Environmental Management and Coordination (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as decommissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, desktop studies, public consultations with members of the community in the project areas, survey, photography, and discussions with key people in KETRACO (the proponent).

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholders including the project proponent, community members, provincial administration, opinion leaders 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.

Policy, Legal and Regulatory Framework

The Environmental Management and Co-ordination Act (EMCA), 1999, is the legislation that governs EIA studies in Kenya. This project falls under the Second Schedule of EMCA, 1999, which list 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. Also discussed are international laws relevant to the proposed projects and good practices as contained in the World Bank Safeguard policies

Identified Potential Impacts

The following positive and negative impacts are likely to be associated with the proposed project.

Positive Impacts

- Reliable and secure power supply
- Direct and indirect skilled and non-skilled employment opportunities.
- Gains in the local and national economy and increase in revenue.
- Informal sectors benefits.
- Development of other Sectors
- Increased security in the area.

Negative Impacts

- Noise pollution
- Generation of exhaust emissions
- Dust emissions
- Solid and liquid waste generation
- Oil spill hazards
- Destruction of existing vegetation and habitats
- Avifauna mortality
- Increased demand for material consumption
- Impacts on workers' and community health and safety
- Soil erosion
- Fire outbreaks
- Visual and aesthetic impacts

- Incidences of electrocution
- Perceived dangers of electrostatic and magnetic forces
- Increase in social vices
- Land take – loss of use

Proposed Mitigation Measures

Mitigation of the potential impacts as described in chapter 6, and implementation of the Environmental Management Plan and Environmental Monitoring Plan (chapter 7 and 8) will help to prevent or minimize the negative impacts, and enhance the positive outcomes of the project.

Conclusion

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

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the proposed project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed project will bring positive effects in the project area including improved supply of electricity, creation

of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that all identified potential negative impacts can be mitigated and that no community objection was received, the project may be allowed to proceed.

CONTENTS

| | |
|--|-------------------------------------|
| EXECUTIVE SUMMARY | 3 |
| LIST OF TABLES..... | 11 |
| LIST OF APPENDICES..... | 12 |
| LIST OF ABBREVIATIONS | 13 |
| CHAPTER 1: INTRODUCTION..... | 15 |
| 1.1 PROJECT BACKGROUND..... | 15 |
| 1.2 STUDY OBJECTIVES..... | 16 |
| 1.3 TERMS OF REFERENCE (TOR) FOR THE ESIA PROCESS | 16 |
| 1.4 SCOPE OF THE STUDY..... | 17 |
| 1.5 ESIA APPROACH AND METHODOLOGY..... | 17 |
| CHAPTER 2: PROJECT DESCRIPTION | 21 |
| 2.1 NATURE OF THE PROJECT..... | 21 |
| 2.1.1. <i>Transmission Line Route</i> | 21 |
| 2.1.2 <i>Substations Works</i> | <i>Error! Bookmark not defined.</i> |
| 2.2 PROJECT DESIGN..... | 21 |
| 2.2.1 <i>Transmission Line Design (400KV Lines)</i> | 22 |
| 2.2.2 <i>Substation Design and Layout</i> | 23 |
| 2.3 PROJECT JUSTIFICATION | 24 |
| 2.4 PROJECT ACTIVITIES..... | 24 |
| 2.4.1 <i>Pre-construction/Project Design</i> | 24 |
| 2.4.2 <i>Construction</i> | 24 |
| 2.4.3 <i>Operation</i> | 25 |
| 2.4.4 <i>Decommissioning</i> | 25 |
| 2.5 PROJECT BUDGET | 25 |
| 2.6 TARGET GROUP FOR THE ESIA REPORT | 25 |
| 2.7 ANALYSIS FOR ALTERNATIVES | 26 |
| 2.7.1 <i>The “Do Nothing” Option</i> | 26 |
| 2.7.2 <i>Demand-side Management Option</i> | 26 |
| 2.7.3 <i>Line Routing and Substation Siting Alternatives</i> | 26 |
| 2.7.4 <i>Alternative Processes and Materials</i> | 26 |
| CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA | 27 |
| 3.1: POSITION AND SIZE OF PROJECT AREA | 27 |
| 3.2: ADMINISTRATIVE UNITS AND POLITICAL UNITS..... | 27 |
| 3.3: THE BIOPHYSICAL ENVIRONMENT | 28 |
| 3.3.1: <i>Physiography</i> | 28 |
| 3.3.2: <i>Topographic Features</i> | 28 |
| 3.3.3: <i>Hydrogeology and surface drainage systems</i> | 28 |
| 3.3.4 <i>Meteorology</i> | 29 |
| 3.4: BIODIVERSITY..... | 29 |
| 3.4.1: <i>Menengai Forest</i> | 29 |
| 3.4.2: <i>Vegetation Types in the Caldera</i> | 30 |
| 3.4.4: <i>Fauna</i> | 30 |
| 3.5: THE HUMAN ENVIRONMENT | 31 |
| 3.5.1: <i>Settlement and Population Patterns</i> | 31 |
| 3.5.2 <i>Land ownership and use</i> | 32 |
| 3.5.3: <i>Water resources and consumption</i> | 32 |
| 3.5.4: <i>Transport and communication</i> | 33 |
| 3.5.5: <i>Public health and sanitation profile</i> | 33 |
| 3.5.6: <i>Tourism</i> | 35 |
| 3.5.7: <i>Agricultural activities</i> | 35 |
| 3.5.8: <i>Archaeological and historical sites</i> | 36 |
| CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS | 37 |
| 4.1 INTRODUCTION | 37 |

| | |
|---|-----------|
| 4.2 NATIONAL POLICY AND LEGAL FRAMEWORK..... | 37 |
| 4.2.1 Policy | 37 |
| 4.2.2 Legal Framework..... | 38 |
| 4.2.3 The Environment Management and Co-ordination Act, 1999 (EMCA)..... | 38 |
| 4.2.4 EMCA: Environmental Impact Assessment and Audit Regulations, 2003 | 38 |
| 4.2.5 The Occupational Health and Safety Act, 2007 | 39 |
| 4.2.6 EMCA: Noise and Excessive Vibration Pollution Control Regulations, 2009..... | 39 |
| 4.2.7 EMCA: Draft Air Quality Regulations, 2008..... | 40 |
| 4.2.8 The Water Act 2002..... | 40 |
| 4.2.9 The Lakes and Rivers Act Chapter 409 Laws of Kenya | 41 |
| 4.2.10 The Public Health Act (Cap. 242)..... | 41 |
| 4.2.11 Waste Management Regulations (2006)..... | 41 |
| 4.2.12 Physical Planning Act (Cap286)..... | 41 |
| 4.2.13 Occupiers Liability Act (Cap. 34) | 41 |
| 4.2.14 Land Acquisition Act (Cap. 295)..... | 42 |
| 4.2.15 The Registered Land Act Chapter 300 Laws of Kenya: | 42 |
| 4.2.16 The Land Adjudication Act Chapter 95 Laws of Kenya | 42 |
| 4.2.17 The Standards Act Cap 496..... | 42 |
| 4.2.18 The Antiquities and Monuments Act, 1983 Cap 215 | 43 |
| 4.2.19 The Civil Aviation Act, Cap 394..... | 43 |
| 4.2.20 EMCA: The Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing Regulations, 2006..... | 43 |
| 4.2.21 EMCA: Controlled Substances Regulation, 2007, Legal Notice No. 73 | 43 |
| 4.2.22 EMCA: Fossil Fuel Emission Control Regulation 2006 | 44 |
| 4.2.23 EMCA: Wetlands, River Banks, Lake Shores and Sea Shore Management Regulation, 2009. | 44 |
| 4.2.24 Penal Code Act (Cap.63) | 44 |
| 4.2.25 Energy Act, 2006..... | 44 |
| 4.2.25 The Forest Act, 2005 Cap 385 | 45 |
| 4.2.26 The Wildlife (Management and Conservation) Act, Cap376 | 45 |
| 4.3 ADMINISTRATIVE FRAMEWORK..... | 46 |
| 4.3.1 The National Environment Council..... | 46 |
| 4.3.2 The National Environment Management Authority | 46 |
| 4.3.3 The Standards and Enforcement Review Committee..... | 46 |
| 4.3.4 The Provincial and District Environment Committees..... | 46 |
| 4.3.5 The Public Complaints Committee..... | 46 |
| 4.4 INTERNATIONAL ENVIRONMENTAL GUIDELINES | 47 |
| 4.5 WORLD BANK’S SAFEGUARD POLICIES | 47 |
| 4.5.1 World Bank Safeguard Policy 4.01-Environmental Assessment | 47 |
| 4.5.2 Bank Safeguard Policy 4.04-Natural Habitats..... | 48 |
| 4.5.3 Bank Safeguard Policy 4.09-Pest Management..... | 48 |
| 4.5.4 Bank Safeguard Policy 4.12-Involuntary Resettlement..... | 48 |
| 4.5.5 Bank Safeguard Policy 4.12-Indigenous People..... | 49 |
| 4.5.6 World Bank Safeguard Policy BP 17.50- Public Disclosure | 49 |
| CHAPTER 5: STAKEHOLDER CONSULTATION | 50 |
| 5.1 INTRODUCTION | 50 |
| 5.2 IDENTIFICATION OF STAKEHOLDERS..... | 50 |
| 5.3 APPROACH TO STAKEHOLDER CONSULTATIONS | 50 |
| 5.3.1 Key Informant oral Interviews:..... | 51 |
| 5.3.2 Key Informant Questionnaires: | 51 |
| 5.3.3 Community Questionnaires:..... | 52 |
| 5.3.4 Public Baraza | 52 |
| 5.4: RESULTS OF STAKEHOLDER CONSULTATIONS: | 52 |
| 5.4.1 Positive Economic/Social Impacts | 53 |
| 5.4.2 Negative Environmental/Social Impacts: | 53 |
| 5.4.3 Overall picture from the stakeholder consultations. | 54 |
| CHAPTER 6: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT | 55 |
| 6.1 INTRODUCTION | 55 |

| | |
|--|-----------|
| 6.2 POSITIVE IMPACTS | 56 |
| 6.2.1 <i>Reliable and Secure Electricity Power Supply</i> | 56 |
| 6.2.2 <i>Employment Opportunities</i> | 56 |
| 6.2.3 <i>Gains in the Local and National Economy</i> | 56 |
| 6.2.4 <i>Informal Sector Benefits</i> | 56 |
| 6.2.5 <i>Development of Other Sectors</i> | 56 |
| 6.2.6 <i>Security</i> | 56 |
| 6.3 NEGATIVE IMPACTS | 56 |
| 6.3.1 <i>Noise Pollution</i> | 56 |
| 6.3.2 <i>Generation of Exhaust Emissions</i> | 57 |
| 6.3.3 <i>Dust Emissions</i> | 57 |
| 6.3.4 <i>Solid and Liquid Waste Generation</i> | 57 |
| 6.3.5 <i>Oil Spill Hazards</i> | 57 |
| 6.3.6 <i>Destruction of Existing Vegetation and Habitats</i> | 57 |
| 6.3.7 <i>Avifauna Mortalities</i> | 57 |
| 6.3.8 <i>Increased Demand for Material Consumption</i> | 57 |
| 6.3.9 <i>Impacts on Workers' and Community Health and Safety</i> | 57 |
| 6.3.10 <i>Soil Erosion</i> | 57 |
| 6.3.11 <i>Fire Outbreaks</i> | 57 |
| 6.3.12 <i>Visual and Aesthetic Impacts</i> | 58 |
| 6.3.13 <i>Incidences of Electrocutation</i> | 58 |
| 6.3.14 <i>Perceived Danger of Electrostatic and Magnetic force</i> | 58 |
| 6.3.15 <i>Increase in Social Vices</i> | 58 |
| 6.3.16 <i>Land Take – Loss of Use</i> | 58 |
| 6.4 PROPOSED MITIGATION MEASURES | 58 |
| 6.4.1 <i>Noise Pollution</i> | 58 |
| 6.4.2 <i>Generation of Exhaust Emissions</i> | 58 |
| 6.4.3 <i>Dust Emissions</i> | 59 |
| 6.4.4 <i>Solid and Liquid Waste Generation</i> | 59 |
| 6.4.5 <i>Oil Spill Hazards</i> | 59 |
| 6.4.6 <i>Destruction of Existing Vegetation and Habitats</i> | 60 |
| 6.4.7 <i>Avifauna Mortalities</i> | 60 |
| 6.4.8 <i>Increased Demand for Material Consumption</i> | 60 |
| 6.4.9 <i>Impacts on Workers' and Community Health and Safety</i> | 60 |
| 6.4.10 <i>Soil Erosion</i> | 60 |
| 6.4.11 <i>Fire Outbreaks</i> | 61 |
| 6.4.12 <i>Visual and Aesthetic Impacts</i> | 61 |
| 6.4.13 <i>Incidences of Electrocutation</i> | 61 |
| 6.4.14 <i>Perceived Danger of Electrostatic and Magnetic force</i> | 61 |
| 6.4.15 <i>Increase in Social Vices</i> | 61 |
| 6.4.16 <i>Land Take – Resettlement and Loss of Use</i> | 61 |
| CHAPTER 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) | 62 |
| CHAPTER 8: ENVIRONMENTAL MONITORING PLAN (EMOP) | 78 |
| CHAPTER 9: RECOMMENDATIONS AND CONCLUSION | 82 |
| 9.1 INTRODUCTION | 82 |
| 9.2 RECOMMENDATIONS..... | 82 |
| 9.3 CONCLUSION | 83 |
| REFERENCES | 84 |
| APPENDICES | 86 |

LIST OF TABLES

Table 2.1: Geographical Position System (N-360-UTM-ARC 1960 Coordinates for Menengai- Rongai 400 kV transmission line

Table 3.1: Administrative Units and area of District by Division

Table 3.2: Distribution of Wildlife Species

Table 3.3: Projected population and Population Density Per Division

Table 3.4: Roads accessing the Proposed Project area and their Classification

Table 3.5: Top Ten Diseases in 2007 for Nakuru District

Table 3.6: Health Facilities within the Project area

Table 3.7: Crop Production (Ha) achievements Per Division in the Project area

Table 5.1: Public Consultation Meetings

Table 6.1: Summary of Potential Impacts

Table 7.1: ESMP during the construction phase of the proposed Project

Table 7.2: ESMP for the operation phase of the proposed Project

Table 7.3: ESMP for the decommissioning phase of the proposed Project

Table 8.1: Environmental Monitoring Plan for the proposed Project

LIST OF APPENDICES

Appendix I: ESIA Team EIA/EA Practicing Licences

Appendix II: Filled Public Consultation Forms (Key Informants)

Appendix III: Filled Public Consultation Forms (Community Members)

Appendix IV: Public Baraza Attendance Sheet

Appendix V: Minutes of Public Consultation Meetings

Appendix VI: Map of the Proposed Transmission Line

Appendix VII: Signed Schedule for Stakeholder Consultation on ToR

LIST OF ABBREVIATIONS

| | |
|-----------------|--|
| AFD | Agence Francaise de Development |
| AfDB | African Development Bank |
| AGO | Automotive Gas Oil |
| AST | Above Ground Storage Tank |
| CB | Circuit Breaker |
| CT | Current Transformer |
| CVT | Constant Voltage Transformer |
| CO ₂ | Carbon Dioxide |
| CO | Carbon Monoxide |
| DO | District Officer |
| DOHSS | Directorate of Occupational Health and Safety Services |
| DC | District Commissioner |
| EA | Environmental Audit |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EMCA | Environmental Management and Coordination Act, 1999 |
| EMoP | Environmental Monitoring Plan |
| EMP | Environmental Management Plan |
| ERC | Energy Regulatory Commission |
| GDC | Geothermal Development Company |
| GHGs | Green House Gases |
| GoK | Government of Kenya |
| HFO | Heavy Fuel Oil |
| IPP | Independent Power Producer |
| KenGen | Kenya Electricity Generating Company |

| | |
|-----------------|---|
| KETRACO | Kenya Electricity Transmission Company |
| KFS | Kenya Forest Service |
| KPLC | Kenya Power and Lighting Company |
| Kshs. | Kenya Shillings |
| kV | Kilo Volt |
| KWH | Kilo Watt Hour |
| KWS | Kenya Wildlife Service |
| LCPDP | Least Cost Power Development Plan |
| L.R | Land Registration |
| mg/kg | Milli grams per kilogram |
| MoE | Ministry of Energy |
| MW | Mega Watts |
| MVA | Mega Volt Amperes |
| NEMA | National Environment Management Authority |
| NOX | Oxides of Nitrogen |
| OSHA | Occupation Safety and Health Act |
| PM | Particulate Matter |
| PPE | Personal Protective Equipment |
| REA | Rural Electrification Authority |
| SF ₆ | Sulphur Hexafluoride |
| SHE | Safety Health and Environment |
| SOX | Oxides of Sulphur |
| STD | Sexually Transmitted Diseases |
| TPH | Total Petroleum Hydrocarbon |
| WRMA | Water Resources Management Authority |

CHAPTER 1: INTRODUCTION

1.1 Project Background

The country's development blue print, the Vision 2030 recognizes the energy sector as one of the infrastructure enablers of the economic, social and political pillars underlying the Vision. The sessional paper No. 4 of 2004 on Energy recognizes that affordable, quality and cost effective energy services is an important prerequisite for attainment of accelerated social and economic growth and development. In view of these considerations, energy sector development is a key policy concern for Kenya's development.

Currently, Kenya's national access to electricity is estimated at 18%. The Government of Kenya, as part of the 2030 Vision, aims to raise access to electricity to 40% by 2020. This increased level of electrification will result in an increased demand for electricity, which will require major expansion in power generation and transmission infrastructure in the country.

The interconnected system has an installed capacity of 1,375 Megawatt (MW) comprising: 757 MW of hydro; 198 MW of geothermal; 0.4 MW of wind; 279 MW of thermal; 26 MW of co-generation; and 60 MW provided by emergency diesel generators. This power is transmitted countrywide through the transmission network, which comprises of 1,323 kilometres (km) of 220 kilovolt (kV) transmission line, 2,122 km of 400 kV transmission line and 632 km of 66 kV transmission line. Kenya is currently interconnected with Uganda through a 400 kV double circuit transmission line rated at 2 x 86 Megavolt Amperes (MVA).

The existing transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nakuru, Nairobi, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.

To address these constraints, KETRACO has identified the need for a number of transmission projects across the country and which are now at various stages of development.

In line with this, KETRACO, a fully government owned institution established by MoE under the Energy Act and mandated to design, develop, operate and maintain new high voltage electricity transmission lines in the country, proposes to construct a 400kV transmission line from Menengai – to Rongai Nakuru County. The transmission line is aimed at evacuating power from the GDC geothermal generated power from the Menengai caldera and inject it to the national grid subsequently increasing the reliability and security of electricity supply, reduce transmission losses and to meet the growing demand for electricity in Nakuru region and surrounding areas.

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

This Environmental Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

1.2 Study Objectives

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

The specific objectives of this ESIA were to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.3 Terms of Reference (TOR) for the ESIA Process

The following are the TOR for the ESIA process

- Description of the baseline environment (physical, biological, social and cultural)
- Detailed description of the proposed project

- Review Legislative and regulatory framework that relate to the project
- Identify potential environmental impacts that could result from the project
- Carry out public consultation on positive and negative impacts of the project
- Propose mitigation measures against identified environmental and social impacts of the project
- Development of an Environmental Management Plan to mitigate negative impacts
- Development of an Environmental Monitoring Plan
- Prepare an Environmental and Social Impact Assessment Report

1.4 Scope of the Study

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the immediate environment as may be affected or may affect the proposed project. Any potential impacts (localized or delocalized) are also evaluated as guided by EMCA 1999 and the Environmental Management and Coordination (Environmental impact assessment and Audit) Regulations, 2003. This report includes an assessment of impacts of the construction, operations and decommissioning of the proposed project site and its environs with reference to the following:

- A review of the policy , legal and administrative framework
- Description of the proposed project.
- Baseline information (bio-physical and socio-economic)
- Assessment of the potential environmental impacts of the proposed project on the biophysical, social-economic, religious and cultural aspect
- Recommendation of cost effective measures to be used to mitigate against the anticipated negative impacts
- Proposition of alternatives
- Problems (non-conformity) identification and recommendation of measures to improve the existing management system;
- Preparation of an Environmental and Social Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.5 ESIA Approach and Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the Environmental Management and Coordination (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, desktop studies, survey, photography, public consultations with

members of the community in the project areas, and discussions with key informants (local administration, heads of departments and NGOs)

The key activities undertaken during the assessment included the following:

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

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

Step 1: Screening

Screening of the project was undertaken to evaluate the need of conducting an EIA and the level of study. Transmission lines are listed under schedule 2 of EMCA, 1999 among projects requiring EIA before commencement. In addition, other considerations taken into account during the screening process included the physical site location, zoning, nature of the immediate neighbourhood, sensitivity of the areas surrounding the site and socio-economic activities in the area, among others.

Step 2: Desk Study

Documentation review was a continuous exercise that involved a study of available documents on the project including the project set-up plans and architect's statement, land ownership documentation, environmental legislation and regulations, district development plans, location maps, etc.

Step 3: Site Assessment

A site assessment was conducted on 3rd and 4th March, 2014 to establish:

- Land ownership, usage and conflicts;
- Flora, fauna and avifauna found on the site;
- The site landscape
- Surface water bodies within the neighbourhood of the site and;
- The general environment and its sensitive receptors found within the environs of the site.

This process was guided by 1) World Bank Project/Site Screening Criteria Worksheet and 2) JBIC Environmental Checklist 15; Power Transmission and Distribution lines

Step 4: Public Consultation

Detailed stakeholders consultations for this study were undertaken from 3rd to 9th March, 2014. These consultations were conducted using structured interviews at key informant, household and community level through public meetings (*barazas*).

The following people were consulted:

- Deputy Manager, Environment, Geothermal Development Company, Nakuru Office
- Environmental Scientist, Geothermal Development Company, Nakuru
- County Director of Environment, Nakuru
- County Physical Planner, Nakuru
- Sub County Public Health Officer, Rongai
- Regional Manager, Water Resources Management Authority, Nakuru
- Sub County Livestock Officer, Rongai
- County Occupational Safety and Health Officer, Nakuru
- Assistant Director Kenya Wildlife Service, Central Rift Area
- Senior Research Scientist, KWS, Central rift Region
- Sub County Agricultural Officer, Rongai
- Assistant Head of Conservancy (KFS), Mau
- Sub County Development Officer, Rongai
- Sub County Commissioner, Rongai
- District Officer, Kampi ya Moto Division
- District Officer, Rongai Division
- District Officer, Rongai
- Chief, O'l Rongai Location
- Chief, Makutano Location
- Chief, Kampi ya Moto Location
- Chief, Lengenet Location
- Chief, Rongai Location

- Open-ended questionnaires were administered to households, and small business enterprises neighbouring the site. Five public *meetings*, organized by the area chiefs were held on 4th, 5th, 6th and 7th March, 2014.

Step 5: Reporting

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

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

CHAPTER 2: PROJECT DESCRIPTION

2.1 Nature of the Project

The project essentially involves construction of an approximately 32km, 400kV overhead transmission line from the proposed Menengai substation within the GDC geothermal fields to Rongai at the substation serving the Kenya Pipeline Pump Station. The project will also involve construction of the new Menengai substation from which the 400kV line will originate and at terminate at the proposed Menengai substation close to Salgaa shopping Centre/Eldoret-Nakuru highway.

2.1.1. Transmission Line Route

The proposed 12km Menengai – Rongai transmission line will take-off from the proposed Menengai substation within the Menengai crater.

The transmission line will then run through a section of the crater in a southerly direction before emerging from the crater into the crater's cliff and onto the O'I Rongai settlement scheme, through Makutano, Kampi ya Moto to Salgaa in Rongai location.

The line terminates at the proposed Rongai substation behind Salgaa shopping centre. The Menengai – Rongai transmission line has been Geo Referenced as indicated in Table 2.1.

Table 2.1: Geographical Position System (N-360-UTM-ARC 1960 Coordinates for Menengai- Rongai 400 kV transmission line

| No. | Name | Northing | Easting |
|-----|---------|----------|---------|
| 1. | SS | 9978340 | 171991 |
| 2. | SS | 9978483 | 172254 |
| 3. | SS | 9978351 | 172326 |
| 4. | SS | 9978208 | 172062 |
| 5. | TT-OFF | 9978290 | 172016 |
| 6. | AA1 | 9976075 | 169679 |
| 7. | A2 | 9972880 | 169558 |
| 8. | A3 | 9972111 | 170803 |
| 9. | A4 | 9970250 | 171315 |
| 10. | PIPE SS | 9969169 | 170164 |

NB: AP= Angle Point

2.2 Project Design

The design criteria as adopted for the conceptual design are initially based on KETRACO's 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 and substation components are designed in a safe, cost effective and reliable manner.

2.2.1 Transmission Line Design (400KV Lines)

The sub-sections below provide a brief description of the project's material inputs.

Conductors

The conductors recommended for the various sub-project options are Aluminium Conductor steel Reinforced (ACSR) "Wolf" and "Lynx" conductors which are according to KETRACO'S standards. The operational performance of the selected conductors, both mechanically and electrically has proven satisfactory under Kenyan conditions. If the detailed line survey for particular sections result in limitations of right of way (ROW) resulting in a compact line design, lighter All Aluminium Alloy Conductors (AAAC) will be considered to minimise tower sizing.

Overhead earth wire (OPGW)

According to KETRACO's standards, a single overhead shield wire is recommended for 400kV lines. The wire would provide a 25 degrees shielding angle for the line circuit which is considered satisfactory considering the isokeraunic level in the region ranging from 120 to 180 thunderstorms days per year.

Supporting structures

Lattice steel self-supporting structures are recommended for the project.

Conductor configuration

KETRACO's current practice is to use a triangle conductor configuration on single circuit lines with the two lower phases on the same horizontal plane. The configuration results in slightly lower and lighter tower with a modest cost saving compared to the typical triangular configuration with the three phases in a horizontal configuration. A double circuit configuration requires the use of the phase conductors for each circuit in a vertical plane.

Foundations

Based on the observation of the ground conditions during the line route surveys, conventional pad and chimney foundations and reinforced concrete pad and 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 and chimney foundations.

Grounding

All towers will be permanently grounded with an individual tower footing resistance aimed to be less than 20Ohms. Over the first 1.5Km 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. At tower sites in urban areas often frequented by people, protective earthing would be carried out aimed at less than 10ohms.

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 standards.

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 to ground fault. Modern circuit breakers, operating in two steps, reducing switching surges to 1.5-2 times the 50HZ voltage.

Lightning Arrestors

Lightning strikes produce high voltages and travelling waves on transmission lines causing insulator flashover and interruption of operation. Steel grounded shield conductors at the top of the towers significantly reduce, but do not eliminate the probability of direct lightning strikes to phase conductors. Lightning arrestors are designed to improve the voltage withstand of substation equipment and are normally installed as the first equipment before the line terminates at the substation gantry and before such equipment like transformers, reactors.

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 swing, low frequency vibration and high frequency oscillations.

2.2.2 Substation Design and Layout

For the proposed Menengai and Rongai substations, the contractor will produce full detailed specifications for all aspects of the substation design, including performance and quality standards, construction procedures and standards and the requirements for design approval, factory testing, drawings, Operation and Maintenance manuals and spare parts procurement details.

KETRACO will check the design layouts for conformity with electrical safety clearance, access for maintenance and repair, lightning protection and sound engineering practice. Particular care will be needed to ensure adequate provisions are made for the new substation with regards to plant interfaces and safety of staff working in a live substation.

The substation and equipment used shall be designed to limit environmental impacts to a minimum and all statutory requirements applicable in the territory complied with. Particular care will be applied in the design of the substation to prevent the contamination of the ground and surface water sources by oil or other liquid contaminants. Where gases are used in equipment or for other purposes, care will be taken to limit the release of greenhouse

gases to a minimum. In particular SF6 (Sulphur Hexafluoride) shall not be deliberately released to atmosphere during construction, testing or maintenance.

Where equipment contains large amounts of flammable material, care will be taken to limit the spread of fire to adjacent equipment or buildings. Where specified in the schedules, large power transformers will be fitted with fire protection systems designed to suppress and extinguish fires in transformer compounds, limit the damage to the transformers and ensure that adjacent transformers are protected against the spread of fire.

The substation structures, buildings and primary equipment shall have a design life of 40 years, while secondary systems such as protection and control equipment shall have a minimum of 15 years.

2.3 Project Justification

The proposed transmission line will increase security and reliability of electricity power supply in Nakuru and surrounding areas. This will in essence boost various sectors including trade and industry; health; education, business (and especially small scale businesses); water and sanitation; security; etc.

2.4 Project Activities

The proposed projects' activities can generally be divided into four stages, namely: preconstruction/project design; construction; operation; and eventual decommissioning of the transmission line and substations as described below.

2.4.1 Pre-construction/Project Design

KETRACO is currently applying for various permits and licenses including procurement of land for the associated substation. The procurement of the various goods and services and contracting of the construction firm and other consultants will begin after the completion of the ESIA process.

2.4.2 Construction

The construction of the transmissions line will require the creation of some temporary access roads to the construction sites. The construction will require some localised vegetation clearance. Materials arising from ground excavation will either be spread in appropriate areas surrounding the line or removed to another site as agreed.

The construction of the substation will require the creation of permanent access roads connecting to the local / national road network. The new substation site will first need to be cleared of vegetation and levelled. Civil works would then start including creation of on-site roads, drainage, digging of foundations, pouring of concrete and creation of areas of hard standing. Substation buildings for housing instrumentation and for storage would then be erected. During the commissioning stage, the substation equipment including electrical switchgear and transformers would be installed and connections made into the substation from the new and existing transmission lines.

2.4.3 Operation

Once constructed, the transmission line will require minimal maintenance which may entail occasional bush clearing and repair of damaged pylons and conductors. After a period of many years, the entire system would need a detailed survey and overhaul. There may be a requirement for occasional visits to ensure nothing goes wrong. Access rights may need to be retained to allow for maintenance works in the future.

The substation will require periodic maintenance of the transformer equipment and of the site infrastructure (buildings, roadways etc) resulting in the generation of industrial waste including hazardous wastes such as used transformer oil. The day-to-day operation of substations will generate domestic waste and sewage and will require the supply of water and energy to the site.

2.4.4 Decommissioning

The transmission line and substation are likely to remain in place for many years and therefore any decommissioning works would be a long time in the future. The transmission line and substation would be dismantled and removed and materials recycled/re-used as far as possible. Any areas disturbed would be restored to pre-project conditions and/or to conditions acceptable to NEMA. Environmental impacts associated with the decommissioning process would be minimised through the implementation of an environmental management plan (ESMP).

2.5 Project Budget

The estimated cost of the project is approximately two point five billion (KShs. 2,500,000,000) only.

2.6 Target Group for the ESIA Report

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction, operation, and decommissioning of the proposed project. The report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of project activities. The information will be useful in planning, implementation, management and maintenance of the substation.

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

- Funding agencies and donors;
- Relevant government ministries and agencies for policy implementation;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the project;
- Contractors to be engaged in the project;
- People to be involved in the management and operation of the project.

2.7 Analysis for Alternatives

One of the functions of the Environmental and Social Impact assessment process is to describe and evaluate various alternatives to the proposed project. Alternatives examined during the study are discussed below;

2.7.1 The “Do Nothing” Option

For this project, the no-development option would mean the proposed project will not be implemented. The implications of this would be no additional reliability and security of electricity supply to Nakuru County and the surrounding regions. Given that there are no sensitive ecosystems within the project site, the level of impacts associated with the project are low and that there is high probability of mitigation of these negative impacts, the “no-go” option would not be the most viable option in this instance.

2.7.2 Demand-side Management Option

Demand Side Management (DSM) is a function carried out by the electricity supply utility aimed at encouraging a reduction in the amount of electricity used at peak times. This is achieved by influencing customer usage to improve efficiency and reduce overall demand. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is the price differentiation (such as time-of-use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for managing the level of growth forecast for Nakuru region.

2.7.3 Line Routing and Substation Siting Alternatives

In proposing the above line route and substation location, consideration was given to social and environmental impacts of the project. The transmission line will generally follow open ground with minimum settlement. Preliminary survey indicates that about one structure will be affected hence no relocation/resettlement is envisioned. The new substation site has been located to avoid areas of dense settlement and where impacts on environment and local people e.g. from loss of farmland or grazing land are minimal.

2.7.4 Alternative Processes and Materials

Highly refined mineral insulating oils are used to cool transformers and provide electrical insulation between live components. Sulfur hexafluoride (SF₆) may also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines and transformers. Polychlorinated Biphenyls (PCB) can be used as a dielectric fluid to provide electrical insulation. SF₆ is a greenhouse gas with a significantly higher Global Warming Potential (GWP) than carbon-dioxide. PCB is a highly toxic substance that is no longer commonly used for electrical insulation. For this project the proponent is advised to use mineral insulating oil for cooling and insulation and to minimize or completely stop the use of SF₆ and PCB.

CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA

The proposed transmission line will traverse Rongai sub-county from Menengai crater through Ol-Rongai, Makutano, Kampi ya Moto, Lengenet to Salгаа in Rongai location. At the time of the study, literature available had not been updated to reflect the changes related to the current political and administrative dispensation.

3.1: Position and Size of project area

Nakuru district is one of the districts that make up the Rift Valley Province. It lies within the Great Rift Valley and borders four other districts namely: Naivasha to South East, Nakuru North to Molo to the West, Koibatek and Laikipia to the North East.

The district covers an area of 1484.1km² and is located between Longitude 35 28` and 35⁰ 36` East and Latitude 0⁰ 13 and 1⁰ 10` South.

3.2: Administrative Units and Political Units

The district is divided into eight administrative divisions as shown in Table 3.1. The areas are inclusive of water masses in the district. Kampi Ya Moto and Ngata Divisions are newly created divisions hived off the Old Rongai Division, Solai hived off the Old Mbogoini Division, while Lanet and Baruti were hived off the Old Nakuru Municipality Division.

There are two constituencies in the district namely Nakuru Town and Rongai. Five of the administrative divisions namely Rongai, Mbogoini, Solai, Ngata and Kampi Ya Moto fall within Rongai Constituency while Nakuru Municipality, Baruti and Lanet lie within Nakuru Town Constituency.

There are two local authorities in the district. These are Nakuru Municipality with nineteen wards and Nakuru County Council with thirty five wards. This gives a total of fifty four wards.

Table 3.1: Administrative Units and area of District by Division

| Division | Area in Km2 | Location | Sub location | No.of Households |
|---------------------|---------------|-----------|--------------|------------------|
| Nakuru Municipality | 187.6 | - | 6 | 56269 |
| Lanet | 38.1 | 1 | 3 | 10119 |
| Baruti | 36.8 | 1 | 4 | 2048 |
| Rongai | 261.4 | 2 | 6 | 3415 |
| Kampi Ya Moto | 305.1 | 2 | 3 | 14374 |
| Ngata | 197.9 | 4 | 9 | 3040 |
| Mbogoini | 203.2 | 2 | 4 | 6758 |
| Solai | 253.8 | 3 | 6 | 6281 |
| Total | 1484.1 | 15 | 41 | 102304 |

Source: District Statistics Office, Nakuru, 2008

3.3: The Biophysical Environment

3.3.1: Physiography

Menengai caldera is a major physiographic feature in the project area. The Caldera lies within the rift floor and is also important for its geothermal potential. The caldera floor, which is fairly flat, covers an area of about 88 km² and is partially covered by young rugged lava flows. West of the caldera around Boita, Menengai Station, Ngata Farm and Kabarak Estate, the topography is made up of flat grounds whose relief is low. The prevalently flat area north of Menengai between Mogotio, Kampi ya Moto, Kisanana and the Bahati Escarpment is enlivened by north trending, double chain of Ol'Rongai volcanic centres by the roughly triangular, flat topped El Bonwala Hill and by arcuate chains of small hills that span from the Ol'Rongai Estate to the Athinai Estate. East of the area is bound by the alignment of the Bahati Escarpment and the Marmanet rift cliffs bind the north-eastern part.

3.3.2: Topographic Features

The main topographic features in the district are the Mau Escarpment covering the western part of the district, the Rift Valley floor, Menengai Crater with its drainage and relief system and the various inland lakes on the floor of the Rift Valley form drainage for nearly all the permanent rivers and streams in the district.

The district is home to Lake Nakuru, famous for its flamingos. The Mau Escarpments with an average altitude of 2500m above sea level is very important for the district as most of the forests are located on it. The forests do influence rainfall pattern in the district while most of the rivers originated from the same escarpment. The catchment of Lake Nakuru is Molo River.

The topography found in the district has greatly influenced economic activities in the district. In the areas where volcanic soils are found crop and dairy farming are common. In the drier parts, livestock keeping, poultry and other activities linked to tourism are practiced.

3.3.3: Hydrogeology and surface drainage systems

The permanent rivers in the project area are Molo and Rongai in the NW. The perennial rivers are the Crater and Olbanita streams in the eastern parts. The N-S, NE-SW, and NW-SW trending fault/fracture systems provide underground channels resulting to stream water disappearing underground at some places interrupting the Olbanita stream at several places. Other surface water bodies include Lakes Nakuru and Solai, and the Olbanita swamp

Lake Nakuru represents the intersection of a piezometric surface and a topographic surface. The ground water around Lake Nakuru and northwest of the lake is controlled by a sedimentary formation comprising of lake sediments and reworked pyroclastics. The boreholes immediately to the north and northwest of the lake show lake water contamination indicating interconnection (Geotermica Italiana Srl, 1987). The same sedimentary formations are found in the boreholes located in the east of Menengai caldera implying connectivity with

the N-S running Solai tectonic axis. There is one location inside the caldera on the eastern rim where a cold spring occurs at the foot of the caldera, further confirming that the southern part of the Solai tectonic axis is an important control for groundwater movement.

The Olbanita swamp is located in an area dominated by dry and thermally anomalous boreholes. The productive ones are characterized by very shallow, low-yield aquifers that get depleted fast since the deeper formations are impervious. These are perched water bodies adjacent to the swamp. The swamp owes its existence to impervious bedrocks that have been affected by hydrothermal alteration. The formations underlying the swamp are the ignimbrite beds that show marked hydrothermal alteration.

3.3.4 Meteorology

The project area is classified into two main agro-climatic zones. The lowland areas of Mogotio and Kisanana in the north are located in semi-arid zone IV with an annual rainfall of 800 mm and mean temperatures of 30°C. Njoro, Bahati and parts of Kampi ya Moto divisions with an altitude of between 1800 m and 2400 m above sea level and average rainfall of between 760 mm and 1270 mm per year fall within a dry sub-humid equatorial climatic zone. Solai area and parts of Kampi ya Moto divisions are marginal areas within the Rift valley floor with altitudes between 1520 – 1890 m above sea level and receive rainfall of less than 760 mm annually. Around Nakuru area, mean annual rainfall is approximately 900 mm. The rainfall regimes are bimodal with the long rains occurring in March to July and the short rains in September to November. Temperatures vary with topography and range from 9.4 to 29.3 °C.

3.4: Biodiversity

3.4.1: Menengai Forest

Menengai Forest is at an altitude of 9910ft above sea level with total gazetted area of 7,315.3 ha including the crater. The forest vegetations resemble that of the “true savannah”. The dominant natural vegetation: Leleshwa (*Tarconanthus camphorates*), *Rhus natalensis*, *Rhus vulgaris*, *Euclea divinorum*, *Acacia sp.* (*A. abyssinnica* & *A. lahai*), *Cussonia sp.* (*C. spicata* & *C. simplifolia*). Dying species due to illegal over exploitation inside the crater include Cedar which are now too scattered and few due to illegal harvesting. There is a big portion of open glades of grass (grassland), which are susceptible to fires. Outside the caldera, on the hilly part of the forest are Black wattle (*Acacia mearsii*) and some planted *Eucalyptus sp.* (*E. maculata*, *E. saligna*, *E. globules* & *E. grandis*), which are however being destroyed by the locals. *Erytherina abyssinica* used to be wide spread within the forest but has been decimated by herbalists who have been digging/exploiting it for medicinal purposes, thus could become endangered if not controlled.

3.4.2: Vegetation Types in the Caldera

Areas within the caldera floor are dominated by bushed grasslands comprised of species of *Tarconanthus camphoratus* and *Acacia drepanolobium* in association with *Chloris gayana*, *Digitaria abyssinica*, *Fimbristylis exilis* (geothermal grass) and *Boma Rhode* grasses

Parches of bushed woodland (*Tarconanthus camphoratus* (Leleshwa), *Acacia* and some *Euphorbia candelabra*), mixed bushland (*Acacia drepanolobium*, *Dodonea viogar* and *Tarconanthus camphorates*), and open grasslands (*Themeda triandra*, *Cynodon dactylon*, *Chloris gayana* and *Digitaria abyssinica*) forming various associations are common both within and outside the Caldera floor.

3.4.3: Vegetation types outside the caldera

Vegetation outside the caldera is mainly characterised by exotic tree species such as *Grevillea robusta* and Eucalyptus with some pockets of *Tarconanthus camphoratus*, *Acacia* and grasses (*plate 3.5*) especially in areas adjacent to the caldera.

Some sections of the line are characterised by crop fields most predominantly maize.

3.4.4: Fauna

The distribution of wild animal species in the project area is given in **Table 3 2**. There are very few wild animal species as large parts of it are farmlands with no open grazing and dispersal areas. Leopards, Baboons, Wild pigs and Snakes are common within Menengai Caldera. Cases of Human - Wildlife conflicts mainly due to invasions of farms by the Baboons and Monkeys have been reported.

Table 3.2: Distribution of Wildlife Species

| Areas | Common Wildlife Species |
|------------------|---|
| Menengai Caldera | Antelopes, Dik dik, Gazelles, Monkeys (vevets, Columbus), Ant bears, Baboons, Leopards, Snakes (Puff udder), Birds (Quills, Guinea fowls, Cave sparrows, bats, weaver birds) and Wild pigs. |
| Solai | Leopards, Zebra, Velvet Monkeys, Baboons, Hyena, Tortoise and Snakes. |
| Kambi ya Moto | Porcupine, Zebra, Baboons and Impala. |
| Dundori | Columbus Monkey, Velvet Monkey, Wild-pigs and Baboons. |
| Bahati | Leopard, Mongoose, Porcupine, Baboons and Hyenas. |

Source: Nakuru District KWS Warden's Office

3.5: The Human Environment

3.5.1: Settlement and Population Patterns

The district settlement consists of people spread across the county. Nakuru town has a sizeable population of Kenyans of Indian origin and a few of the original settler families who remained in the area. The settlement patterns in the district are largely guided by natural resource availability, rainfall patterns and economic opportunities in the urban centres. Kambi Ya Moto Division is the largest division but has the least population density attribute to rural-urban migration as a result of a much well developed physical infrastructure, industrial establishments and proximity to both the district and provincial headquarters.

Table 3.3 shows that the district was projected to have a total population of 471,513 people in 2008 with municipality division recording the highest share of the population estimated at 236,886 people followed by Lanet division with 46,478 people in the same period. Barut division is the least populated with a figure of 11,699 people. The projections for the subsequent years to the end of 2012 indicated a steady rise to 492,144 and 571,276 people respectively for the year 2010 and 2012, a similar trend is repeated for the rest of the planning period.

Table 3.3: Projected population and Population Density Per Division

| Division | Area (Km ²) | 1999 (Census) | | 2008 Projections | | 2010 Projections | | 2012 Projections | |
|---------------|-------------------------|----------------|-------------------------|------------------|-------------------------|------------------|-------------------------|------------------|-------------------------|
| | | Pop. | Density km ² | Pop. | Density km ² | Pop. | Density km ² | Pop. | Density km ² |
| Baruti | 36.8 | 9169 | 249 | 11699 | 318 | 12210 | 332 | 14174 | 385 |
| Lanet | 38.1 | 36428 | 956 | 46478 | 1220 | 48511 | 1273 | 56311 | 1478 |
| Municipality | 187.6 | 185665 | 990 | 236886 | 1263 | 247250 | 1318 | 287006 | 1530 |
| Kampi ya moto | 305.3 | 23187 | 78 | 30388 | 100 | 31717 | 104 | 36817 | 121 |
| Rongai | 261.4 | 35726 | 137 | 45582 | 174 | 47576 | 182 | 55226 | 211 |
| Ngata | 197.9 | 25618 | 129 | 32685 | 165 | 34116 | 172 | 39601 | 200 |
| Mbogoini | 203.2 | 23427 | 115 | 29890 | 147 | 31198 | 154 | 36214 | 178 |
| Solai | 253.8 | 29710 | 117 | 37906 | 149 | 39565 | 156 | 45926 | 181 |
| Total | 1484.1 | 369,560 | 249 | 471,513 | 318 | 49144 | 332 | 571,276 | 385 |

Source: Nakuru District Development Plan, 2008 – 2012

3.5.2 Land ownership and use

About half (about 50%) of the land in the proposed project area is public owned land comprising of the Menengai Forest which covers the Northern, Eastern and Southern parts of the Menengai Caldera, Kenya Prison Service land and Municipality of Nakuru land. The rest of the land is private owned with sizes ranging from 0.8 to 200 acres.

The local people occupying the northern and north-eastern parts of the prospect area practice small-scale intensive mixed farming that include livestock keeping. To the east and south of the area are sub-urban and urban developments. Large-scale wheat and dairy farming occupies mostly the western area and some parts of the Caldera floor.

3.5.3: Water resources and consumption

The main surface water resources are permanent rivers Molo and Rongai in the far NW of the Project area. The Crater and Olbanita streams in the north-eastern parts of the area are

seasonal and have water flowing most months of the year. Other surface water bodies include Lakes Nakuru (Saline) and Solai, and the Olbanita swamp.

The Olbanita swamp is located in an area dominated by dry and thermally anomalous boreholes. The productive ones are characterized by very shallow, low-yield aquifers that get depleted fast since the deeper rock formations are impervious mainly due to hydrothermal alteration.

3.5.4: Transport and communication

Most of the project area is well serviced by a network of earth roads and all weather roads through the western part and eastern parts. Accessibility to the proposed project site is by roads indicated in **Table 3.4**. The main road users for the roads in the project area are 'matatus' (public transport vans), trucks, private cars and cyclists.

Table 3.4: Roads accessing the Proposed Project area and their Classification

| | Description | Classification | Surface type |
|----|--|----------------|--------------|
| 1. | Nakuru-Eldama Ravine Road | B4 | Gravel |
| 2. | Nakuru-Bahati-Subukia Road | B5 | Gravel |
| 3. | Olrongai-Kwa Gitau (Off Nakuru- Eldama Ravine Rd) | D365 | Earth |
| 4. | Kampi ya Moto-Banita-Bahati (Off Nakuru- Eldama Ravine Rd) | E454 | Earth |
| 5. | Maili Kumi-Solai Road (Off Nakuru-Bahati-Subukia Road) | D455 | Earth |

The existing roads network, railway lines, electric power service lines, telecommunication lines and Global System for Mobile (GSM) Communication coverage of the prospect area is adequate. All parts of the area except some parts of Menengai caldera are accessible by motorable tracks serving the farming communities. The Nairobi - Kisumu Railway line and Trans-Africa highway pass through the southern and western parts of the area. Electric power and telephone service lines serve most of the farms and market centres that dot the area. GSM coverage is adequate for most parts of the prospect including inside the Menengai caldera.

3.5.5: Public health and sanitation profile

Rift Valley Provincial Hospital is the largest health facility in the project area located in Nakuru Town. There are also a number of health centres and dispensaries within the project area. According to the District Public Health Office (Ministry of Health, Nakuru), the top ten most common diseases in the project area for listed health facilities are malaria, upper

respiratory tract infections, skin diseases, diarrhoea, accidents, rheumatism, pneumonia, eye infections, urinary tract infection and dental disorders. The general disease morbidity for the larger Nakuru district is as shown in **Table 3.5**.

Table 3.5: Top Ten Diseases in 2007 for Nakuru District

| | Disease | Occurrence/Morbidity |
|----|--------------------------------------|-----------------------------|
| 1 | Upper respiratory tract infection | 468,501 |
| 2 | Malaria | 463,427 |
| 3 | Disease of the skin (include ulcers) | 103,588 |
| 4 | Diarrhoeal diseases | 95,930 |
| 5 | Accidents (incl. Fractures, burns) | 62,567 |
| 6 | Pneumonia | 60,654 |
| 7 | Dental carries | 43,188 |
| 8 | Eye infections | 42,086 |
| 9 | Rheumatism | 39,063 |
| 10 | Urinary tract infections | 31,597 |

Source: District Public Health Office, Nakuru

The current health facilities within project area are as indicated in the **table 3.6**.

Table 3.6: Health Facilities within the Project area

| Public Health Facilities (GoK) | Private Health Facilities |
|---|---|
| <ul style="list-style-type: none"> • Rift Valley Provincial Hospital • Forces Memorial Hospital • Ol'rongai Dispensary • Menengai GSU Dispensary • Kabarak Health Centre • Kipsyenan Dispensary • Banita dispensary • Upper Solai Dispensary • Maji Tamu Dispensary • Kipngochoch Dispensary • GK Prisons Dispensary | <ul style="list-style-type: none"> • Majani Mingi Dispensary • St. John Cottage |

Apart from Nakuru town that has the municipal sewage system. Most of the stakeholders in the project area have their own sewerage systems, which are mostly soak pits, septic tanks and pit latrines. Latrine coverage for the project area has been estimated to be 68.6% (Nakuru District Public Health Office, Ministry of Health).

3.5.6: Tourism

The Menengai caldera and Lake Nakuru National Park are among other areas with a major tourist attraction potential in Nakuru District. The caldera peak offers a panoramic view of the surrounding areas including Nakuru Town. Lake Nakuru, a Ramsar site, located a few km south of the Caldera is famous for being the first successful Rhino Sanctuary in Kenya and habitat for flamingoes. There are plans to package Lake Nakuru National Park together with Menengai caldera and Lord Egerton Fort as tourist attraction sites under an ecotourism project (personal communication with a KWS Research Scientist, Nakuru). Menengai caldera is already attracting many local and foreign non-paying visitors.

3.5.7: Agricultural activities

The main agricultural activity of the project area has been crop farming and livestock keeping. Areas surrounding Menengai Caldera and parts of the intra-caldera are intensively cultivated on both commercial and subsistence scale due to rich fertile volcanic soils. The main cash crops grown are Wheat, Sisal and Coffee. Other cash crops include Maize, Potatoes, Citrus, Pyrethrum, Brassicas, Kales and Tomatoes. The main food crops grown are Maize, Beans and Potatoes (**Table 3.7**). Other food crops include Sorghum and Millet grown at Kampi ya Moto and Makongeni.

Around Kiamunyi, Mashiara, Menengai farm, Valley farm and Kampi ya Moto areas, large-scale wheat, maize and dairy farming is predominant. The eastern side of the caldera rim is mainly under subsistence cultivation of maize, beans, potatoes and horticultural crops (tomatoes).

Table 3.7: Crop Production (Ha) achievements Per Division in the Project area

| Crop | Nakuru North District (Bahati Division) | Rongai Division | Nakuru Municipality Division |
|----------------|---|-----------------|------------------------------|
| Maize | 10500 | 5500 | 1314 |
| Wheat | 600 | 2800 | 5 |
| Sorghum | 25 | 34 | 6.3 |
| Barley | 100 | | |
| Oats | 4 | | |
| Finger Millet | 10 | 25 | 18 |
| Beans | 900 | 3500 | 1117 |
| Cow Peas | 5 | 6 | 7.8 |
| Pigeon peas | 4 | 0 | 4.25 |
| Green grams | | | 1 |
| Dolichos | | 5 | 1 |
| Arrow roots | 4 | 1.5 | 0.7 |
| Sweet potatoes | 50 | 9 | 5.75 |
| Irish potatoes | 505 | 40 | 413.5 |
| Cassava | 8 | 1 | 2 |
| Sunflower | 2 | | 4 |
| Soya beans | 10 | 7 | 2.5 |
| Pyrethrum | 50 | | 1 |
| Tea | 305 | | |
| Coffee | 2139 | 119 | |
| Sisal | | 7000 | |
| Sugarcane | | 5.5 | 2.5 |
| Yams | 4.5 | | |

Source: District Crop Development Office (DCDO), Nakuru

3.5.8: Archaeological and historical sites

Hyrax Pre-historic Site is the only site of historical significance within the prospect area. It is located on Hyrax Hill, which is a prominent rocky lava ridge measuring about 500 m in length and rising to 50 m above the surrounding plain off the Nakuru–Nairobi road. The hill owes its name to the numerous hyraxes that used to live in the rocky openings.

The archaeological features dating between 200 and 5000 years ago have been found on the foot of the hill. The older is the Neolithic occupation with remains on Site I. There is also recent Iron Age activity at the same site and earlier Iron Age activity on Site II.

Hyrax has been central to the development of archaeological research in Kenya from over 70 years. Together with other sites in the region, it has formed a basis of understanding of evolution of mankind from hunting and gathering way of life to a greater dependence on food production especially pastoral activity in these high grasslands.

CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Introduction

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

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

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

4.2 National Policy and Legal Framework

4.2.1 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.

4.2.2 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.

4.2.3 The Environment Management and Co-ordination Act, 1999 (EMCA)

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

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

4.2.4 EMCA: 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.

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

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

The report 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.

4.2.6 EMCA: 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 document in an effort to comply with the provisions of the Regulations.

4.2.7 EMCA: Draft 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.

4.2.8 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.

Observation of the requirements of the act shall be observed by the Proponent especially during the construction phase.

4.2.9 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 requirements of this Act shall be observed by the Proponent to ensure protection of water systems and associated flora and fauna.

4.2.10 The Public Health Act (Cap. 242)

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

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

4.2.11 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.

4.2.12 Physical Planning Act (Cap286)

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

The Proponent shall secure all mandatory approvals and permits as required by the law.

4.2.13 Occupiers Liability Act (Cap. 34)

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

The Proponent shall endeavour to ensure that the management of health and safety issues is of high priority during the operational phase of the project.

4.2.14 Land Acquisition Act (Cap. 295)

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

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

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

4.2.15 The Registered Land Act Chapter 300 Laws of Kenya:

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

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

4.2.16 The Land Adjudication Act Chapter 95 Laws of Kenya

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

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

4.2.17 The Standards Act Cap 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be

applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

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

4.2.18 The Antiquities and Monuments Act, 1983 Cap 215

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

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

4.2.19 The Civil Aviation Act, Cap 394

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

The Proponent shall comply with the provisions of the Act in seeking authorization from KCAA.

4.2.20 EMCA: The Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing Regulations, 2006

The Act states that no person shall 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.

4.2.21 EMCA: Controlled Substances Regulation, 2007, Legal Notice No. 73

The Controlled Substances Regulations defines controlled substances and provides guidance on how to handle them. The regulations stipulate that controlled substances must be clearly labelled with among other words, "Controlled Substance-Not ozone friendly" to indicate that the substance or product is harmful to the ozone layer. Advertisement of such substances must carry the words, "Warning: Contains chemical materials or substances that

deplete or have the potential to deplete the ozone layer.” Persons handling controlled substances are required to apply for a permit from NEMA.

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

4.2.22 EMCA: 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.

4.2.23 EMCA: 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 Proponent shall comply with the provisions of the Act in protecting wetlands, preventing and controlling pollution and siltation in rivers.

4.2.24 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.

4.2.25 Energy Act, 2006

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

enforcer in the energy sector. This commission among other things shall be responsible for issuing all the different licenses in the energy sector.

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

4.2.25 The Forest Act, 2005 Cap 385

The forest Act, Cap 385 of 1962 (revised 1982, 1992 and 2005) addresses the reservation, protection, management, enforcement and utilization of forests and forest resources on government land. The forest Act is applicable to gazetted forest areas (Forest Reserves) and specifically covers:

- Gazettement, alteration of boundaries and De-Gazettement of Forest Reserves
- Prohibition of activities in Forest Reserves (removal of forest produce, grazing, cultivation, hunting etc) and on unalienated Government land (removal of trees, collection of honey, lighting of fires) except under license from the Director of Forest Services (Section 8);
- Enforcement of the provisions of the Act, penalties and powers afforded to enforcing officers, among others.

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

4.2.26 The Wildlife (Management and Conservation) Act, Cap376

An Act of Parliament to consolidate and amend the law relating to the protection, conservation and management of wildlife in Kenya; and for purposes connected there with and incidental thereto

Land use; Sec 63. Where any written law, or any document of title to any land, makes a reference to improvements to such land, or to principles of good husbandry, or any like reference which relates to livestock, such reference shall be deemed to include any game-ranching, game cropping or other wildlife utilization lawfully undertaken under the rules.

Under section 16, The Wildlife (Conservation And Management) (National Parks) Regulations, the Act provides that any nuisances within the national Parks will not be allowed except with the special permission of the Director or an officer of the Service, or of a duly authorized agent of the Director, no person, while within any National Park shall -

- (a) discard any refuse or litter; or
- (b) in any other way disfigure the National Park or part thereof; or
- (c) unnecessary cause or make any noise or do any act which is likely to disturb or annoy any other person.

The Proponent shall observe the guidelines as set out in the Wildlife (Management and Conservation) Act.

4.3 Administrative Framework

4.3.1 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.

4.3.2 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.

4.3.3 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

4.3.4 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.

4.3.5 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.

4.4 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.

4.5 World Bank's Safeguard Policies

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.

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)

4.5.1 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.

4.5.2 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 ESIA study. The consulting team engaged several stakeholders during project impact evaluation and those consulted included the NEMA, WRMA, and KFS among others.

4.5.3 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 site 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.

4.5.4 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).

4.5.5 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.

4.5.6 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.

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1 Introduction

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

The specific objectives for consultation process were to:

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

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

5.2 Identification of stakeholders

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

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

5.3 Approach to Stakeholder Consultations

A detailed stakeholder's consultation for this study was undertaken from the 3rd to 7th March, 2014. These consultations were conducted in the form of:

5.3.1 Key Informant oral Interviews:

The following people were consulted:

- Deputy Manager, Environment, Geothermal Development Company, Nakuru Office
- Environmental Scientist, Geothermal Development Company, Nakuru
- County Director of Environment, Nakuru
- County Physical Planner, Nakuru
- Sub County Public Health Officer, Rongai
- Regional Manager, Water Resources Management Authority, Nakuru
- Sub County Livestock Officer, Rongai
- County Occupational Safety and Health Officer, Nakuru
- Assistant Director Kenya Wildlife Service, Central Rift Area
- Senior Research Scientist, KWS, Central rift Region
- Sub County Agricultural Officer, Rongai
- Assistant Head of Conservancy (KFS), Mau
- Sub County Development Officer, Rongai
- Sub County Commissioner, Rongai
- District Officer, Rongai
- District Officer, Kampi ya Moto
- Chief, Ol-Rongai Location
- Chief, Kampi ya Moto Location
- Chief, Lengenet Location
- Chief, Makutano Location

5.3.2 Key Informant Questionnaires:

Open-ended questionnaires were administered to stakeholders comprised of GOK officers and civil society groups in charge of diverse sectors which are likely to be impacted by the project. Concerns, views and opinions from a total of 9 respondents were received.

5.3.3 Community Questionnaires:

Open-ended questionnaires were administered to households, and small business enterprises neighboring the site. Concerns, views and opinions from a total of 27 respondents were received.

5.3.4 Public Baraza

Two public *barazas* organized by the Area chiefs were held as indicated in table 5.1.

Table 5.1: Public Consultation Meetings

| N r | Dates | Location | Venue | No. of Participants |
|----------------|--------------|-----------------|---------------------------|--------------------------------|
| | 4/3/2014 | Kampi ya Moto | Kampi ya Moto | 40 |
| | 5/3/2014 | Makutano | Losibil Centre | 30 |
| | 6/3/2014 | Ol'Rongai | Ol'Rongai Chief's camp | 150 |
| | 6/3/2014 | Rongai | Gicheha village | 35 |
| | 7/3/2014 | Lengenet | Lengenet chief's camp | 37 |

5.4: Results of Stakeholder Consultations:

Overall 132 Persons responded to the semi-structured interviews and stakeholder questionnaires, and 5 public consultations with a total of 266 people were held. Feedback received from the public and stakeholder consultation is outlined below:

- There was overwhelming support for the project in all public consultation meetings. All the provincial administrators and the communities consulted expressed their support to the project.
- The community also has expectations of regulatory authorities in the area to regulate situations that have the potential to lead to community safety risks such as traffic control, security, environmental health, pollution and control of HIV/AIDS.
- The community also expects that the project will contribute to development of social amenities through Corporate Social Responsibility and that they will also contribute towards their development if called upon.
- The community is aware that there will be a “human face” while compensating the people whose land and property will be required to give way for the project.
- During Project Construction, there will be a lot of movement of equipment and materials involving heavy and light vehicles and accidents may occur. In order to mitigate the negative outcomes, the project shall incorporate road safety awareness campaigns which will complement the activities of the Road Safety unit of the Ministry of Roads.
- Projects of this magnitude often attract many socio-economic groups and relationships that have both positive and negative results. Truck drivers, commercial sex workers, the youth and other local inhabitants will relate in varied ways and incidences of such diseases as HIV/AIDS may not be ruled out. The project will involve STI/HIV/AIDS

prevention campaigns through education programmes to sensitize the population on relationships and prevention measures to use.

- The conservationists in the area expressed concern that there will be visual intrusion of the environment and landscape within the project area due to construction of high towers.

5.4.1 Positive Economic/Social Impacts

The Proposed High Voltage Transmission line will increase power supply and stimulate economic growth in the region through:

- Many micro and small-scale enterprises will come up in the area and most unemployed youth will become economically productive and add value to the economy. These will include welding, hair dressing, computer services, photocopying, food and beverages among many more business.
- Provision of employment opportunities to both local population and migrant workers and the anticipated increase in the flow of money will create a more suitable environment for micro and small enterprises. This is a spiral effect along the entire project route as every location of the project shall benefit independently;
- Speculators who will rush to purchase plots within the area of the power line because of the anticipated investment potential in the areas of the power supply.
- The expected rural-urban migration which is likely to lead to cultural diffusion that may gradually provide a platform for reducing tribalism which is one of Kenya's perpetrator of socio-economic stagnation within communities.

5.4.2 Negative Environmental/Social Impacts:

There were some concerns raised by members of the public during the public consultation meetings. These include the following:

- There will be displacement of persons along the transmission line way leave;
- Structures and resources like trees along the way leave will also be affected
- Potential loss of exotic and indigenous trees, whether of commercial or medicinal value,
- The project will disrupt the agricultural activity in the area where maize, beans, and several other legumes are grown.
- During the construction phase, construction personnel brought in from outside the community may be infected with HIV/AIDS and other sexually transmitted diseases, and could introduce these diseases to the community members they interact with

5.4.3 Overall picture from the stakeholder consultations.

The overall picture emerging from the stakeholder consultations is that stakeholders' attitude towards the project is found positive and desirous of enjoying the benefits associated with power as soon as possible.

In addition, the project is seen as being strategic to stabilising power supply which is crucial to sustained economic growth. In order to sustain this overwhelming public support, the project development should proceed simultaneously with resolution of stakeholder concerns.

CHAPTER 6: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

6.1 Introduction

A summary of the main potential impacts of the proposed project based on stakeholders' views and consultants' previous experience in undertaking ESIA is listed in Table 6.1.

Table 6.1: Summary of Potential Impacts

| Environmental & Social Impact | Positive/Negative | Direct / Indirect | Temporary/Permanent | Major/Minor | Occurrence | | |
|---|-------------------|-------------------|---------------------|-------------|--------------|-----------|-----------------|
| | | | | | Construction | Operation | Decommissioning |
| Electricity supply | Positive | Direct | Permanent | Major | x | √ | x |
| Employment opportunities | Positive | Direct | Permanent/Temporary | Major | √ | √ | √ |
| Gains in the Local and national economy | Positive | Direct | Permanent | Major | √ | √ | x |
| Informal sectors benefits | Positive | Direct | Permanent | Major | √ | √ | x |
| Development of other sectors such as health, education, construction, industries etc. | Positive | Direct | Permanent | Major | x | √ | x |
| Security | Positive | Direct | Permanent | Major | √ | √ | x |
| Noise pollution & increased vibration | Negative | Direct | Permanent | Major | √ | √ | √ |
| Generation of exhaust emissions | Negative | Direct | Permanent | Minor | √ | √ | √ |
| Dust emissions | Negative | Direct | Temporary | Minor | √ | x | √ |
| Solid and liquid waste generation | Negative | Direct | Permanent | Major | √ | √ | √ |
| Oil spills hazards | Negative | Direct | Permanent | Minor | √ | √ | √ |
| Destruction of existing vegetation and habitats | Negative | Direct | Permanent | Minor | √ | x | x |
| Avifauna Mortality | Negative | Direct | Permanent | Minor | x | √ | x |
| Increased demand for material consumption | Negative | Direct | Permanent | Major | √ | √ | x |
| Impacts on workers' and community health and safety | Negative | Direct | Permanent | Major | √ | √ | √ |
| Soil erosion | Negative | Direct | Temporary | Minor | √ | x | x |
| Fire outbreaks | Negative | Direct | Temporary | Major | √ | √ | x |
| Visual impacts | Negative | Direct | Permanent | Minor | √ | x | x |
| Incidences of electrocution | Negative | Direct | Temporary | Major | x | √ | x |
| Perceived dangers of electrostatic and magnetic force | Negative | Direct | Permanent | Minor | x | √ | x |
| Increase in social | Negative | Direct | Permanent/T | Minor | √ | √ | x |

| | | | | | | | |
|-------------------------|----------|--------|-----------|-------|---|---|---|
| vices | | | emporary | | | | |
| Land take - loss of use | Negative | Direct | Permanent | Minor | √ | x | x |

6.2 Positive Impacts

Broadly, the identified positive impacts associated with the proposed project include;

6.2.1 Reliable and Secure Electricity Power Supply

The project will enhance the reliability and security of electricity supply in the region in addition to increasing the region's power supply. This will help meet the increasing demand for power supply and minimize the frequency of power outages.

6.2.2 Employment Opportunities

The construction, operation and decommissioning of the proposed project will create employment opportunities for both skilled and unskilled personnel. The proponent has committed to ensure that priority is given to the local community.

6.2.3 Gains in the Local and National Economy

Expected gains in the local and national economy from the construction and operation of the proposed project will be in the form of consumption of locally available materials including: timber, glass, metal, and cement among other construction materials; taxes levied from employees; and income from business associated with the project.

6.2.4 Informal Sector Benefits

The project will require supply of large quantities of building materials most of which will be sourced locally. It will also spur the growth of small business enterprises including kiosks to serve construction workers and employees, barbershops, salons, metal welding posho mills, cell phone charging, photocopying shops etc.

6.2.5 Development of Other Sectors

Increase in reliability and security of power supply in national power grid will enhance efficiency and productivity of other sectors including health, education, water supply, agriculture and livestock production, industry, etc.

6.2.6 Security

With increased lighting in the area and presence of guards on the project site the security of the area will be enhanced.

6.3 Negative Impacts

The following negative impacts are also associated with the proposed project

6.3.1 Noise Pollution

The construction and decommissioning works of the substation and other infrastructure related to the project will most likely be noisy due to the moving machines (mixers, tippers, drilling etc.) and incoming vehicles to deliver construction materials to site or take away debris.

6.3.2 Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the motored equipment during the construction and decommissioning phase of the proposed project. Motor vehicles that will be used to ferry construction materials, take away debris during decommissioning phase or those used for general operation activities (operation phase) will also have impacts on air quality

6.3.3 Dust Emissions

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

6.3.4 Solid and Liquid Waste Generation

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

6.3.5 Oil Spill Hazards

Motorized machinery on the proposed site may be containing moving parts which will require continuous oiling to minimise the usual corrosion or wear and tear. There is also a potential for oil spills and accidents during oil transportation, storage and operations of the transformers and batteries.

6.3.6 Destruction of Existing Vegetation and Habitats

Construction of the transmission line and substation will result in clearing of some of the existing vegetation and habitats.

6.3.7 Avifauna Mortalities

Site assessment revealed presence of various species of avifauna. Avifauna mortalities associated with similar projects have previously been reported.

6.3.8 Increased Demand for Material Consumption

During the life of the project, water, energy and construction materials will be used. This will have an impact on the availability of these materials to the local population.

6.3.9 Impacts on Workers' and Community Health and Safety

Project workers may be exposed to various risks and hazards including slips and trips, falls, flammable and explosive substance, electrical shocks, dust, noise and vibrations, poor hygiene, fire, bruises and cuts, etc.

6.3.10 Soil Erosion

There are possibilities of soil erosion occurring during the construction phase and especially during rainy and windy seasons.

6.3.11 Fire Outbreaks

Fire due to electrical faults and flammable substance is a possible effect of the proposed project.

6.3.12 Visual and Aesthetic Impacts

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

6.3.13 Incidences of Electrocutation

Since the proposed project will be dealing with electricity, workers and other people who gain access to the project sites risk being electrocuted or receiving electric shocks.

6.3.14 Perceived Danger of Electrostatic and Magnetic force

Electricity transmission lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. The strength of both electric and magnetic fields is a function of the voltage and the lateral distance from the transmission line or substation to the receptor. Many studies published during the last decade on occupational exposure to Electro-Magnetic Fields (EMF) have exhibited a number of inconsistencies and no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields are a threat to human health. However, the EMF decrease very rapidly with distance from source and there should be no potential health risks for people neighbouring the project given the proposed transmission line way-leave and substation acreage.

6.3.15 Increase in Social Vices

With an increase in the population of the area boosted by the project employees the social set up of the area will be affected. This change may be in the form of loose morality, an increase in school drop-out due to cheap labour, Child labour, and Increased incidences of HIV/AIDS and other communicable diseases.

6.3.16 Land Take – Loss of Use

No resettlement will be necessary but loss of use may occur.

6.4 Proposed Mitigation Measures

The following is a summary of proposed mitigation measures to avoid, offset or minimize the identified negative impacts. Detailed mitigation measures are contained in the EMSP (chapter 7)

6.4.1 Noise Pollution

Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of site and nearby communities. The contractor will adhere to the EMCA Noise and Excessive Vibration Pollution Control Regulation, 2009 and will be required to implement noise control measures amongst exposed work force and community. This will include provision of hearing protective devices such as ear plugs and ear muffs; avoiding construction or demolition activities during the night, education and awareness programmes and creation of a buffer to propagate against noise pollution among other noise control measures.

6.4.2 Generation of Exhaust Emissions

To mitigate against exhaust emissions, the proponent is advised to sensitise truck drivers and machine operators to switch off engines when not in use; regularly service engines and

machine parts to increase their efficiency and reduce generation of exhaust emission; and where feasible use alternative non-fuel construction equipment.

6.4.3 Dust Emissions

The proponent will endeavour to minimize the effect of dust on the surrounding environment resulting from site clearance, excavation, spreading of the topsoil, demolition works and temporary access roads to ensure protection of health and safety of workers and communities. Control measures will include, use of PPE; regular sprinkling of water on dusty areas and temporary access roads; and observing set speed limits among other measures.

6.4.4 Solid and Liquid Waste Generation

To avoid waste generation or to minimize the amount of waste generated, the following measures are recommended; use of an integrated solid waste management system i.e. the 3 R's: Reduction at source, Reuse and Recycle; accurately estimate the dimensions and quantities of materials required; use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time; providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage; use of building materials that have minimal or no packaging to avoid the generation of excessive packaging waste; providing waste collection bins at designated points on site; disposing waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws. In addition all drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations; construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a regular basis; and proper procedures for the management of human waste will be put in place in order to prevent outbreak of diseases; place in strategic places signs against littering and dumping of wastes; audits waste generation and develop Waste Reduction Action Plans (WRAP).

6.4.5 Oil Spill Hazards

The proponent will endeavour to prevent petroleum products used in the project which include bitumen, oils, lubricants and gasoline from contaminating soils and water resources (ground and surface water). To accomplish this, the proponent will; install oil trapping equipment in areas where there is a likelihood of oil spillage; collect the used oils and re-use, re-sell, or dispose of appropriately using expertise from licenced waste handlers; prepare a written response plan and display it on strategic areas and train workers on specific procedures to be followed in the event of a spill; immediately institute clean up measures in case of an oil spill; design the project sites to have spill prevention and detection systems to protect the environment especially where the transformers will be located; design appropriate protection devices against accidental discharge of transformer oil substances; route drains through an oil/water separator; ensure regular inspection and maintenance of

the transformers to minimize spillage; ensure that all waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.

6.4.6 Destruction of Existing Vegetation and Habitats

To minimize destruction of existing vegetation and habitats, the proponent will; avoid unnecessary vegetation clearing; ensure proper demarcation and delineation of the project area to be affected by construction works; specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage; with assistance from community and KFS, initiate a tree planting exercise on the un-used land; design and implement an appropriate landscaping programme for project site; and support community initiatives in tree planting.

6.4.7 Avifauna Mortalities

To minimize bird collisions leading to their mortality, the proponent will undertake wire marking to alert birds to the presence of power lines, allowing them time to avoid collision and will build raptor platforms for bird roosting and nesting

6.4.8 Increased Demand for Material Consumption

To ensure minimal demand for material consumption, the proponent will; harness rainwater and storm-water whenever possible for use in dust prevention and gardening; promote recycling and reuse of water as much as possible; promptly detect and repair water pipe and tank leaks; sensitise construction workers to conserve water by avoiding unnecessary use; ensure taps are not running when not in use; switch off electrical equipment, appliances and lights when not being used; install occupation sensing lighting at various locations such as storage areas which are not in use all the time; install energy saving fluorescent tubes at all lighting points within the project site instead of bulbs which consume higher electric energy; monitor energy use during the operation of the project and set targets for efficient energy use; sensitise the workers to be energy efficient; ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered; ensure that damage or loss of materials at the construction site is kept to a minimum through proper storage and use; and encourage material recycling.

6.4.9 Impacts on Workers' and Community Health and Safety

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

6.4.10 Soil Erosion

To reduce soil erosion, the proponent will; apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil; ensure that construction vehicles are restricted to use existing graded roads; ensure that any compacted areas are ripped to reduce run-off; develop and implement a storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure.

6.4.11 Fire Outbreaks

To mitigate against fire outbreaks, the proponent will; ensure compliance with fire safety regulations and install all necessary fire safety equipment; conduct regular trainings and fire drills for employees; conduct periodic maintenance to ensure that, there are;- no overloaded electrical systems; no incorrectly installed wiring; no live naked wires; and fuel store areas are continuously monitored; create fire breaks (ploughed strips) on strategic areas of the land; build capacity for community on fire related issues including fighting and vigilance

6.4.12 Visual and Aesthetic Impacts

To reduce impacts on visual and aesthetic values of the area, the project proponent will; undertake extensive public consultation during the planning of the project; design structures at the site in such a way as to improve the beauty of the surroundings; restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers; design and implement an appropriate landscaping programme.

6.4.13 Incidences of Electrocution

To reduce incidences of electrocution, the proponent will; put in place a maintenance system to ensure physical integrity of project equipment is maintained; deactivate and properly ground live wires before repair works are performed; ensure that live wire works is conducted by trained personnel; ensure that access to the project sites and especially substation should only be by authorization and trained personnel; erect a perimeter fence to deny unauthorized people access the substation; place warning signs on strategic places; conduct periodic awareness and sensitization campaigns for the neighbouring communities.

6.4.14 Perceived Danger of Electrostatic and Magnetic force

The proponent will conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces

6.4.15 Increase in Social Vices

To minimize project effects on local social set up, the proponent will; conduct periodic sensitization forums for employees on ethics, morals, general good behaviour and the need for the project to co-exist with the neighbours; offer guidance and counselling on HIV/AIDS and other STDs to employees; provide condoms to employees; and ensure enforcement of KETRACO's policy on sexual harassment and abuse of office.

6.4.16 Land Take – Resettlement and Loss of Use

Conduct consultation meetings with Project Affected Persons and ensure timely compensation for loss of property and land use. Ensure adherence to country legal legislations and World Bank Safeguard Policy 4.12 on Involuntary Resettlement

CHAPTER 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environment Management Plan is an important process of ensuring project sustainability and environmental and social protection. Whereas efforts are usually made to develop mitigation measures for a proposed project, it is during the operation lifespan of the project that actual impacts are noted or experienced.

It is therefore important to integrate in the environmental and social impact assessment process, an environment monitoring and management plan that includes the monitoring of the progress of mitigation measures being implemented while also monitoring the project for any new negative impacts that were not earlier considered or anticipated.

The Proponent shall ensure that the Contractor understands and implements all specified mitigation measures during the construction period. The Proponent's Supervising Engineer is responsible for assessing the Contractor's Environmental and Social Management Plan and internally implements the Management Plan to ensure that the Environmental and social impacts are monitored and management in an environmentally and socially acceptable manner.

Tables 7.1, 7.2 and 7.3 provide the ESMP during construction, operation and decommissioning phase of the proposed project.

Table 7.1: ESMP during the construction phase of the proposed Project

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|----------------------|----------------------------|----------------------------------|
| 1. Minimization of Noise and Vibration | | | | |
| Noise and vibration | 1. Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used. | KETRACO & Contractor | Entire construction period | 0 |
| | 2. Sensitise construction drivers to avoid running of vehicle engines or hooting | KETRACO & Contractor | Entire construction period | 0 |
| | 3. Regular servicing of engines and machine parts to reduce noise generation | KETRACO & Contractor | Entire construction period | 0 |
| | 4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels. | KETRACO & Contractor | Entire construction period | Design cost |
| | 5. Trees to be planted around the site to provide some buffer against noise propagation | KETRACO & Contractor | Entire construction period | 10,000 |
| | 6. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work. | KETRACO & Contractor | Entire construction period | 0 |
| | 7. Provide necessary PPE to workers who may be exposed to high levels of noise and ensure proper and constant use | KETRACO & Contractor | Entire construction period | Ear plugs and ear muff @500 each |
| | 8. All construction equipment and machinery to be used must be tested to verify if they are compliant with Kenya and the internationally acceptable standards of noise. | KETRACO & Contractor | Entire construction period | |
| 2. Abate Air Pollution | | | | |
| Dust emission | 1. Ensure strict enforcement of on-site speed limit regulations | KETRACO & Contractor | Entire construction period | 0 |
| | 2. Avoid excavation works in extremely dry weather | | | 0 |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|--|---|------------------------|----------------------------|--|
| | 3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction and vehicles | | | 10,000 |
| | 4. Stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions | | | 0 |
| | 5. PPE to be provided to employees and ensure proper and constant use | | | Dust coats and dust masks @3000 per employee |
| Exhaust emission | 1. Sensitise truck drivers and machine operators to switch off engines when not in use | | | 0 |
| | 2. Regular servicing of engines and machine parts to reduce exhaust emission generation | | | 0 |
| | 3. Alternative non-fuel construction equipment shall be used where feasible | | | 0 |
| 3. Minimize solid and liquid waste generation and ensure efficient waste management during construction | | | | |
| Increased solid waste generation | 1. Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle | KETRACO and Contractor | Entire construction period | 0 |
| | 2. Accurate estimation of the dimensions and quantities of materials required. | | | 0 |
| | 3. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time | | | 0 |
| | 4. Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage | | | Design cost |
| | 5. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste | | | 0 |
| | 6. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site | | | 0 |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|--|---|------------------------|----------------------------|-------------------|
| | 7. Waste collection bins to be provided at designated points on site | | | 10,000 |
| | 8. Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws. | | | 10,000/month |
| Generation of wastewater | 1. Provide means for handling sewage generated at the construction site | KETRACO and Contractor | One-off | 30,000 |
| | 2. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies | | Entire construction period | 0 |
| | 3. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated | | | 6,000 - quarterly |
| 4. Minimize Oil Spills | | | | |
| Oil spills Hazards | 1. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles. | KETRACO and Contractor | Continuous | 0 |
| | 2. In case of an oil spill, immediate clean up measures will be instituted | | | |
| | 3. Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water | | One-off | 10,000 |
| | 4. A written response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill. | | One-off | 0 |
| | 5. Collected used oils should be re-used, disposed of appropriately by licenced waste handlers, or be sold for reuse to licensed firms | | Continuous | 5,000 per month |
| 5. Minimize vegetation disturbance at and or around construction site | | | | |
| Destruction of existing vegetation and habitat | 1. Avoid unnecessary vegetation clearing | KETRACO and Contractor | Continuous | 0 |
| | 2. Ensure proper demarcation and delineation of the project area to be affected by construction works. | | | 0 |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) | |
|--|--|------------------------|----------------------------|--------------------------------------|-----------------------|
| | 3. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage. | | | 0 | |
| | 4. Designate access routes and parking within the site. | | | 0 | |
| | 5. With Assistant from community, KWS and KFS, initiate a tree planting exercise | | | Entire construction period | 50,000 |
| | 6. Design and implement an appropriate landscaping programme for the project site. | | | | 20,000 |
| | 7. Support community initiatives in tree planting | | | KETRACO and community | Entire project period |
| 6. Reduce demand for material consumption and ensure efficiency in material consumption | | | | | |
| Increased Water Demand | 1. Harness rainwater and storm-water whenever possible for use in dust prevention, gardening and other site specific uses | KETRACO & Contractor | Entire construction period | 0 | |
| | 2. Install water conserving taps that turn-off automatically when water is not being used | | | 40% more than price of ordinary taps | |
| | 3. Promote recycling and reuse of water as much as possible | | | 0 | |
| | 4. Promptly detect and repair water pipe and tank leaks | | | 1,000 per month | |
| | 5. Sensitise construction workers to conserve water by avoiding unnecessary use. | | | 0 | |
| | 6. Ensure taps are not running when not in use | | | 0 | |
| Increased energy consumption | 1. Ensure electrical equipment, appliances and lights are switched off when not being used | KETRACO and Contractor | Entire construction period | 0 | |
| | 2. Install energy saving bulbs/tubes at all lighting points instead of incandescent bulbs which consume higher electric energy | | | 5,000 | |
| | 3. Plan well for transportation of materials to ensure that fossil fuels (diesel, transformer oil, petrol) are not consumed in excessive amounts | | | 0 | |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|-------------------------------|---|-------------|
| | 4. Monitor energy use during construction and set targets for reduction of energy use. | | | 0 |
| Demand of Raw material | 1. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered. | KETRACO & Contractor | Entire construction period | 0 |
| | 2. Ensure that damage or loss of materials at the construction site is kept to a minimum through proper storage and use. | | | |
| | 3. Encourage material recycling | | | |
| 7. Minimize occupational health and safety risks | | | | |
| Impacts on workers' and community health and safety | 1. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007 | KETRACO, DOHSS and Contractor | Entire construction period | 100,000 |
| | 2. Prohibit access by unauthorized personnel into the construction site | | | 0 |
| | 3. Train all employees and regularly sensitize them on safe working procedures | | | 100,000 |
| | 4. Periodic community sensitization of the dangers posed by the project | | Quarterly during the entire construction period | 50,000 |
| | 5. Place warning signs where necessary | | Whenever necessary | 10,000 |
| | 6. Provide necessary PPEs to workers | | Continuous | 10,000 |
| | 7. Erect a perimeter fence to enclose the substation | | One-time off | Design cost |
| 8. Reduce soil erosion and storm-water runoff | | | | |
| Soil erosion and storm-water runoff | 1. Surface runoff and roof water shall be harvested and stored in tanks so that it can be used for cleaning purposes. | KETRACO and Contractor | Entire construction period | 10,000 |
| | 2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed. | | First quarter | |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|-------------------------------|----------------------------|-------------------|
| | 3. Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil. | | | |
| | 4. Ensure that construction vehicles are restricted to use existing graded roads | | Entire construction period | |
| | 5. Ensure that any compacted areas are ripped to reduce run-off. | | | |
| | 8. Roof catchments will be used to collect the storm water for some project uses | | | 0 |
| 9. Fire outbreaks | | | | |
| Fire safety | 1. Conduct a fire risk assessment | KETRACO, DOHSS and Contractor | First quarter | 0 |
| | 2. Ensure compliance with fire safety regulations and install all necessary fire safety equipment | | Entire construction period | 50,000 |
| | 3. Conduct regular trainings and fire drills for employees | | | 10,000 |
| | 4. Periodic maintenance to ensure that, there are;- no overloaded electrical systems; no incorrectly installed wiring; no live naked wires; and fuel store areas are continuously monitored | | | 0 |
| | 5. Create fire breaks (ploughed strips) on strategic areas of substation land. | KETRACO | Continuous | 50,000 |
| | 6. Build capacity for community on fire related issues including fighting and vigilance | KETRACO and community | Continuous | 1,000 per session |
| 10. Visual and aesthetic impacts | | | | |
| Visual and aesthetic impacts | 1. Extensive public consultation during the planning of the project | KETRACO and community | Planning phase | 5,000 |
| | 2. Structures at the site should be designed in such a way that they will improve the beauty of the surroundings. | | | |
| | 3. Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers, | | Continuous | 10,000 |
| | 4. Design and implement an appropriate landscaping programme | | Quarter one | 20,000 |

| Potential Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|--|---|------------------------|----------------------------|----------------|
| 11. Increase in social vices | | | | |
| Increase in social vices including HIV/AIDS | 1. Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours | Contractor | Entire construction period | 0 |
| | 2. Guidance and counselling on HIV/AIDS and other STDs to employees | KETRACO and contractor | | 10,000 |
| | 3. Provision of condoms | | | 10,000 |
| | 4. Contractor to have a strong policy on sexual harassment and abuse of office guided by proponent's policy on the same | Contractor | Quarter one | 0 |
| 12. Land take –Resettlement and loss of use | | | | |
| Resettlement and loss of use | 1. Ensure fair and timely compensation of those affected | KETRACO | One-of | Project design |

Table 7.2: ESMP for the operation phase of the proposed Project

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|--|--|-------------------|----------------------------|------------------|
| 1. Abate Air Pollution | | | | |
| Generation of exhaust emission | 1. Vehicle idling time shall be minimised | KETRACO | Entire implementation time | 0 |
| | 2. Regular servicing of engines and machine parts to reduce exhaust emission generation | | | |
| 2. Minimization of solid and liquid waste generation and ensuring more efficient waste management | | | | |
| Solid waste generation | 1. Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle | KETRACO | Continuous | 0 |
| | 2. Provide solid waste handling facilities such as rubbish bags and skips | | One-off | 20,000 |
| | 3. Ensure that wastes generated by the project are efficiently managed through recycling, reuse and proper disposal procedures. | | Continuous | 0 |
| | 4. A private licensed company to be contracted to collect and dispose solid waste on regular intervals | | | 30,000 /year |
| | 5. Place in strategic places signs against littering and dumping of wastes | | | 5,000 /year |
| | 6. Audits on waste generation and development of Waste Reduction Action Plans (WRAP) | | | To be determined |
| Liquid waste generation | 1. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies | KETRACO | Continuous | 20,000 / annum |
| | 2. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated | | | |
| | 3. Audits on liquid waste generation and development of liquid Waste Reduction Action Plans | | | |
| Release of sewage into | 1. Provide adequate and safe means of handling sewage generated at the substation and other areas | KETRACO | One-off | 40,000 |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|-------------------------------|---|-------------------|------------|---------------------------|
| the environment | 2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately | | Continuous | 0 |
| | 3. Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated | | | 0 |
| 3. Minimize Oil Spills | | | | |
| Oil spills Hazards | 1. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles | KETRACO | Continuous | 0 |
| | 2. In case of an oil spill, immediate clean up measures will be instituted | | | |
| | 3. The substation should be designed with spill prevention and detection systems to protect the environment especially where the transformers will be located. | | One-off | Part of construction cost |
| | 4. Design appropriate protection devices against accidental discharge of transformer oil substances. | | | |
| | 5. The project design should provide adequate storage areas for the transformer oil | | | |
| | 6. Drains should be routed through an oil/water separator | | One-off | Part of construction cost |
| | 7. Frequent inspection and maintenance of the transformers should be done to minimize spilling | | Continuous | 0 |
| | 8. A written response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill. | | One-off | 0 |
| | 9. The substation operator should ensure the proper containment or collection and disposal for the waste oil or used oil | | Continuous | 0 |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|--|--|-------------------|------------|---------------------------|
| | 10. All waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan | | | 20,000/year |
| | 11. Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water | | One-off | Project construction cost |
| 4. avifauna mortality | | | | |
| Project related avifauna mortalities | 1. To minimize collisions, undertake wire marking to alert birds to the presence of power lines, allowing them time to avoid the collision | KETRACO | One-off | Part of construction cost |
| | 2. Build raptors platforms for bird roosting and nesting | | | |
| 5. Reduce demand for material consumption and ensure efficiency in material consumption | | | | |
| High water demand | 1. Prompt detection and repair of water pipe and tank leaks | KETRACO | Continuous | 30,000/year |
| | 2. workers to be sensitized on water conservation techniques. | | | 10,000/year |
| | 3. Ensure taps are not running when not in use | | | 0 |
| | 4. Install water conserving taps that turn-off when water is not being used | | One-off | 30,000 |
| | 5. Install a discharge meter at water outlets to determine and monitor total water usage | | One-off | 10,000 |
| | 6. Harness rainwater and storm-water whenever possible for project use | | Continuous | 0 |
| | 7. Create water conservation awareness | | Continuous | 10,000/year |
| High demand for energy | 1. Switch off electrical equipment, appliances and lights when not being used | KETRACO | Continuous | 0 |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|-----------------------------------|----------------|---------------|
| | 2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time | | One-off | 20,000 |
| | 3. Install energy saving fluorescent tubes at all lighting points within the substation instead of bulbs which consume higher electric energy | | One-off | 10,000 |
| | 4. Monitor energy use during the operation of the project and set targets for efficient energy use | | Continuous | 2,000/month |
| | 5. Sensitise the workers to be energy efficient | | | 0 |
| 6. Minimize occupational health and safety risks | | | | |
| Impacts on workers' and community health and safety | Implement all necessary measures to ensure health and safety of workers and the general public during operation of the proposed project as stipulated in the Occupational Safety and Health Act, 2007 | KETRACO | Continuous | 5,000/month |
| 7. Fire outbreaks | | | | |
| | 1. Ensure compliance with fire safety regulations and install all necessary fire safety equipment | | | 0 |
| | 2. Conduct regular trainings and fire drills for employees | | | 20,000/year |
| | 3. Periodic maintenance to ensure that, there are;- no overloaded electrical systems; no incorrectly installed wiring; no live naked wires; and fuel store areas are continuously monitored | KETRACO DOHSS and Community | Continuous | 0 |
| | 4. Create and maintain fire breaks (ploughed strips) on strategic areas of the substation land and other project sites. | | | 10,000 /annum |
| | 5. Build capacity for community on fire related issues including fighting and vigilance | | | 20,000 /annum |
| | | | | |
| 8. Minimize Electrocutio | | | | |
| Electrocutio n from live power lines | 1. Put in place a maintenance system to ensure physical integrity of project equipment is maintained | KETRACO | Planning stage | 0 |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|-------------------|---------------------|----------------|
| or electric equipment | 2. Deactivating and properly grounding live wires before repair works are performed | | Continuous | |
| | 3. Ensure that live wire works is conducted by trained personnel | | | |
| | 4. Access to the substation should only be by authorization and trained personnel. | | | |
| | 5. Erect a perimeter fence to deny unauthorized people access the substation | | During construction | 0 |
| | 6. Clear warning signs to be placed on strategic places | | Continuous | 10,000/year |
| | 7. Personnel should not approach an exposed energized or conductive part unless the personnel is ;-properly insulated from the energized part with gloves or other approved insulation; the energized part is properly insulated from the personnel and other conductive objects; the personnel is properly isolated and insulated from any other conductive object | | | 0 |
| | 8. Conduct periodic awareness and sensitization campaigns for the neighbouring communities | | 10,000/year | |
| 9. Electrostatic and magnetic forces | | | | |
| Perceived danger of Electrostatic and Magnetic force | 1. Conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces | KETRACO | Continuous | 20,000 / annum |
| 10. Increase in social vices | | | | |
| Increase in social vices including HIV/AIDS | 1. Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours | KETRACO | Continuous | 30,000/year |
| | 2. Guidance and counselling on HIV/AIDS and other STDs to employees | | | |
| | 3. Provision of condoms | | | |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---------------------------|---|-------------------|------------|------------|
| | 4. enforcement of KETRACO's policy on sexual harassment and abuse of office | | | |

Table 7.3: ESMP for the decommissioning phase of the proposed Project

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|------------------------|------------|---|
| 1. Reduction of Noise and vibrations | | | | |
| Increase in noise and vibration | 1. Install portable barriers to shield compressors and other small stationary equipment where necessary. | KETRACO and Contractor | Continuous | To be determined |
| | 2. Demolish mainly during the day. The time that most of the neighbours are out working. | | | |
| | 3. Provide appropriate PPE to workers | | | |
| | 4. Co-ordinate with relevant agencies and neighbouring communities regarding all demolition activities | | | |
| 2. Abatement of air pollution | | | | |
| Generation of dust | 1. Watering all active demolition areas as and when necessary to lay dust. | KETRACO and Contractor | Continuous | 0 |
| | 2. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard. | | | |
| | 3. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites. | | One-off | 10,000 |
| | 4. Provide appropriate PPE to all workers | | Continuous | Dust coats and dust masks @ 3000 per employee |
| Generation of exhaust emission | 1. Vehicle idling time shall be minimised | KETRACO and Contractor | Continuous | 0 |
| | 2. Regular servicing of engines and machine parts to reduce exhaust emission generation | | | |
| 3. Waste management | | | | |
| Demolition waste | 1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1.Source reduction 2.Reusing 3. Recycling 4.Incineration 5. Sanitary land filling. | KETRACO and Contractor | Continuous | 0 |

| Expected Negative Impacts | Recommended Mitigation Measures | Responsible Party | Time Frame | Cost (Ksh) |
|---|---|------------------------------|------------|------------------------------|
| | 2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site | KETRACO and Contractor | One-off | 0 |
| | 8. Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws. | KETRACO and Contractor | Continuous | Cost borne by the contractor |
| 4. Oil spills | | | | |
| Oil spills Hazards | 1. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of demolition facility and vehicles. | KETRACO and Contractor | Continuous | 0 |
| | 2. In case of an oil spill, immediate clean up measures will be instituted | | | |
| | 3. Close surveillance of the fuel and cooling oil store | | | |
| 5. Impacts on workers' and community health and safety | | | | |
| Health and Safety for workers' and community members | 1. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007 | KETRACO DOHSS and Contractor | Continuous | To be determined |
| | 2. Prohibit access by unauthorized personnel into the demolition site | | | |
| | 3. Place warning signs where necessary | | | |
| 6. Rehabilitation of project site | | | | |
| Vegetation disturbance | 1. Implement an appropriate re-vegetation programme to restore the site to its original status | KETRACO and community | One-off | 100,000 |
| | 2. Consider use of indigenous plant species in re-vegetation | | | |
| | 3. Trees should be planted at suitable locations so as to interrupt sight lines (screen planting), between the adjacent residential area and the development. | | | |

CHAPTER 8: ENVIRONMENTAL MONITORING PLAN (EMoP)

Environmental and Social monitoring is envisioned as an important process in project management. The monitoring programme will reveal changes and trends brought about by the presence and operations of the project. Such information will be useful in the formulation of sustainable project management and operation strategies.

Monitoring systems will be set up by the Proponent during operational phase, so that potentially environmentally problematic areas can be detected well in advance and the appropriate remedial action taken. The Proponent will have a checklist of items that need to be monitored as a matter of routine or periodically over agreed intervals, depending on the nature of the aspect to be monitored. The types of parameters that can be monitored may include proposed mitigation measures or design features, or actual impacts. Depending on the nature of impact or aspect to be monitored, monitoring can be done as part of routine or periodic maintenance. However, socio-economic and ecological parameters can be effectively assessed over a longer time span.

The basic activities for a sound-monitoring programme for the transmission line once it starts operating should at least include the following parameters:

- Collection and analysis of relevant environmental and social data of the site including:
 - Evaluation of the type and quantity of solid waste generated at the construction site
 - Inspection of the materials being used
 - Evaluation of the construction practices

The key parameters to be measured during the project life cycle are presented in table 8.1.

Table 8.1: Environmental Monitoring Plan for the proposed Project

| Monitoring scope | Frequency | | | Methodology | Responsible entity |
|--------------------------------|---|----------------|---|---|------------------------|
| | Construction | Implementation | Decommissioning | | |
| 1. Noise and vibration impacts | Daily observation; monthly noise level analysis | Monthly | Daily observation; monthly noise level analysis | Noise level analysis; quarterly reports on log of vehicle and machine servicing; trees planted; number of (noise) licences given; PPE provided; and sensitization meetings held | KETRACO and Contractor |

| Monitoring scope | Frequency | | | Methodology | Responsible entity |
|--|--|------------------------------|--|--|------------------------|
| | Construction | Implementation | Decommissioning | | |
| 2. Impacts on air pollution | Daily dust observation; monthly air quality analysis | Monthly air quality analysis | Daily dust observation; monthly air quality analysis | Daily dust observation; quarterly air sampling and lab analysis; quarterly reports on PPE provided; log of vehicle and machine servicing; sensitization meetings held; frequency of sprinkling water | KETRACO and Contractor |
| 3. Solid and liquid waste generation | Monthly | Monthly | Monthly | Reports on waste management plans developed; amounts of waste generated; facility provided for handling and storage of waste; methods employed for waste disposal; training meetings held, Waste water quality analysis; Reports on liquid waste management plans developed; number of inspections held to identify leaking or blocked pipes | KETRACO and Contractor |
| 4. Oil spills | Daily | Monthly | Daily | Reports of oil trapping equipment installed; number of oil spill incidents and corrective measures taken | KETRACO and Contractor |
| 5. Destruction of existing vegetation and habitats | Daily | | | Reports on site zoning program; community initiatives held on tree planting; landscaping programme on re-vegetation implemented | KETRACO and Contractor |
| 6. Avifauna mortalities | | Quarterly | | Reports on wire marking and raptor platforms build; incidents of bird strikes | KETRACO and Contractor |

| Monitoring scope | Frequency | | | Methodology | Responsible entity |
|------------------------------------|--------------|----------------|-----------------|---|------------------------|
| | Construction | Implementation | Decommissioning | | |
| 7. Demand for material consumption | Monthly | Monthly | | Quarterly reports on water use audit; amount of water harnessed from rain or any other source outside of the regular water supply at the site; number of sensitization meetings held; water conservation storage erected; conservation water taps installed, Reports of raw material audits; sources of the raw materials; damaged material, Reports on energy audits held; number of installed energy conservation bulbs; reduction of amount of fuel used | KETRACO and Contractor |
| 8. Health and Safety issues | Daily | Monthly | Daily | Quarterly reports on health and safety plans; SHE training programs; records of any incident, accident; investigation and corrective actions; PPE provided; progress of perimeter wall construction; warnings posted; | KETRACO and Contractor |
| 9. Soil erosion | Daily | | | Reports on storm water management and soil erosion control plans developed; amounts of run-off and roof water harvested; water harvesting and storage facilities installed | KETRACO and Contractor |
| 10. Fire outbreaks | Monthly | Monthly | | Reports on fire risk assessment held; compliance with OSHA 2007; trainings held; | KETRACO and Contractor |
| 11. Visual and aesthetic impacts | Quarterly | | | Reports on public consultation held; landscaping programme designed and implemented | KETRACO and Contractor |

| Monitoring scope | Frequency | | | Methodology | Responsible entity |
|--|--------------|----------------|-----------------|--|------------------------|
| | Construction | Implementation | Decommissioning | | |
| 12. Electrocutation incidences | | Quarterly | | Reports on maintenance system developed; electrocution accidents occurrence and corrective measures taken; visitors and employees access to the substation log; progress on construction of the perimeter wall; warning signs posted; sensitization workshops held | KETRACO and Contractor |
| 13. Perceived danger of Electrostatic and Magnetic force | | Quarterly | | Reports on education and awareness campaigns held | KETRACO and Contractor |
| 14. Increase in social vices | Monthly | Monthly | | Reports on sensitization forums held; sessions held on guidance and counselling on HIV/AIDS and other STDs; number of condoms issued | KETRACO and Contractor |
| 15. Rehabilitation of project site | | | Monthly | Reports on re-vegetation programme developed and implemented; number and species of trees planted | KETRACO and Contractor |

CHAPTER 9: RECOMMENDATIONS AND CONCLUSION

9.1 INTRODUCTION

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

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed transmission line will bring positive effects in the project area including improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, Informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that all identified potential negative impacts can be mitigated and that no community objection was received, the project may be allowed to proceed.

9.2 Recommendations

Following the impact analysis presented in the previous sections, the following recommendations were made

- The proposed project to be implemented in compliance with the relevant legislation and planning requirements

- The proponent to ensure implementation of the mitigation measures provided in the EMP
- The proponent to monitor implementation of the EMP using the developed EMoP
- The proponent to conduct annual Environmental Audits and submit to NEMA
- NEMA to consider, approve and grant an Environmental Impact Assessment License to the proponent

9.3 Conclusion

From the foregoing, it is noted that;

- All identified negative impacts can be mitigated
- No objection from the community was received
- Benefits to the community, region, and the country at large are immense

The ESIA team, therefore, recommends to NEMA to consider, approve and grant an Environmental Impact Assessment License to the proponent and the proponent to implement the project with strict adherence to the proposed ESMP

REFERENCES

ACTS-UNEP, 2001. The Making of a framework Environmental Law in Kenya. Acts press, Nairobi, Kenya.

Geotermica Italiana Srl., (1987): Geothermal reconnaissance survey in the Menengai-Bogoria area of the Kenya Rift Valley. UN (DTCD)/ GOK

Kenya Gazette Supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government Printer, Nairobi

Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi

Kenya gazette supplement number Environmental Management and Coordination (Emissions Control) Regulations, 2006 Government printer, Nairobi

Kenya gazette supplement Environmental Management and Coordination (Water Quality) Regulations, 2006

Kenya gazette supplement Environmental Management and Coordination (Waste Management) Regulations, 2006

Kenya gazette supplement Environmental Management and Coordination (Excessive Noise and Vibration Control) Regulations, 2009

Kenya gazette supplement, Special Issue 51, Legal Notice number 19; Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009 Government printer, Nairobi

Kenya Gazette Supplement Acts Building Code 2000 Government Printer, Nairobi

Kenya Gazette Supplement Acts Land Planning Act (Cap. 303) Government Printer, Nairobi

Kenya Gazette Supplement Acts Local Authority Act (Cap. 265) Government Printer

Kenya Gazette Supplement Acts Penal Code Act (Cap. 63) Government Printer, Nairobi

Kenya Gazette Supplement Acts Physical Planning Act, 1999 Government Printer, Nairobi

Kenya Gazette Supplement Acts Public Health Act (Cap. 242) Government Printer, Nairobi.

The World Bank Safeguard Policies

Republic of Kenya, (2009): Nakuru district Development Plan 2008 – 2012, Government Printer, Nairobi.

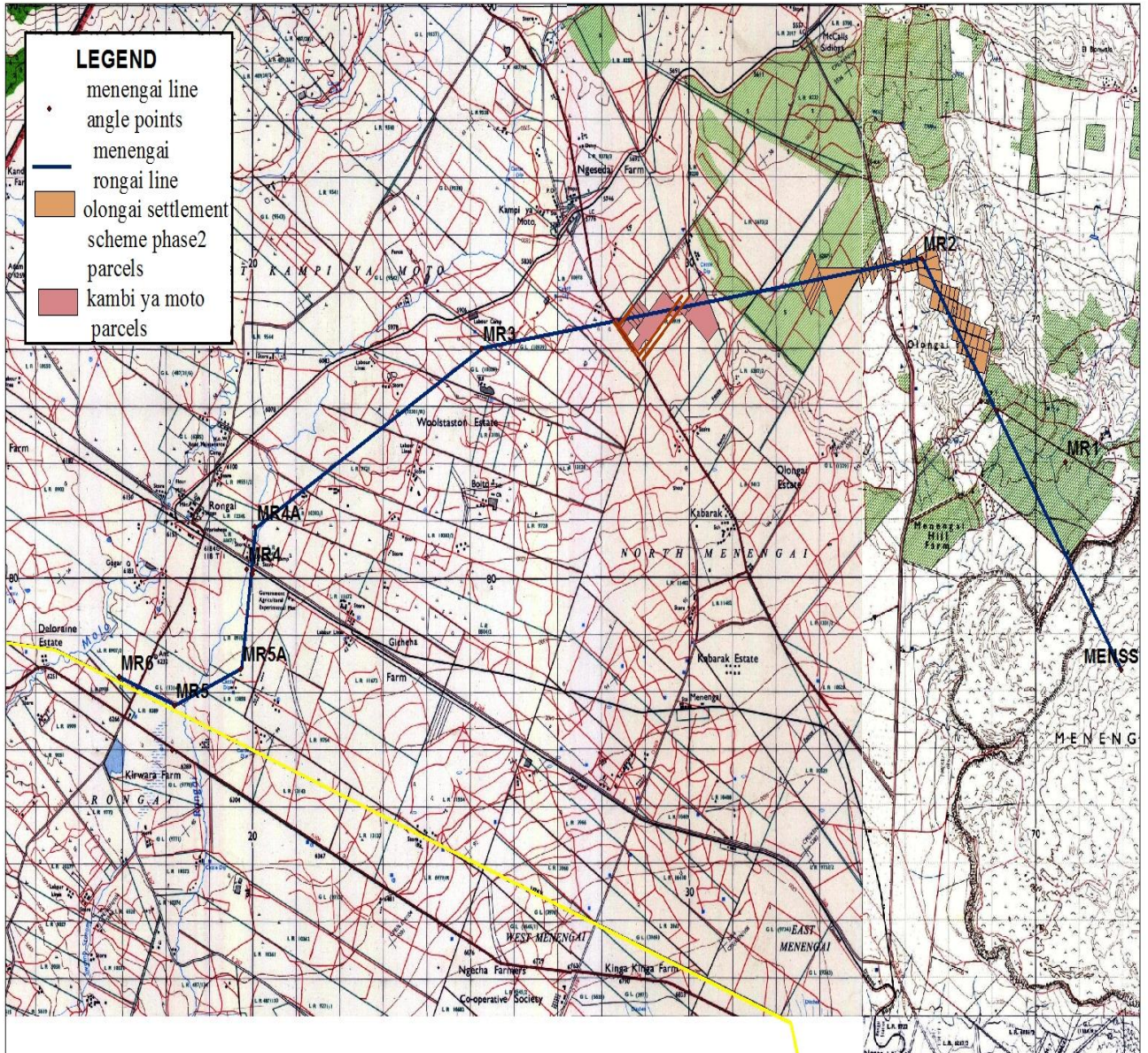
World Bank. 1991. Environmental Assessment Sourcebook. Volume I. Policies, Procedures and Cross-Sectoral Issues. *Environment Department*. Technical Paper No. 139.

World Bank. 1991. Environmental Assessment Sourcebook. Volume III. Guidelines for Environmental Assessment of Energy and Industry Projects. *Environment Department*. Technical Paper No.154.

APPENDICES

APPENDIX I

Map of the Proposed Transmission Line



APPENDIX II

Filled Public Consultation Forms (Key Informants)

APPENDIX III

Filled Public Consultation Forms (Community Members)

APPENDIX IV

Public Baraza Attendance Sheet