The Kenya Power & Lighting Company Limited.

GIBB Africa
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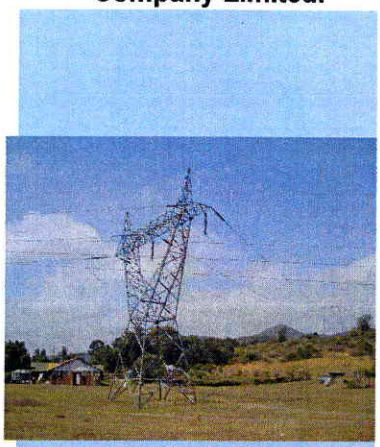

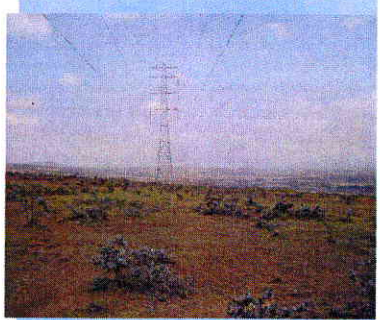

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROPOSED KISUMU-LESSOS-OLKARIA TRANSMISSION LINE UPGRADING PROJECT

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT STUDY REPORT VOLUME I

FINAL REPORT

22 DECEMBER 2009

CLIENT CERTIFICATION PAGE

I certify that this Environmental and Social Impact Assessment (ESIA) Study Report was conducted under my direction and supervision; that all reasonable skill, care and due diligence was observed; that I have reviewed and approved the report, and that the assessments, methodology and content conform to the requirements of the Kenya Environmental Management and Coordination Act, 1999.

I hereby certify that the particulars given in this report are correct and true to the best of my knowledge.

Signature ..... Date .....

Name .....

Designation .....

Address .....

Telephone .....

Official Stamp .....

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT
PROPOSED KISUMU-LESSOS-OLKARIA
TRANSMISSION LINE PROJECT

CONTENTS

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LIST OF ACRONYMS

AEWA	Africa-Eurasia Migratory Water Bird Agreement
AEZ	Agro Ecological Zone
asl	above sea level
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Conservation of Migratory Species; Catchment Management Strategy
CSR	Corporate Social Responsibility
dbA	decibels (in A scale)
DDP	District Development Plan
DOHSS	Directorate of Occupational Health & Safety Services
EAC	East African Community
EIA	Environmental Impact Assessment
EMCA	Environmental Management & Coordination Act
EMFs	Electric & Magnetic Fields
EMP	Environmental Management Plan
EPC	Engineering, Procurement, Construction
ERC	Energy Regulatory Commission
ESIA	Environmental & Social Impact Assessment
FGD	Focus Group Discussions
GWh	GigaWatt hour
ha	Hectare
HV	High voltage
IBA	Important Bird Area
ICNIRP	International Commission on Non-ionising Radiation Protection
IEEE	Institute of Electrical & Electronics Engineers
IFC	International Finance Corporation
IPP	Independent Power Producer
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KCAA	Kenya Civil Aviation Authority
KFS	Kenya Forest Services
KIFCON	Kenya Indigenous Forest Conservation (Program)
Km	Kilometre
kV	Kilo Volts
KPLC	Kenya Power & Lighting Company
KWS	Kenya Wildlife Services
LH	Lower Highlands
LM	Lower Midland
MAB	Man & Biosphere
MEA	Multilateral Environmental Agreements
MEMR	Ministry of Environment & Mineral Resources
MSDS	Material Safety Data Sheets
MVA	Megavolt Amperes
NEC	National Environmental Council
NEMA	National Environment Management Authority
NGO	Non-governmental organisation
NMK	National Museums of Kenya
NTFPs	Non-timber Forest Products
ODA	Official Development Assistance
OP	Operational Policy
OSHA	Occupational Safety & Health Act
PAPs	Project Affected Persons
PCB	Polychlorinated Biphenyls
PCDP	Public Consultation & Disclosure Plan
PID	Public Information Document
PM	Project Manager

RAP	Resettlement Action Plan
RfP	Request for Proposals
RoW	Right-of-Way
SERC	Standards & Enforcement Review Committee
SF6	Sulfur Hexafloride
SCMP	Sub-Catchment Management Plans
SHE	Safety, Health & Environment
STDs	Sexually Transmitted Diseases
TA	Tropical Alpine
ToRs	Terms of Reference
TSCs	Timed Species Counts
UETCL	Uganda Electricity Transmission Company
UH	Upper Highlands
UM	Upper Midland
UNESCO	United Nations Education, Scientific and Cultural Organisation
URTI	Upper Respiratory Tract Infections
WRUA	Water Resources User Associations
USD	United States Dollar
VCP	Variable Circular Plot
WB	World Bank
WHO	World Health Organisation
WMP	Waste Management Plan

EXECUTIVE SUMMARY

1. Introduction

Currently Kenya suffers from an unreliable and unstable power grid infrastructure that is unable to keep pace with a demand for electricity growing at 4.9% annually. Power outages are a common occurrence.

GIBB is registered with the National Environmental Management Authority (NEMA) as a firm of experts to undertake Environmental Impact Assessments & Environmental Audits pursuant to Regulation 14 of the EIA Regulations. GIBB is therefore qualified and authorised to undertake the environmental assessment. A copy of the GIBB Registration Certificate and Practising License are included in Appendix 1 of this report.

According to the Act an Environmental Impact Assessment (EIA) study shall be conducted in accordance with the general EIA Regulations dated June 2003. The aim of the exercise is to comply with statutory requirements.

Background

The proposed transmission line project is expected to be funded by the Japan International Cooperation Agency (JICA). JICA has consequently selected a consultant (Nippon Koei/ICNet/Tokyo Electric Power Services) who will be undertaking preliminary survey for Kisumu-Lessos-Olkaria Transmission line upgrading project.

To ensure that the above project is implemented in an environmentally and socially sustainable manner, KPLC engaged the services of GIBB Africa Ltd. to conduct an Environmental and Social Impact Assessment (ESIA) for the proposed project.

Project Justification

According to the Least Cost Power Development Plan, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150 MW.The national economic growths has also been on the upward trend - rising from 1.8 % in 2003 to 5.8 % in 2005. Significant effects of this growth are notable in agriculture, tourism and construction among others with a corresponding increase in power generation that rose from 4,852 GWh in 2003 (with sales of 3,801 GWh) to 5,195 GWh in 2004 (sales of 4,090 GWh). Maximum energy demand was projected at 5,641 GWh in 2006 and 24,957 GWh by year 2026.

The above overview is a strong justification for the proposed Olkaria-Lessos-Kisumu new 220 kV transmission line project. However, environmental and social implications as outlined under this Scoping report would be studied in greater detail under a full environmental and social impact assessment, and integrated in the project design.

Project Description

The Olkaria-Lessos line is a 220kV double-circuit line expected to pass adjacent to the existing transmission line, while the Kisumu-Lessos line is also a 220kV double circuit which provides an alternate path from Lessos-Muhoroni-Kisumu to supply Kisumu area. The length of the targeted transmission lines is approximately 255Km, with approximately 170Km between Olkaria and Lessos, and 85Km between Lessos and Kisumu. The new transmission line requires a Right-of-Way (RoW) of 40m, also called the wayleave or trace. The existing substations at Olkaria, Lessos and Kisumu will be expanded to cater for the proposed line. The new transmission line is expected to improve reliability.

Objectives of the ESIA Study

The Environmental and Social Impact Assessment (ESIA) aims to achieve the following objectives:

- To identify and assess the potential environmental and social impacts of the proposed project;
- To identify and recommend measures for mitigation of potential adverse impacts;
- To verify compliance with the environmental regulations and industry standards;
- To generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle;
- To recommend cost effective measures to be implemented to mitigate against expected measures; and
- To prepare an environmental and social impact assessment report compliant with the Environmental Management and Coordination Act 1999 and detailing findings and recommendations.

Previous Studies

The Feasibility Study and Preliminary Environmental Impact Assessment for the Olkaria-Lessos-Kisumu Transmission Line was carried out in April 2003 by ETC East Africa Ltd. Included in the study was a review of the environmental policy, institutional and legal framework in Kenya, a description of the project, a description of the existing environment of the project area, an analysis of environmental impacts and alternatives, and a mitigation plan.

The scoping study for the transmission lines was carried out by KPLC at desk level as well as through a field study from 9 June 2009 to define the scope and structure of the study. The field study for the scoping exercise was conducted on 22-24 June, 5 July, 17-19 July and 21 July 2009.

The Scoping Study was submitted to the National Environment Management Authority (NEMA) and included presentation of Terms of Reference (ToRs) for approval, as per the requirements of the Kenyan EIA/EA Regulations. The ToRs were approved by NEMA on 31 July 2009.

Methodology

The Environmental and Social Impact Assessment (ESIA) was based on document review, field assessments, and discussions with project proponents.

The field assessments included the following:

- Baseline environmental and socio-economic survey;
- Ecological survey;
- Landscape survey;
- Socio-economic survey;
- Public consultations and meetings.

2. Legal and Regulatory Framework

Kenya has over 77 statutes which relate to environmental concerns. Most of these statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health; soil erosion; air quality, etc.

Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licences and sectoral laws. For example there are provisions in the Occupational Safety and Health Act, Local Government Act and the Food Drugs and Chemical Substances Act on handling of wastes and hazardous wastes in the environment. There was however need for stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management

and Coordination Act in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

Laws of particular concern to this project are:

- The Environmental Management and Coordination Act (EMCA), 1999;
- Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101;
- Environmental Management and Coordination (Waste Management) Regulations (2006);
- Environmental Management and Coordination (Water Quality) Regulations (2006);
- Environmental Management and Coordination, Conservation of Biological Diversity (BD) Regulations (2006);
- Environmental Management and Coordination (Fossil Fuel Emission Control) Regulations (2006);
- The Wildlife (Conservation and Management) Act (1989);
- The Wildlife (Conservation and Management) Policy (2004);
- The Forest Act (2005);
- The Energy Act (2006);
- Employment Act (2007); and
- The Occupational Safety and Health Act (2007).

JBIC Guidelines

JBIC establishes and makes public the above guidelines with the objective of contributing to efforts by the international community, particularly developing regions, towards sustainable development, through consideration of the environmental and social aspects in all projects subject to lending or other financial operations. Environmental and social considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous people. The proposed transmission line falls under Category A.

World Bank Policies

The following World Bank Policies apply to the proposed transmission line project:

- Environmental Assessment (OP 4.01);
- Natural Habitats (OP 4.04);
- Indigenous Peoples (OP 4.10);
- Physical Cultural Resources (OP 4.11);
- Involuntary Resettlement (OP 4.12); and
- Forests (OP 4.36).

3. Description of the Project Environment

The proposed project traverses approximately eleven Districts, with a variety of environmental settings. The general topography of the area is quite varied, with two major physical environments being traversed by the project: the Rift Valley and Lake Victoria basins. The regions are also associated with high plant and animal diversity, as well as sensitive ecosystems and endangered plant and animal species.

Climate/ Meterology

Climatic features in the project areas, especially the temperatures and rainfall are closely related to altitude changes and with variations induced by local topography. Variations in temperature in the project area mainly depend on the altitude of the location. The rainfall in the project area is mainly determined by the altitude and the prevailing winds. Generally the floor of the Rift Valley in Nakuru District has lower rainfall than the flanking highlands.

Geology

The geology of the project area is complex and consists of several geological formations. In most of the floor of the Rift Valley, the common rocks are basically Quarternary deposits mainly the pyroclastic rocks, which consist of tuffs and ashes.

As one climbs the escarpment, the entire area in Molo and the vicinity (stretching from Njoro through Molo, Mau Summit to Londiani and covering a large extent of the Mau Escarpment) is covered by volcanic rocks ranging in age from Tertiary to Recent and lacustrine and fluviatile sediments derived from them. The bulk of rocks form a succession of pyroclastics, apparently derived from several different sources. Lava flows are less common. The major rocks are phonolites, basalts, trachytes and variable pyroclastics.

Kisumu District mainly consists of rocks and sediments ranging from Nyanzian (Precambrian) to recent times. On the plains, the alluvial deposits and the lacustrine sediments cover the lacustrine and alluvial area of Quaternary sediments lying on the floor of the Kavirondo Rift Valley. To the east, the Kano Plains merge with the volcanic area of Tinderit Hills while to the north are the scarps of the Nandi Hills.
In conformity with the geology of the area, the soils are also of great variety. They range from the soils developed on the mountains to those developed in the plains, especially on the Rift Valley floor.

Soils

Soils developed on lacustrine plains are found in Kisumu District around Lake Victoria and especially on the upper level of Kano Plains. Flood plains in the project area are found in the Kano Plains of Kisumu District where pockets of eutric Fluvisols are found. These are a complex of well drained to imperfectly drained, very deep, very dark grayish brown to dark reddish brown, stratified soils of varying consistence and texture.

Soils on lower middle level uplands are soils that cover extensive areas to the west as you climb the Mau Escarpment in Nakuru District including areas such as Njoro, Elburgon and Molo. They are developed on ashes and other pyroclastic rocks from recent volcanoes. The soils are well drained, deep to very deep, dark reddish brown, friable and smeary, silty clay to clay with humic topsoil. The characteristic soils are mollic Andosols.

Hydrology

The project area falls under two drainage systems, the Rift Valley (which covers 22.5% of Kenya) and the Lake Victoria (provides 8% of the country's needs) drainage basins.

Topography

The general topography of the area is quite varied. There are four major topographical features associated with the study area. They include the Rift Valley floor, the Mau Escarpment, the Nandi Hills and Escarpment, and the Kano Plains.

Flora

The natural vegetation of the project area has been substantially disturbed by human activities. Natural vegetation is only found in the protected forest reserves and the national parks. Most of the land in the project area is used for human settlement, urban development, small and large arable farming, ranching, floriculture and other land uses. What has remained of the natural vegetation is basically a mosaic of various vegetation types interspersed with human settlement and farmlands. Most prominent remnants of vegetation in the project area are forests, woodlands, bush lands and wetlands.

The Mau Complex forests are located on the western side of the Rift Valley. They span north-south from Eldama Ravine to Narok and east-west from Nakuru to Kericho. They form the largest closed-canopy forest ecosystem of Kenya. Before the disputed 2001 excisions, the

Mau Complex forests covered some 420,851 hectares, an area as large as the forests of Mt. Kenya and the Aberdares.

Within the Lake Victoria region, not much information is recorded for this area, except for the adjacent Nandi Escarpment, which has some recordings of rare species, and interesting vegetation. This area is a mid-elevation forest lying not far from Kakamega forest an Important Bird Area (IBA). Rainfall is high, 1,600-1,900 mm/year depending on altitude. Sensitive habitats in this area include South Nandi Forest, as well as Kimondi and Sirua rivers, all which drain into the river Yala, a major catchment of L Victoria. Biogeographically, South Nandi is often considered an eastern extension of Kakamega. In effect, South Nandi is transitional between the lowland forests of West and Central Africa (the easternmost outlier of which is Kakamega) and the montane forests of the Central Kenya highlands.

Fauna

Wildlife near the project area is generally quite low due to human influence. However in the protected areas and in areas where the land use ranching is compatible with wildlife, wildlife is present in significant numbers. Most of the wildlife near the project area is found in the Hells Gate National Park, Lake Naivasha area, Lake Elementeita, Soysambu Wildlife Sanctuary, Lake Nakuru National Park, Koibatek Forest Reserve and Mau Forest Reserve.

Additionally, the Great Rift Valley Lakes serve as important waterfowl habitats, with Lake Nakuru having the largest number of waterbirds. Lake Elementaita is the breeding area of the Great White Pelican in East Africa. There is documented evidence on the constatnt migration of waterfowl between the Great Rift Valley lakes.

Land Use

The natural potential of the land covered by the project area has been described by Jaetzold and Schmidt (1983). Land use in this region depends mainly on the altitude above sea level and the amount of rainfall received in various locations, among other minor factors. The area falls under five major Agro-ecological Zones (AEZs), including Tropical alpine (TA), Upper Highlands (UH), Lower Highlands (LH), Upper Midland (UM), and Lower Midland (LM). Based on the above classification, the most prominent land use categories of the project area are forest, tea, wheat/barley, coffee/maize, cotton, sugar cane and ranching zones.

Overview of socio-economic characteristics of land owners/residents – Preliminary survey results

A minor survey of the socio-economic characteristics of land owners/residents found withinthe project area was carried out, based on a survey questionnaire provided by the JICA Study Tea. The following key features were surveyed: basic profile of PAPs (landowners and residents); land likely to be lost/affected; household budget; accessibilities; perception of the project; and impacts.

Areas of Conservation Interest

Areas of conservation interest near the project area are associated with sites of scenic beauty, the lakes situated on the Rift Valley Floor and the forest reserves associated with the Mau Escarpment. Areas of scenic beauty in this region are mainly protected in the Olkaria/ Hell's Gate, Nakuru and Longonot National Parks. These areas also contain significant wildlife populations.

Tourist attractions in Kisumu district are listed as Ndere Island, Lake Victoria, Impala Sanctuary, Kit Mikaye, and National Museum.

However, there are no known archaeological sites that the transmission line will pass through.

4. Project Description and Justification

The principal objective of the project is to construct a 220kV transmission line necessary to improve reliability and serve the increasing load through the year 2022. Specific objectives of the proposed project include the following:

- Design and construction of a power transmission line as per specifications provided by the electricity generation regulatory authorities (ERC, KPLC, Ministry of Energy, etc);
- Observe sustainability through complying with all local laws, among them those dealing with environmental protection; and
- Upon completion of construction of the line, hand it to KPLC for operation and maintenance.

Existing substations

The following existing substations will form part of the proposed project:

- Olkaria;
- Lessos;
- Mamboleo (Kisumu).

Additional bays will be set up to accommodate the proposed line in each of the above substations, and in some cases, such as Lessos, additional land, up to 50 acres, acquired to cater for the proposed substation expansion.

Engineering, Procurement and Construction

An engineering, procurement and construction (EPC) contractor has not been selected yet for this project. Nonetheless, the EPC activities are generally divided into the following separate components:

- Engineering
- Procurement, Manufacturing and Transport; and
- Construction.

The first component involves the design and specification of all transmission line components, with the next task involving the actual procurement of these components, and the logistics of transportation. The construction component will involve the tasks of site survey, route clearance and access, civil works (i.e. construction of foundations), tower erection, conductor stringing and inspection testing, commissioning, operational acceptance and handover. The timing and schedule of the overall program will be confirmed following selection of the EPC Contractor.

It is not at present known the exact number of staff required for construction of the transmission line. Nonetheless, Project Managers, Supervisors and numerous semi-skilled and unskilled workers (recruited locally) will be required. There will be separate erection crews, and semi-skilled and unskilled workers will be trained by supervisors prior to commencement of construction. Local people will be recruited as unskilled labourers from the villages traversed by the transmission line, where possible.

Commissioning

Various tests will be undertaken to ensure that the transmission line performs as per specification. During testing, line ground clearances will be thoroughly checked. Once construction of the transmission line is completed, the soil along the right-of-way will be assessed for problems such as erosion or compaction and corrective action will be taken, as appropriate. Areas of bare soil will be seeded with native cover crops to stabilise the soil, reduce erosion and prevent invasion by undesirable plant species.

Once all circuits have been connected, 'dry' testing will begin. This testing entails confirmation that all connections have been made according to the wiring diagrams. Voltage is then applied

to individual circuits to check for correct performance of circuit breakers and correct setting of relays. 'Wet' testing will involve energising the complete system and a final test, prior to full commissioning.

Operation

Once the transmission lines are constructed there is relatively little ongoing maintenance required. The key activities involve surveillance of the condition of the transmission line and wayleave; emergency maintenance and repairs; and vegetation control.

Decommissioning

It is anticipated that the transmission line will be continuously maintained and repaired, and will be operated for several decades. Because of their long useable life, the circumstances under which they might ultimately be decommissioned are difficult to foresee.

Provisional Project Cost

The provisional project cost is estimated at approximately **USD 99.5 million.**

The proposed transmission line is expected to be commissioned from April 2013. This is considered suitable because construction at Olkaria II in Naivasha as well as erection of the transmission line is anticipated to be complete by then, hence completing the interconnection.

The area of immediate impact will be the transmission line corridor Right-of-Way (ROW) of 40m width by 255 Km from Olkaria to Kisumu. Tower foundations along the entire line will require a permanent area of approximately 6-8m by 6-8m (36-64m^2) based on a typical 220kV line tower, and the land for the tower shall be acquired by the project proponent. Along the corridor, appropriate clearance between conductors and vegetation/structures needs to be maintained for the entire life of the transmission line. However, farming and grazing within the corridor is generally permitted.

5. Analysis of Alternatives

Three possible options are available for the proposed transmission line as follows:

- Alternative 1 whereby the new transmission line would follow the existing one for most parts;
- Alternative 2 where the new transmission line would create a completely new path;
- Alternative 3, based on utilising the system as it is without undertaking any new works (do nothing).

Based on the above impact analysis, it is proposed that a new transmission line be established to cater for the increased energy demands in Kenya. The no-action option (Alternative 3) is not feasible. Additionally, it is proposed that Alternative 1 be selected, that will involve establishing a new transmission line along the existing one on most sections of the route, and avoids proximity to sensitive ecosystems such as Lake Nakuru National Park. The heavy investment anticipated due to higher settlement that requires compensation and resettlement,disturbance of the Ogiek community, as well as ecological destruction of the Mau Forest Complex and numerous river crossings (77), makes Alternative 2 not a viable option at this time.

An additional alternative includes further modification within Alternative 1 to cater for the bird migratory routes and airstrips within the Elementaita area, through maintaining of the proposed transmission line route with the existing one, or underground construction in this section.

6. Public Consultation

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans.

The initial public consultations took place between 13 August 2009 and 15 September 2009 (79 people), the second round of public consultations between 28 September 2009 and 4 October 2009 (495 people), and the third round between 26 and 31 October 2009 (435 people).

Issues Arising

- Need for comprehensive public consultations;
- Community sensitization prior to project commencement;
- Avoid cumulative impact of wayleaves on same people;
- Handle resettlement issues sensitively;
- Consideration of social cost when resettlement is inevitable;
- Mandatory and fair compensation for property and trees to PAPs;
- Consideration of vulnerable groups during compensation and resettlement;
- Loss of sensitive ecological habitats;
- Bird migratory routes in Elementaita area;
- Existing airstrips in Elementaita area;
- Effect of transmission lines on sensitive habitats such as Lakes Naivasha, Nakuru, Elementaita, National Parks, and animal sanctuaries/conservancies;
- Consider risk of landslides at Maji Mazuri, as experienced 3-4 years ago;
- Transparent wayleave acquisition procedure;
- Lessos – specific proposals for compensation and resettlement packages by the local community received.

A key theme from the above public consultations is the need for inclusion of the Project Affected Persons (PAPs) right from the start (sensitization), an open and fair compensation and resettlement process, as well as some Community Social Reponsibility (CSR). It is also expected that KPLC will employ labourers from the local community during the construction phase.

KPLC should therefore initiate, as soon as possible, mechanisms to include the affected communities along the proposed transmission line, whereby their concerns will be addressed, as well as the expectations of KPLC.

7. Assessment of Potential Impacts and Proposed Mitigation Measures

The following key project impacts were identified based on our assessment and comments received during public consultations:

- Visual and Aesthetic Impacts;
- Land take;
- Impacts on National Parks and Conservancies;
- Impacts on Forests;
- Impacts on Wetland Ecosystems;
- Impacts on Avifauna;
- Impacts on Aviation;
- Impacts on Archaeological, cultural and historical sites;
- Impacts on Public Health;
- Social Impacts;
- Occupational Health & Safety Impacts;
- Soil Erosion Impact from Vegetation Clearance;
- Impacts of Earth and other Construction Material Sourcing (eg. Quarrying);
- Hazardous Materials;
- Waste Management;
- Air and Dust Emissions;
- Noise;
- Impacts of Fuel and Chemical Storage on Site;

- Traffic Congestion/ Road Wear and Tear;
- Labour Force Management;
- Contractor Code of Conduct; and
- Environmental and Social Monitoring.

8. Environmental and Social Management (ESMP) and Monitoring (ESMoP) Plans

The Environmental and Social Management (ESMP) and Monitoring (ESMoP) Plans address specific concerns and mitigation measures encountered during the engineering, procurement and construction phases of the transmission line project.

To ensure that the negative environmental impacts can be controlled and mitigated effectively, a stringent and scientific management and monitoring plan has been prepared. The ESIA proposes to utilize existing structures with KPLC management, including Safety, Health & Environment (SHE) departments, and the KPLC Resettlement Unit (KRU), be responsible for ensuring that the overall environmental and social targets are achieved and that the environmental responsibilities and obligations of the ESIA are satisfied during the life of the transmission line project. The Project Manager shall conduct quarterly audits to ensure that the system for implementation of the ESMP and ESMoP is operating effectively.

9. Conclusion

GIBB recommends that KPLC adhere to all the proposed mitigation measures outlined in this Study, the various relevant guidelines and legislation governing resettlement and compensation, sensitive ecosystems, labour force management, public and worker health and safety, management of hazardous and contaminating material, management of waste.

1 INTRODUCTION

Currently Kenya suffers from an unreliable and unstable power grid infrastructure that is unable to keep pace with a demand for electricity growing at 4.9% annually (ETC, 2003). Power outages are a common occurrence.

With Kenya's gradual integration into an interconnected East African Pool, development priority has shifted from power generation projects to a renewed concentration on strengthening the overall stability and reliability of the country's internal transmission system network.

KPLCs most recent least cost expansion plan was developed in early 2001. This revised earlier forecasts (1999) and has placed greater emphasis on the transmission sub-sector, increasing voltages as well as the total distances of the required transmission upgrades.

1.1 Background

Kenya's Power Sector falls under the Ministry of Energy, which offers the general oversight and policy direction. Kenya Power and Lighting Company (KPLC) is responsible for electricity transmission, distribution and supply to customers. KPLC purchases bulk power through power purchase agreements with KenGen, Independent Power Producers (IPPs) and the Uganda Electricity Transmission Company (UETCL).

The transmission and distribution systems are owned and operated by KPLC. The transmission system consists of 1323Km of 220kV, 2035Km of 132kV transmission lines and 600Km of 66kV sub-transmission lines. The distribution system consists of 58Km of 40kV, 5973Km of 33kV and 15265Km of 11kV distribution lines. The corresponding substation transformer capacities are 2602MVA for 220/132/66/33kV and 1384MVA for 66/40/33/11kV distribution.

The proposed transmission line project is expected to be funded by the Japan International Cooperation Agency (JICA). JICA has consequently selected a consultant (Nippon Koei/ICNet/Tokyo Electric Power Services) who will be undertaking preliminary survey for Kisumu-Lessos-Olkaria Transmission line upgrading project.

To ensure that the above project is implemented in an environmentally and socially sustainable manner, KPLC engaged the services of GIBB Africa Ltd. to conduct an Environmental and Social Impact Assessment (ESIA) for the proposed project.

GIBB is registered with the National Environmental Management Authority (NEMA) as a firm of experts to undertake Environmental Impact Assessments & Environmental Audits pursuant to Regulation 14 of the EIA Regulations. GIBB is therefore qualified and authorised to undertake the environmental assessment. A copy of the GIBB Registration Certificate and Practising License are included in Appendix 1 of this report.

According to the Environmental Management & Coordination Act (1999) an EIA study shall be conducted in accordance with the general EIA Regulations dated June 2003. The aim of the exercise is to comply with statutory requirements, as well as JICA guidelines for confirmation of Environmental and Social Considerations.

This study details the potential positive and negative effects of the proposed development on the project environment, and includes the preparation of an ESIA Study Report, recommending appropriate environmental and social solutions to minimise any undesirable effects resulting from the construction of the Transmission Line.

1.2 Project Justification

According to the Least Cost Power Development Plan, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150 MW. The national economic growth has also been on the upward trend - rising from 1.8 % in 2003 to 5.8 % in 2005. Significant effects of this growth are notable in agriculture, tourism and construction among others with a corresponding increase in power generation that rose from 4,852 GWh in 2003 (with sales of 3,801 GWh) to 5,195 GWh in 2004 (sales of 4,090 GWh). Maximum energy demand was projected at 5,641 GWh in 2006 and 24,957 GWh by year 2026.

The current national distribution reaches only about 18% of the population with as low as 4% in the rural areas. Rural electrification programmes are among the targets of the Kenya Government's call for enhanced power generation and review of the distribution network. This would be approached from improvement and expansion of the transmission line network.

Power generated by KENGEN, Independent Power Producers (IPPs) and other smaller plants is also sold to KPLC in bulk under a Power Purchase Agreement for distribution. The current transmission capacity comprises of 1,323 Km of 220 kV and 2,085 Km of 132 kV main transmission lines and also about 632 Km of 66 kV sub – transmission lines. Most of the transmission lines are old and need to be upgraded so as to meet the required standards.

The above overview is a strong justification for the proposed Olkaria-Lessos-Kisumu new 220 kV transmission line project. However, environmental and social implications as outlined under this Scoping report would be studied in greater detail under a full environmental and social impact assessment, and integrated in the project design.

1.3 The Project

The proposed Olkaria-Lessos line is a 220kV double-circuit line expected to pass adjacent to the existing Jinja line in most places, while the Kisumu-Lessos line will also be a 220kV double circuit line which provides an alternate path from the existing Lessos-Muhoroni-Kisumu line to supply Kisumu area. The length of the targeted transmission lines is approximately 255Km, with approximately 178 – 213Km between Olkaria and Lessos, and approximately 77 - 103Km between Lessos and Kisumu, depending on the alternative selected.

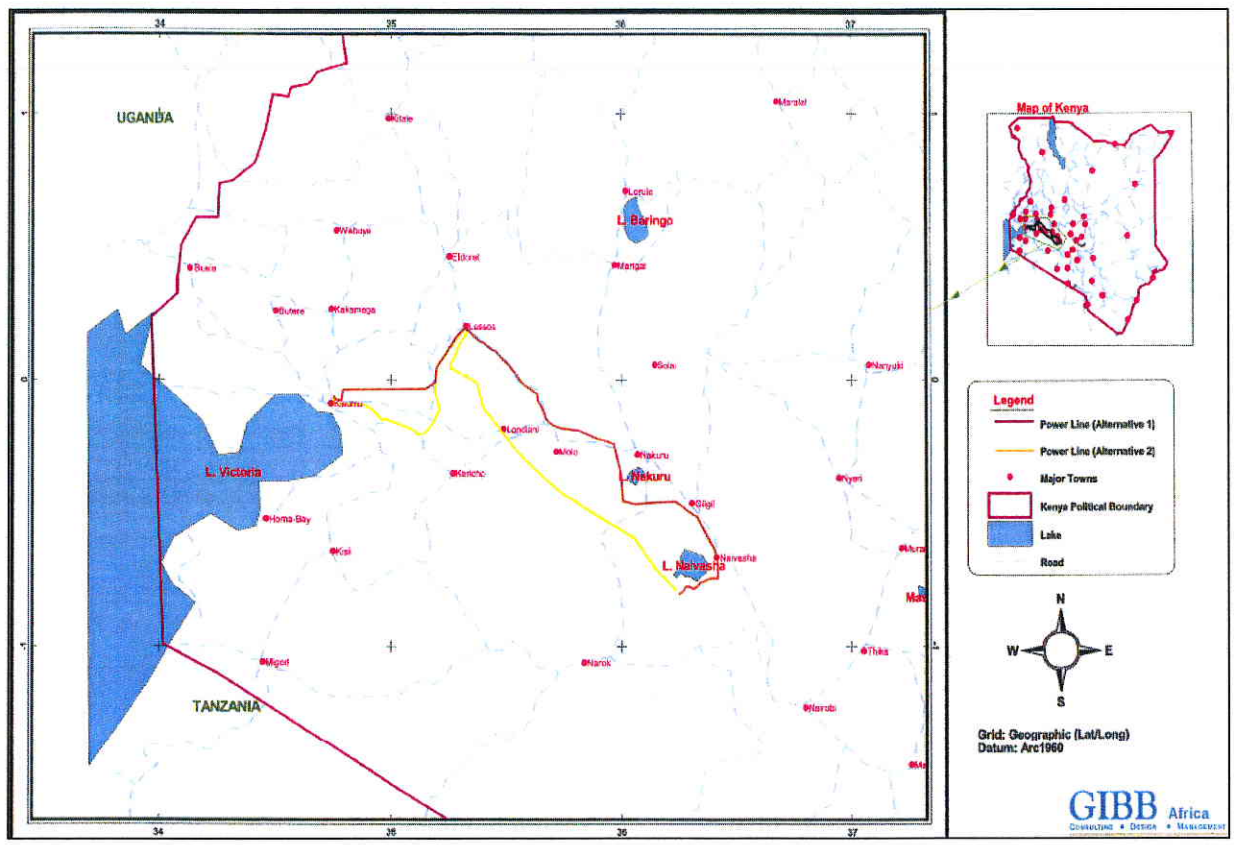
Alternative 1 of the proposed Olkaria-Lessos transmission line will in most sections follow the existing transmission line, except at the Elementaita area. Alternative 2 of the proposed Olkaria-Lessos transmission line, the shortcut route, will take off from Olkaria through Ndabibi, Eburru escarpment via the Mau forest, and into Lessos.

Alternative 1 of the proposed Lessos-Kisumu line, the shortcut line, will descend Nandi escarpment along the existing Muhoroni line, but separate at the foot of the escarpment, to run parallel to the foot of the escarpment, take a turn at Kibos village, and then approach the existing Mamboleo substation in Kisumu. Alternative 2 of the proposed Lessos-Kisumu line will be expected to follow the existing line.

The new transmission line requires a Right-of-Way (RoW) of 40m, also called the wayleave or trace. The existing substations at Olkaria, Lessos and Kisumu will be expanded to cater for the proposed line,. The new lines are expected to improve reliability.

Figure 1-1 below illustrates the line route of the proposed transmission line.

Figure 1-1: Proposed Transmission Line Route



1.4 Location

The project area traverses approximately eleven (11) Districts, namely Naivasha, Nakuru, Njoro, Molo, Rongai, Kipkelion, Uasin Gishu, Koibatek, Nandi, Nyando and Kisumu. Some of these districts, such as Naivasha, Njoro, Molo, and Rongai are relatively new, and will therefore be discussed under the larger district areas in this report.

1.5 Purpose of carrying out the ESIA

1.5.1 Justification for preparation of the ESIA Report

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out during the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction and operation stages. Electrical infrastructure, including transmission lines and electrical substations (Item 10) are developments listed under the Second Schedule of the Environmental Management and Coordination Act (EMCA, 1999). This ESIA is further conducted in accordance with Section 58 of EMCA, the Environmental (Impact Assessment and Audit) Regulations of June 2003 and JICA's guidelines for confirmation of Environmental and Social Considerations.

1.5.2 Objectives of the ESIA

The Environmental and Social Impact Assessment (ESIA) aims to achieve the following objectives:

- To identify and assess the potential environmental and social impacts of the proposed project;
- To identify and recommend measures for mitigation of potential adverse impacts;
- To verify compliance with the environmental regulations and industry standards;
- To generate baseline data for monitoring and evaluation of how well the mitigation measures will be implemented during the project cycle;
- To recommend cost effective measures to be implemented to mitigate against expected measures; and
- To prepare an environmental and social impact assessment report compliant with the Environmental Management and Coordination Act 1999 and detailing findings and recommendations.

The study details the positive and negative effects of the development on the project environment and recommends appropriate environmental and social measures to minimise any undesirable effects resulting from the upgrading of the Transmission Line.

1.5.3 Summary of Terms of Reference for the Study

A Request for Proposals (RfP) was made by KPLC in June 2009 for an ESIA of the Kisumu-Lessos-Olkaria transmission line upgrading project. GIBB Africa was awarded the tender on 3 August 2009 (letter of award included in Appendix 2 of this report). Below are the Terms of Reference outlined in the RfP:

- Description of the baseline environment (physical, biological, social and cultural);
- Detailed description of the proposed project;
- Legislative and regulatory framework;
- Identify potential environmental impacts that could result from the project;
- Occupational safety and health concersn;
- Carry out public participation and consultations on the positive and negative impacts of the project;
- Propose mitigation measures to the identified environmental and social impacts;
- Development of an Environmental Management Plan to mitigate negative impacts;
- Development of an Environmental Monitoring Plan; and
- Environmental and Social Impact Assessment Report.

1.5.4 Target Group for the ESIA Report

This Environmental and Social Impact Assessment Report has been prepared for use by different stakeholders to be involved in the construction of the proposed transmission lines. 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 the project activities. The information will be useful in planning, implementation, management and maintenance of the transmission lines.

In this regard, the report will be useful to the following stakeholders:

- Funding agencies and donors;
- Relevant government ministries and agencies;
- Affected communities;
- Planners and engineers to be involved in preparation of designs and plans for the transmission lines;
- Contractors engaged in the construction works for the transmission lines;
- People involved in the management and operation of the transmission lines.

1.6 Methodology

1.6.1 Feasibility Study and Preliminary Environmental Impact Assessment, 2003

The Feasibility Study and Preliminary Environmental Impact Assessment for the Olkaria-Lessos-Kisumu Transmission Line was carried out in April 2003 by ETC East Africa Ltd. Included in the study was a review of the environmental policy, institutional and legal framework in Kenya, a description of the project, a description of the existing environment of the project area, an analysis of environmental impacts and alternatives, and a mitigation plan.

Three transmission lines and two substations were assessed in the feasibility study, namely Kamburu-Meru, Olkaria-Lessos and Lessos-Kisumu. Additionally, the Naivasha and Lanet substations were assessed for purposes of rehabilitation.

1.6.2 Scoping Study, 2009

The scoping study for the transmission lines was carried out by KPLC at desk level as well as through a field study from 9 June 2009 to define the scope and structure of the study. The field study for the scoping exercise was conducted on 22-24 June, 5 July, 17-19 July and 21 July 2009.

The Scoping Study was submitted to the National Environment Management Authority (NEMA) and included presentation of Terms of Reference (ToRs) for approval, as per the requirements of the Kenyan EIA/EA Regulations. The ToRs were approved by NEMA on 31 July 2009. A copy of the approval to the ToRs is included in Appendix 3 of this report.

1.6.3 Approaches to undertaking of the ESIA

The Environmental and Social Impact Assessment (ESIA) was based on document review, field assessments, and discussions with project proponents.

The field assessments included the following:

- Baseline environmental and socio-economic survey;
- Ecological survey;
- Landscape survey; and
- Public consultations and meetings.

The client provided the proposed project details, with discussions involving an explanation of the proposed project as well as views on environmental aspects that needed to be considered during the design and implementation of the project. The primary data collection was carried out through structured questionnaires, observation and photography, site visits, consultation with stakeholders and desk studies. Some information presented in this report was obtained from available published and unpublished documents. Examples of this information include data on rainfall, flora and fauna, population statistics, some socio-economic data, and the maps used in the report.

(a) Collection of Secondary Data

This method is useful for gathering and reviewing relevant published and unpublished environmental information relating to the project area, including previous environmental / feasibility studies and other relevant reports. This forms the basis for the baseline information, and informs the subsequent public consultations.

(b) Primary Data Collection

The primary data collection phase consisted primarily of field surveys, involving numerous approaches, including distribution of the project information document, ecological survey, landscape survey, socio-economic survey and public consultations. Each of these tools and

approaches is outlined in the following sections.

Field surveys, including critical observations, were carried out to get an impression of the physical, biological and social conditions of the project area. The site visits allowed the Consultants to discuss with key government agencies and stakeholders on their views and understanding of the current problems, as well the potential impacts of the proposed project activities.

(i) Project Information Document (PID)

A document highlighting the project information was prepared prior to the primary data collection period. This document was used to explain to respondents the details of the proposed project, as well as geographical extent. Respondents were given a copy of the project information document to keep, and encouraged to raise further comments to the consultant, using contacts available in the document. This document is included in Appendix 6 of this report.

(ii) Ecological Survey

A comprehensive survey of biodiversity along the existing 132 kV line was carried out, and also included the proposed areas the line will pass through that are not covered by the existing line. To begin with, a literature review on already existing documented information regarding vegetation, soils, fauna, flora and avifauna was carried out. Internet searches, and library visits were also conducted. A review of studies initially undertaken during the conception of the line was also considered.

Following the literature review, interviews with key stakeholders were held, followed by ground sampling, mainly using line (road) and drive transects for vegetation, avifauna and mammal species.

(ii).1 Line (road) transects

In some of the areas, road transects were identified in the project area, and observations (up to 20 m) made on each side of the transect (road). The degree of forest or woodland cover was recorded for three life forms i.e. trees, shrubs and bushes (including grasses). The method is also useful to record sightings of animals.

General botanical surveys were undertaken along each transect, within a band of 10m on either side. These enabled better understanding of the various habitat physiognomic structures. Plant identification was undertaken on site.

(ii).2 Drive transects

The existing transmission line covers a long section, therefore drive transects were undertaken in many sections. Due to the vastness of the area, and presence of wildlife in some areas, vegetation, fauna and avifauna identification was done while in the vehicle, driving along already existing roads and along the way leaves. The method applied here was mainly visual.

(iii) Landscape Survey

The research approach adopted comprised two parts:-

- Extensive literature review
- Field survey

(iii).1 Literature Review

This comprised review of information on planning exterior spaces, urban and regional planning. Sources consulted are included in the References to this study. Specific aspects reviewed included:

- The planning, form, scale and siting of new developments;

- Civil design and public infrastructure;
- Storm water management including rain gardens, treatment of wetlands;
- Parks, botanical gardens, arboretums, greenways and nature reserves;
- Recreation facilities e.g theme parks;
- Highways, transportation structures, bridges and transit corridors;
- Urban design, town and city squares, water fronts, pedestrian schemes, parking lots;
- Large and small urban regeneration schemes;
- Landscape engineering;
- Forest, tourist or historical landcapes, historical garden appraisal and conservation studies;
- Reservoirs, dams, powerstations, reclamation of extractive industry applications;
- Use of toposurvey maps;
- Environmental assessment and landscape planning advice, land management proposals;
- Ecological designs.

(iii).2 Field Survey

This comprised of site investigations and included the following:

- Site observation and records through sketching and notes;
- Use of toposurvey maps;
- Detailed photographic survey and measured drawing; and
- Interview of landscape inhabitats.

(iv) Socio-economic Survey

A socio-economic survey was undertaken to determine the socio-economic characteristics of land owners/residents found within the project area. The methodology used was the guided interview style, with questions based on the items found in a questionnaire provided by the JICA Study Team. The exercise was carried out during the public consultations, and a sample of the questionnaire is presented in Appendix 8, and the detailed results presented in Section 3.4.3.

(v) Public Consultations

Public consultations are critical in preparing an effective ESIA. The Kenyan EIA Regulations of 2003 and the JBIC guidelines recommend that the proponent seek the views of persons who may be affected by the project. Public consultations consisted of a variety of methods, including use of the Project Information Document (PID) found in Appendix 6, to guide focus group discussions, public meetings, and guided interviews. The Public Consultation and Disclosure Plan (PCDP) is presented as Volume II of this report.

(v).1 Focus Group Discussions (FGD)

These are characterised by relatively free flow of information between the members of the group. Stakeholders' opinions were sought regarding the proposed project, and their views noted down, with the discussion being generally focussed on the proposed project.

(v).2 Public Meetings

These included larger numbers of stakeholders airing their opinions and concerns regarding the proposed project, and were carried out in three rounds. Public meetings and their outcome is discussed in more detail in Chapter Five.

(v).3 Guided Interviews

A questionnaire planned for the study was administered, and where respondents were not able to fill it in personally, the Consultants conducted an interview based on the items in the

questionnaire. This questionnaire is included in Appendix 7.

Fig 1-2: Initial Public Consultations at Ngata-Kirobon (Nakuru) and Mau Summit area

1.7 Constraints and Limitations

The information presented in this report is by and large consistent with the data and information gathered through the various sources and approaches outlined above. However, just as in any studies, a number of constraints were experienced, and as a result, there could be some gaps of information in the report as the consultants could not exhaust the collection of all primary data.

The findings and issues advanced in this report reflect the general views and feelings of some selected people and stakeholders; they may not cover the specific issues from some unique situations or some individuals affected by the project.

Some of the information in the report was processed from secondary sources and such data includes information for maps, land resources, atmospheric resources, water resources, and geological resources in Kenya. It is therefore necessary to view the information presented in the context of the time reference and limitations.

During the public meetings, the following factors were noted as contributing to low participation turnout in the following areas:

- Mau Summit: Ethnic tensions still present in area, so participation stifled;
- Timboroa: second round of public consultations coincided with MP's visit to schools in the area, so few members of public attended the consultative meeting for this project;
- Kibos village: second round of public consultations coincided with wedding of community members;
- Notice for second meeting did not reach some areas on time, eg. Bagaria, Mau Summit, Mberere, and Mamboleo, therefore public consultation was *ad hoc*.

1.8 The ESIA team

The ESIA team comprised GIBB's environmental and social experts, landscape architect, transmission engineers, ecologist and public consultation expert.

The team was also assisted by the following KPLC staff:

• Bernard Karanja	Naivasha
• Joseph Kago	Naivasha
• William Chemalmal	Nakuru
• Benjamin Kilonzo	Nakuru
• Peter Owiti	Eldoret
• Ronald Siakama	Eldoret
• John Eldoret	Eldoret
• Jackson Keter	Lessos
• Kirui	Lessos
• Aggrey Kasuku	Lessos
• Samson Akuto	Kisumu
• Semo	Kisumu
• Sammy Abira	Kisumu
• Paul Akoko	Kisumu

1.9 Structure of the ESIA Report

This report has been prepared under the following chapters:

Executive Summary: This chapter presents a summary of the significant findings and recommended actions, with an emphasis on expected impacts and management measures.

Chapter 1: **Introduction:** This chapter gives a description of the type of project proposed, history, location, background, reasons for the ESIA, constraints and limitations and the ESIA team and the ESIA report format.

Chapter 2: **Policy, Legal and Regulatory Framework**: This chapter outlines the Environmental requirements from Kenya, JICA/ JBIC, World Bank, IFC Performance Standards, African Development Bank, and the East African Community.

Chapter 3: **Description of the Project Environment:** This chapter gives a description of the environmental setting of the proposed project and surrounding areas, e.g., climate, soils, topography, geology, flora type and diversity, fauna, endangered species and sensitive habitats, land use, human populations, socio-economics, and cultural heritage.

Chapter 4: **Project Description and Justification:** This chapter gives a description of the status of the project in the project cycle, specifically during construction, operation and decommissioning.

Chapter 5: **Analysis of Alternatives:** This chapter presents the choice of possible transmission line routes, and each is analysed for its advantages and disadvantages. The best optionis then presented.

Chapter 6: **Public Consultation:** This chapter presents the existing social conditions, and gives a description of the objectives, methods used and summary of results of the public consultation activities undertaken during the ESIA. Volume II of this report presents the Public Consultation and Disclosure Plan.

Chapter 7: **Assessment of Potential Impacts and Proposed Mitigation Measures:** This chapter presents the analysis of beneficial and adverse impacts of the project on the biophysical and human (social, cultural and economic) environments. The analysis covers anticipated impacts during the

construction, operation phases and decommissioning phases and also describes the enhancement and mitigation measures proposed to enhance benefits or prevent, minimize, mitigate or compensate for adverse impacts as well as the estimated cost of mitigation.

Chapter 8: **Environmental and Social Management and Monitoring Plan:** This chapter presents the proposed Environmental and Social Management and Monitoring Plan prepared for the project. Also included is the management of waste.

Chapter 9: **Conclusion:** The conclusion briefly presents the environmental and social acceptability of the project, taking into account the impacts, measures and recommendations identified during the assessment process.

REFERENCES

APPENDICES

2 LEGAL & REGULATORY FRAMEWORK

2.1 Kenyan Legal and Regulatory Framework

Kenya has over 77 statutes which relate to environmental concerns. Most of these statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health; soil erosion; air quality, etc.

Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licences and sectoral laws. For example there are provisions in the Occupational Safety and Health Act, Local Government Act and the Food Drugs and Chemical Substances Act on handling of wastes and hazardous wastes in the environment. There was however need for stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management and Coordination Act in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment. The salient attributes of this law are outlined below, as well as recent regulations enacted to support it.

2.1.1 The Environmental Management and Coordination Act (EMCA), 1999

The Environmental Management and Co-ordination Act (EMCA) 1999 is an Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

The main objective of the Act is to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for over 77 statutes in Kenya that contain environmental provisions;
- Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

The Act empowers the National Environment Management Authority (NEMA) 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 related to the environment.

The Second Schedule to the Act specifies the projects for which an EIA or environmental audit must be carried out. According to the Act, Section 58, all projects listed in the Second Schedule of the Act must submit a Project Report to NEMA. Electrical infrastructure, including transmission lines and electrical substations (Item 10) are developments that are listed in the Second Schedule of the Environmental Management & Coordination Act (EMCA, 1999).

The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out Environmental Impact Assessments (EIAs) and Environmental Audits (EAs).

Under EMCA 1999 NEMA has developed regulations to establish guidelines for better management of the environment and promote sustainable development. To date, the regulations presented in the following sections have been gazetted.

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

The Environmental Impact Assessment and Audit Regulations state in Part III Rule No. 6 that an environmental impact assessment study shall be conducted in accordance with terms of reference developed during the scoping exercise by the proponent and approved by the

Authority.The terms of reference shall include matters required to be considered in the making of an environmental impact assessment as may be contained in the Second Schedule to these Regulations and such other matters as the Director General may in writing require. Further, an environmental impact assessment study shall be conducted in accordance with the general environmental impact assessment guidelines set out in the Thrid Schedule to these Regulations.

In accordance with the above, the proponent, KPLC, undertook a Feasibility Study and Preliminary Environmental Impact Assessment in 2003, and a Scoping Study together with Terms of Reference (ToRs) in 2009. The ToRs were approved on 31 July 2009.

This environmental impact assessment study, according to the above regulations, Part III Rule 16, takes into account environmental, social, cultural, economic, and legal considerations, and shall:

- Identify the anticipated environmental impacts of the project and the scale of the impacts;
- Identify and analyze alternatives to the proposed project;
- Proposed mitigation measures to be taken during and after the implementation of the project; and
- Develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

This Study has been prepared in accordance with the above regulations.

Additionally, Part II, Rule No.16 – Preparation of the Environmental and Social Impact Assessment Study outlines the following:

- *A proponent shall submit to the Authority an ESIA study report incorporating but not limited to the following information:*

- *The proposed location of the project;*
- *A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project;*
- *The objectives of the project;*
- *The technology, procedures and processes to be used, in the implementation of the project;*
- *The materals to be used nithe construction and implementation of the project;*
- *The products, by-products and waste generated by the project;*
- *A description of the potentially affected environment;*
- *The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;*
- *Alternative technologies and processes available and reasons for preferring the chosen technology and processes;*
- *Analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies;*
- *An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;*
- *Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out activities or major industrial and other development projects;*
- *The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;*
- *An identification of gaps in knowledge and uncertainties which were encountered in compiling the information;*
- *An economic and social analysis of the project;*

- *An indication of whether the environment or any other state is likely to be affected and the available alternatives and mitigating measures; and*
- *Such other matters as the Authority may require.*

- *In preparing a project report under this regulation, the proponent shall pay particular attention to the issues specified in the Second Schedule to these Regulations.*

- *A project report shall be prepared by an environmental impact assessment expert registered as such under these Regulations.*

(b) Environmental Management and Co-ordination (Waste Management) Regulations 2006

These are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006 (See Appendix 11 of this Report). These Regulations apply to all categories of waste as provided in the Regulations. These include:

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

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

From this project, anticipated waste includes domestic, industrial, hazardous and toxic waste. Wastes contaminated with petroleum product are considered to be hazardous. Treatment of toxic or hazardous waste should be done using the classes of incinerators presented in the third schedule of these regulations.

(c) Environmental Management and Coordination, (Water Quality) Regulations 2006

These are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006 (See Appendix 11 of this Report). These Regulations apply to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

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

These Regulations outline:

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

There are several river crossings in this project and protection of these domestic water sources, especially during construction, is critical for the local communities. A map representing anticipated river crossings by the proposed transmission line is presented in Appendix 9.3.

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

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

Additionally, these links provide for the local enforcement of the international Convention on Biological Diversity (CBD). It is the responsibility of KPLC to ensure that biological diversity is maintained along the route of the proposed transmission line.

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

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement no. 74, October 2006 (See Appendix 11 of this Report). These regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

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

These regulations are described in Legal Notice No. 19 of the Kenya Gazette Supplement no. 9, February 2009. These regulations include management of wetlands, wetland resources, river banks, lake shores and sea shores. Specific sections have requirements that apply to wetlands in Kenya either in private or public land. The regulations empower the District Environment Committee to co-ordinate, monitor and advise on all aspects of wetland resource management within the district.

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

These regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment (See Appendix 11 of this Report). It also prohibits excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source. It however makes provisions for permitting of certain activities such as fireworks, demolitions, firing ranges and specific heavy industry.

(h) Standards and Enforcement

Part VIII of the Act deals with environmental quality standards. It establishes a Standards and Enforcement Review Committee (SERC) whose functions include the establishment of standards for all environmental media.

Standards have been established as regulations to the Act as presented above. Standards for the following are still scheduled for release:

- Air quality;
- Chemicals;
- Land use;
- Economic instruments.

2.1.2 The Wildlife (Conservation and Management) Act - 1989

The Wildlife (Conservation and Management) Act, Cap 376 of 1976, as amended in 1989, covers matters relating to wildlife in Kenya including protected areas, activities within protected areas, control of hunting, import and export of wildlife, enforcement and administrative functions of wildlife authorities. The 1989 amendment specifically established the Kenya Wildlife Services (KWS) as the parastatal charged with implementation of the provisions of the Act.

The Act specifically provides for the protection and regulation of protected animals, game animals and game birds as defined in three schedules. The first schedule includes game animals mostly mammals, although the list also includes crocodile and ostrich. The second schedule lists game birds, and the third schedule lists protected animals, which comprise primarily mammals, although it also includes two species of marine turtles, while in 1981 it was amended to include several species of reptiles, amphibians and butterflies. Apart from the protection provided to plants within National Parks and National Reserves, plants receive no further protection under this Act outside the protected areas.

Specific provisions of the Act allow for the establishment of National Parks (Section 6), National Reserves (Section 18), and local sanctuaries (Section 19). The National Parks are managed by KWS. Strict regulations prohibit various activities within National Parks, unless they are subject to the written consent of the Minister or in other cases the Director of KWS. No such prohibitions are specified for National Reserves or for local sanctuaries. Areas that were formerly game reserves but are declared as National Reserves continue to be administered by the local authorities, unless otherwise directed by the Minister by notice in the Kenya Gazette. Management of local sanctuaries is not addressed in the Act.

(a) The Wildlife (Conservation and Management) Policy - 2004

The above Policy initially outlines the principal direction of the Kenya Wildlife Services (KWS) by elaborating the its purpose, in both general and strict terms. Aspects of the law with which KWS is directly concerned are then outlined, that is, the Wildlife Act, amended in 1989.

Protected areas under the Wildlife Act are also outlined, and include terrestrial national parks, and marine national parks, as well as guidelines for activities within these protected areas, such as residence in national parks; recreational, spiritual and cultural activities; and mining. The connections between private/ communal lands to national parks is also elaborated, and more detail offered on national reserves and local sanctuaries.

Additional key areas elaborated in the above policy include conservation outside protected areas, such as migratory corridors; guidelines for general conservation and management; wildlife use outside protected areas; human-wildlife conflicts; conservation education; wildlife research; veterinary service; and eco-tourism.

2.1.3 The Forest Act

The Forest Act, Cap 385 of 1962 (revised 1982, 1992 and 2005) addresses the reservation, protection, management, enforcement and utilisation 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 (Section 4);
- Declaration of Nature Reserves within Forest Reserves and regulation of activities within Nature Reserves (Section 5);
- Issuance of licenses for activities within Forest Reserves (Section 7);
- 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 (Sections 9-14);
- Power of the Minister to make rules with respect to sale and disposal of forest products, use and occupation of land, licensing and entry into forests (Section 15). This prerogative has been taken with the Forests (General) Rules, which sets forth rules for sale of forest produce and specifies royalty rates for these products.

Section 4 of the Forest Act relates to excision and addition to the Government forest estate. Section 4 (2) states that declaration or alteration of forest boundaries, or cessation of a forest area may not take place unless twenty-eight days notice of the intention to make the declaration is published by the Minister in the Kenya Gazette. Implementation of changes in forest areas can be effected by Legal Notices (published in the Kenya Gazette Supplement) once the formalities of 28 days notice are complete. Of relevance to the proposed transmission line project is that application for removal of trees must therefore be made to the Director of Forest Services.

(a) Way Leave Authorisation

Under the Kenya Forest Service Charter, way leave authorisation requires to client to present a map to Kenya Forest Services (KFS) showing the route of the way leave, and accompanied by an application letter. Compensation on each tree removed is based on the Forest Service General Order (FSGO) which presents a list of prices of services provided by KFS within the current year. Waiting time for way leave authorisation is 30 upon application.

2.1.4 The Agriculture Act, Cap 318 of 1980 (revised 1986)

This Act has the stated objectives to promote and sustain agricultural production, provide for the conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry. Authorised officers are empowered to prohibit the clearing of vegetation and the grazing of livestock and to require the planting of trees to protect the soil from erosion, as well as impose penalties under the Act.

KPLC will be required to liaise with the Ministry of Agriculture in areas where trees will be required for wayleave purposes, as well as compensation values of land, based on its productivity.

2.1.5 Antiquities and Monuments Act, 1983 (Cap 215)

This Act aims to preserve Kenya's national heritage. Section-2 defines an antiquity as any moveable object other than a book or document made or imported into Kenya before 1895. Human, faunal or floral remains in Kenya dating to before the benchmark date of 1895 are also deemed to be antiquities. Both the National Museums of Kenya and the Kenya Cultural Centre have been established in part to discharge this Act.

2.1.6 Energy Act (2006)

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

The Act stipulates on the development of energy systems in Kenya, and procedures to be followed for licensing of any electricity generation or distribution in Kenya.

Part IV of the Act, Sections 43-63, provide guidelines for the supply of electrical energy. These sections provide guidelines for contracts for bulk supply of electrical energy; forms of contract for supply of electrical energy to consumers; tariffs and tariff structures and terms of supply; permission to survey and use land to lay electric supply lines; power of the licensee to enter land to inspect and repair lines; liability of licensee to make compensation for damage; laying of electric supply lines along roads, railways, etc; compulsory acquisition of land; power to lop

trees and hedges; electric supply lines; power of the Minister to provide electric lines or funds; and regulations for electric energy, among others.

The proposed project will be required to follow the guidelines set out in this Act.

2.1.7 Acts related to Land

The establishment of infrastructure such as the proposed transmission line is accompanied by displacement and resettlement of people. In addition to best practices and international guidelines, the following legislation are applicable in Kenya:

(a) Government Land Act Cap 280

This Act provides for regulation of leasing and other disposal of Government lands and for other purposes. More specifically, it provides for the disposal of land within townships, agricultural land, and land for special purposes. The Act also provides for Licenses for temporary occupation of land, general provisions relating to leases, licenses and agreements, and registration of transacations relating to Government land.

(b) Land Titles Act Cap 282

This Act makes provision for the removal of doubts that have arisen in regard to titles to land and to establish a Land Registration Court. Specific provisions include guidelines on adjudication of claims, and registration of documents after certificate of ownership is granted.

The above Act is also accompanied by subsidiary legislation, that is:

- The Land Titles Rules;
- The Land Titles (Fees; Custody of Documents) Rules;
- The Land Titles (Fees; Land Registration Court) Rules;
- The Land Titles (Survey Fees) Rules; and
- The Land Titles (Registration Fees) Rules, 1994.

(c) Registration of Titles Act Cap 281

This Act provides for the transfer of land by registration of titles. Parts within the Act elaborate on mechanisms of bringing lands under the Act, grants, transfers and transmissions of land, registration of titles, and mode and effect of registration, transfers, leases, charges, powers of Attorney, and rectification of titles, among others.

(d) Land (Group Representatives) Act Cap 287

This Act provides for the incorporation of representatives of groups who have been recorded as owners of land under the Land Adjudication Act, and for related purposes. The Act also elaborates on the incorporation of group representatives and the administration of groups.

(e) Trust Land Act Cap 291

This Act makes provision for Trust land, through the establishment of divisions and divisional boards. The Act also establishes guidelines for the setting apart of land, as well as leases and guidelines.

Subsidiary legislation under this Act includes:

- Trust land (wayleaves for Electric Lines) Rules;
- The Trust land (removal of Forest Produce) Rules;
- The Trust land (removal of Common Minerals) Rules; and
- The Trust land (conveyancing Fees) Rules, 1994 among others.

(i) Trust Land (Wayleaves for Electric Lines) Rules

These Rules apply to all Trust land, and state that a wayleave licence is granted under Section 38, for the purpose of erecting or laying an electric line over or under land. These rules were set in 1948, therefore the recommended annual fees for wayleave licenses are currently not applicable.

The Wayleave Licence grants the licensee the right to enter acquired land as reasonably necessary for the purpose of placing and maintaining an electric line across or under the said land, and of replacing the same or any part thereof, and of keeping clear a track parallel with and adjoining the electric line. The licensee is also granted the right to fell, lop or remove any tree, crop or shrub which may obstruct or interfere with the working of the electric line. However, the licensee is required to give the owner of such trees, crops or shrubs three days notice in writing to do the same.

(f) Registered Land Act Cap 300

The above Act makes further and better provides for the registration of title to land, and provides for the regulation of dealings in land so registered, and for purposes connected therewith.

The Act further elaborates on the organization and administration of the Act, the effect of registration, title deeds, certificates of lease and searches, instruments and agents, transmissions and trusts, restraints on disposition, rectification and indemnity, and decisions of registrars and appeals.

(g) Land Control Act Cap 302

This Act provides for controlling of transactions in agricultural land. The Act further elaborates on the establishment of land control areas and boards, the control of dealings in agricultural lands, and rules governing Appeal Boards.

2.1.8 The Kenya Civil Aviation (Amendment) Act 2002, Cap 394

This Act makes provision for the control, regulation and orderly development of civil aviation in Kenya. The Act also provides for the establishment of the Kenya Civil Aviation Authority (KCAA), responsible for:

- Securing sound development of the civil aviation industry in Kenya;
- Advising the government on matters concerning civil aviation;
- The safety and technical regulation of civil aviation.

Under Section 10 of this Act, the control of structures and others on or near aerodromes is highlighted. Specifically, the Director General of KCAA considers that provisions for the safety or efficiency of air navigation ought to be made:

- Whether by lighting or otherwise for giving aircraft warning of the presence of building, structure, tree or natural growth or formation on or in the vicinity of an aerodrome, or;
- By the removal or reduction in height of any such obstruction.

Under this Act, KCAA has the mandate to authorise and approve the height of transmission lines when they are near flight paths to ensure the safety of aircraft. Compliance of this project to the Act can only be determined following compliance with KCAA's authorisation procedure, which involves payment of an inspection fee, conducting of an aerial inspection along the proposed transmission line route, and a further analysis by KCAA. It is therefore important that KPLC initiate the above procedure in good time prior to the construction phase of the proposed transmission line.

2.1.9 The Radiation Protection Act (Revised 1985)

This is an Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes.

Transmission lines produce electric fields generated by the line voltage on the conductors, and magnetic fields generated by the current in the conductors. Based on studies and calculations, at present however there exists no scientific proof of a causal connection between electric and magnetic field exposure generated by low frequency alternative current of power networks and negative health effects.

2.1.10 Public Health Act (1986)

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

The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases.

2.1.11 The Traffic Act (Cap 203)

This Act consolidates the law relating to traffic on roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers of vehicles other than motor vehicles and other road users; and miscellaneous provisions as to roads, among others.

Many types of equipment shall be transported through the roads of Kenya to various destinations of installation. Their registration and licensing will be required to follow the stipulated road regulations.

2.1.12 Public Roads and Roads of Access Act (Cap 399)

Sections within this Act deal with employment of public officers, dedication of line of public transport, application to construct road of access, notice to be served on land owners affected, right of way over road of access, prohibition of classes of traffic, appeals, rules, penalties and cognizance of offences.

Improvement of an access road is planned to the new substation at Timboroa/Makutano. This is an already existing road, hence minimal developments are required.

2.1.13 Local Government Act (rev. 1998)

This Act provides for the establishment of authorities for local government, to define their functions and to provide for matters connected therewith and incidental thereto. In all the areas where the project shall be undertaken, the local authorities will require to be informed. Where the lines pass through local government land, permits shall have to be acquired.

2.1.14 Employment Act, 2007

This Act declares and defines the fundamental rights of employees; minimum terms and conditions of employment; to provide basic conditions of employment of employees; and to regulate the employment of children, among other rights. Key sections of the Act elaborate on the employment relationship; protection of wages; rights and duties in employment; termination and dismissal and protection of children, among others. This Act will guide the management of workers, especially during the construction period.

More specifically, KPLC is considering establishing a Policy that ensures that unskilled labour is sourced from each of the areas that the proposed project traverses. This will address a key concern arising during the public consultations regarding employment of young people from within the areas traversed, instead of employing from outside the concerned communities.

2.1.15 Work Injury and Benefits Act, 2007

This Act provides for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid; appeals; and miscellaneous provisions. Schedules provided in the Act outline the degree of disablement; occupational diseases; and dependant's compensation. In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken.

2.1.16 The Occupational Safety and Health Act, 2007

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

It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of this Act is to:

- Secure the safety, health and welfare of persons at work;
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

The Occupational Safety and Health Act, 2007 (OSHA 2007) revokes the Factories and Other Places of Work Cap.514. However sections of the Factories and Other Places of Work that are not inconsistence with those of OSHA 2007 remain applicable.

The scope of OSHA, 2007 has been expanded to cover all workplaces including offices, schools, academic institutions and plantations. It establishes codes of practices to be approved and issued by the Directorate of Occupational Safety and Health Services (DOHSS) for practical guidance of the various provisions of the Act.

Other parameters within the Act include:

- Duties of employers, owners or occupiers of workplace;
- Establishment of safety and health committees;
- Annual safety and health audit of workplaces;
- Safety and Health obligations for persons who may come to premises for work and are not employees of that particular workplace;
- Reporting of any accident, dangerous occurrence or occupational poisoning caused in the workplace to the area Occupational Health and Safety Office. These incidents should be entered in the General Register. In case of a fatal accident, information to the area Safety and Health Office should be within 24 hrs and a written notice to the same within 7 days;
- The duties of manufactures, designers, importers and suppliers to ensure that all articles and substances for use at workplace are safe and will not cause injury to health and the environment;
- Duties of self employed persons;
- Duties of employed persons;
- Prohibition of interference or misuse any appliance, convenience or any other facility provided to secure Safety, Health and Welfare at work by any person (occupier, self employed person or employed);
- The administration of the Act is the responsibility of a Director and other appointed and gazetted officials (Occupational Health and Safety Officers);

- The establishment of National Council for Occupational Safety and Health to assist the Director to discharge his duties and those that may be required by the Minister;
- The registration of all workplaces by the Director DOHS forming the basis of his work statistics;

- Machinery safety to include:
  - Safe use of machinery, plant and equipment;
  - Prime makers and transmission machines;
  - The maintenance, construction of fencing safeguards;
  - The statutory requirements of various machines, plants and equipment (hoists and lifts, chains and ropes, cranes, steam receivers and containers, air receivers, cylinders for compressed liquefied and dissolve gases and refrigeration plants).

- Chemical safety including:
  - Handling, transportation and disposal of chemicals and other hazardous substances;
  - Importance of Materials Safety Data Sheets (MSDS);
  - Labelling and marking of chemical substances;
  - Classification of hazardous chemicals and substances;
  - Establishment and adoption of exposure limits on hazardous substances in a workplace;
  - Control of air pollution, noise and vibrations;
  - Redeployment on medical advice;

- Health, safety and welfare special provision including:
  - Permit to Work systems;
  - Work processes that are likely to harm persons below eighteen (18) years;
  - Supervision of apprentices and indentured learners;
  - Training and supervision of inexperienced workers;
  - Medical surveillance;

- Penalties, offences and legal proceedings including:
  - The upward adjustments of all fines imposed in the event of failure to comply with provisions of the Act;
  - The need to investigate and prosecute the real offender otherwise all those who fail to comply with any provisions of this Act that have been legally imposed on him/her shall be prosecuted.

- The establishment of the safety and Health fund and Safety and Health regulations and procedures thereof;
- The establishment of provisions as to the conduct of business and affairs of the National Council for Safety and Health under Third Schedule.

(a) Occupational Health and Safety Regulations

The following additional subsidiary regulations were made under the Factories and Other Places of Work Act but have not yet been revoked under the Occupational Safety and Health Act.

Regulations under The Factories and Other Places of Work Act now deemed to be under The Occupational Health and Safety Act, 2007 are:

- The Factories (Cellulose Solutions) Rules 1957;
- The Factories (Wood Working Machinery) Rules 1959;
- The Factories (Dock) Rules 1962;
- The Factories (Eye Protection) Rules 1978;
- The Factories (Electric Power) (Special) Rules 1978;
- The Factories (Building Operations and Works of Engineering Construction) Rules

1984;
- The Factories and Other Places of Work (Health & Safety Committees) Rules 2004;
- The Factories and Other Places of Work (Medical Examination) Rules 2005;
- The Factories and Other Places of Work (Noise Prevention and Control) Rules 2005.
- The Factories and Other Places of Work (Fire Risk Reduction) Rules 2007;
- The Factories and Other Places of Work (Hazardous Substances) Rules 2007.

(i) Factories and Other Places of Work (Fire Risk Reduction Rules) 2007

The rules define classes of fires:

Class A fire: Fire involving ordinary combustible materials such as paper, wood cloth, rubber or plastic materials;
Class B fire: fire involving flammable or combustible liquid, flammable gasses, greases or similar material, rubber or plastic material;
Class C fire: Fire involving energized electrical equipment where safety to the worker requires the use of electrically non-conductive extinguishers media;
Class D fire: Fire involving combustible metal such as magnesium, zirconium, sodium, lithium or potassium.

These rules outline standards on:

- Handling, storage and disposal of flammable substances and vapours;
- Provisions for preparedness, drills, training and procedures in the event of fire hazards, fire escape exits, control of spread of smoke, means of evacuation and formation of fire fighting team
- Marking and labelling (English and Kiswahili) highly flammable substances storage areas and containers;
- Monitoring of flammable substances, First Aid, notices, colour coding of pipes, fire safety policy, and fire safety audit.

Procedures in the event of fire hazards are also included in these regulations.

(ii) Factories and Other Places of Work (Hazardous Substances Rules) 2007

These regulations cover specifications for factories and workplaces where hazardous substances are handled. Provisions are made for exposure limits, protection of workers and the environment, maintenance of equipment and future guidelines on hazardous substances.

(iii) Factories and Other Places of Work (Noise Prevention and Control Rules) 2005

These rules are described in Legal Notice No. 25 of the Kenya Gazette Supplement No. 22 of April 2005 and state the noise regulations that apply to every factory, premises, place, process and operations to which the provisions of the Factories and Other Places of Work Act (Cap 514) applies. These Rules describe the following:

- Permissible noise levels;
- Noise prevention programme;
- Noise measurements and records;
- Information on noise and training of workers;
- Noise measuring equipment;
- Engineering controls;
- Installation and maintenance of machinery or plant;
- Means of communication;
- Hearing protection;
- Noise hazard areas;
- Workers responsibility in noise hazard areas;
- Duties of the occupier;
- Medical examination and hearing tests;

- Compensation and notification of occupational hearing impairment;
- Noise programme review; and
- Offences and penalties.

Working in a noisy facility fall under the Factories and other places of Work Act, (Cap 514) First Schedule (Rule 4), anybody working in an area involving exposure to noise, needs Audiometric examination and internal examination (pre-employment and annual) to determine deafness, cases with deterioration of hearing loss of 20dBA or more in two successive examinations within two weeks.

(iv) Safety and Health Committees Rules, 2004

These rules may be cited as the Factories and Other Places of Work Safety and Health Committees Rules 2004.

These rules shall apply to all factories and other workplaces which regularly employ twenty or more employees.

The following are outlined in the Regulation:

- Rule No. 4 outlines the formation of the committee;
- Rule No. 6 outlines the duties and functions;
- Rule No. 7 outlines the meetings and minutes of the committee.
- Rule No. 8 outlines the roles.

(v) Medical Examination Rules

These are described in Legal Notice No. 24 of the Kenya Gazette Supplement No. 22 of April 2005. The Medical Examination Rules apply to all those employees in employment or who have been in employment in every workplace to which the provisions of the Factories and Other Places of Work Act (Cap 514) apply. The Rules describe the following:

- Occupations requiring medical examination;
- Duties of employer and employees as to medical examination;
- Reports on examination;
- Certificate of redeployment;
- Certificate of fitness;
- Notification of occupational diseases;
- Offences and penalties.

(vi) Noise Prevention and Control Rules

These rules are described in Legal Notice No. 25 of the Kenya Gazette Supplement No. 22 of April 2005 and state the noise regulations that apply to every factory, premises, place, process and operations to which the provisions of the Factories and Other Places of Work Act (Cap 514) applies. These Rules describe the following:

- Permissible noise levels;
- Noise prevention programme;
- Noise measurements and records;
- Information on noise and training of workers;
- Noise measuring equipment;
- Engineering controls;
- Installation and maintenance of machinery or plant;
- Means of communication;
- Hearing protection;
- Noise hazard areas;
- Workers responsibility in noise hazard areas;
- Duties of the occupier;

- Medical examination and hearing tests;
- Compensation and notification of occupational hearing impairment;
- Noise programme review; and
- Offences and penalties.

(b) Building Operations and Works of Engineering Construction Rules

The provisions of the Factories Act relevant to building operations and engineering construction works are contained in the Abstract of the Act for Building Operations, and Works of Engineering Construction Rules.

These are summarised in Table 2-1 below:

Table 2-1: Minimum Health and Safety Requirements for Engineering Construction Works

Legal Requirements	Description
General Requirements	
Give notice of particular operations or works:	Notice should be sent in writing to the Occupational Health and Safety Officer, not later than seven days after commencement of construction and building works except where the construction works will be complete in less than six weeks or notice had already been given to the Occupational Health and Safety Officer (Section 60 of the Act).
General Register:	A general register of every person undertaking building operations or construction works should be kept in adherence to the prescribed form L.D.B.C.R.2. This register is kept at the site of operations or at the office of the person undertaking the operations or works. The register should contain: • The certificate of registration of the workplace; • Every other certificate issued by the Chief Inspector under this Act; • The prescribed particulars as to the finishing (washing, white washing, colour washing, painting or varnishing) of the facility; • The prescribed particulars as to every accident and case of occupational disease occurring in the workplace of which a notice is required to be sent to a labour officer under the provisions of any law for the time being in force; • All reports and particulars required by any other provision of this Act to be entered in or attached to the general register; • Such other matters as may be prescribed (Section 62 of the Factories and Other Places of Work Act).
Special rules and welfare:	Printed copies or prescribed Abstracts of the Factories and Other Places of Work Act must be kept posted at the site of operations or works (Section 61 of the Factories and Other Places of Work Act).
Safety Requirements	
Air receivers:	These should be of sound construction and be properly maintained. They should be thoroughly examined by a competent person at intervals of 24 months and the reports of such examinations attached to the General Register (Section 39 of the Factories and other Places of Work Act).
Cylinders for compressed, liquefied and dissolved gases:	Such cylinders should be of good construction, sound material, and adequate strength and free from patent defect. The cylinders should conform to standards specified under the Standards Act or to a prescribed standard specification, approved in writing, by the Director, Kenya Bureau of Standards. They should be thoroughly examined by a competent person at regular intervals and a maintenance register kept (Section 39A of the Amendment of the Factories and Other Places of Work Act).
Notification of accidents:	The particulars of an accident causing death or disablement of a worker for more than three days from earning full wages at the work place where he was employed must be sent in the prescribed form (L.D.B.C.R 6) to the Occupational Health and Safety Officer and entered in the General Register. Certain dangerous occurrences must also be reported whether or not they cause disablement (Section 62 of the Factories and Other Places of Work Act).
Health Requirements	

Legal Requirements	Description
Sanitary accommodation:	Sufficient and suitable sanitary conveniences must be available for persons employed. These must be kept clean and well lit (Sections 16 and 18 of the Factories and Other Places of Work Act).
Miscellaneous Requirements	
Prohibition of deduction from wages:	The occupier must not make a deduction from wages in respect of anything he has to do or provide in pursuance of the Factories Act or permit any person in his employment to receive payment from other employees for such services (Section 66 of the Factories and Other Places of Work Act).
Duties of persons employed:	An employee must not wilfully interfere with or misuse any means, appliance, convenience or other thing provided in pursuance of the Act for securing health, safety or welfare provided for the employee's use under the Act. The employee must not wilfully and without reasonable cause do anything likely to endanger himself or others (Section 65 of the Factories and Other Places of Work Act).
Inspection:	The Occupational Health and Safety Officer have the power to inspect every part of the premises by day or by night. The Officer may require the production of registers, certificates and other papers, may examine any person alone or in the presence of any other person as he thinks fit and may require the person to sign a declaration of truth of the matters about which the person is examined. Every person obstructing an Occupational Health and Safety Officer is liable to a penalty (Section 69 of the Factories and Other Places of Work Act).

2.2 Kenyan Institutional framework

There are over 20 institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the Ministry of Environment and Mineral Resources (MEMR), Kenya Forest Services (KFS), Kenya Wildlife Services (KWS), National Museums of Kenya (NMK), and the public universities, among other organizations. There are also local and international NGOs involved in environmental issues in Kenya.

In 2001, the Government established specific administrative structures to implement the Act. The main administrative structures are described in the following sections.

2.2.1 The National Environmental Council (NEC)

This was established under EMCA, and is chaired by the Minister for Environment and Mineral Resources, with membership from all relevant ministries, as well as a broad range of other interested parties. The National Environmental Council (the Council) is responsible for formulation of national policies, goals, and objectives, and the determination of policies and priorities for environmental protection.

2.2.2 The National Environment Management Authority (NEMA)

The responsibility of the National Environmental Management Authority (NEMA) is to administer EMCA by exercising 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.

In addition to NEMA, the Act 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).

2.2.3 Provincial and District Environmental Committees

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

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

2.2.4 Public Complaints Committee

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

2.3 Japan Bank for International Cooperation (JBIC) Guidelines

The Japan International Cooperation Agency (JICA), which is responsible for the implementation of technical cooperation and the preliminary study of grant aid projects in Japan's bilateral grants, prepared environmental guidelines for infrastructure projects in 1990, which were later revised, and the new guidelines for environmental and social considerations completed in March 2004. These guidelines cover development studies, preliminary studies of grant aid projects and technical cooperation projects. Their objectives are to encourage the recipient governments to take appropriate considerations of environmental and social factors as well as to ensure that JICA's support for and examination of environmental and social considerations are conducted accordingly.

2.3.1 Japan's Official Development Assistance Charter, June 30 1992

This charter was established to obtain broader support for Japan's Official Development Assistance (ODA). The basic philosophy of this charter is that the international community, from a humanitarian viewpoint, cannot ignore the fact that many people in developing countries, which constitute a majority among countries in the world, suffer from famine and poverty. Japan's ODA is provided in accordance with the principles of the United Nations Charter, as well as an additional four principles.

Further outlined in the Charter are the priorities, measures for the effective implementation of ODA, and measures to promote understanding and support at home and abroad. African countries are considered priority regions in the Charter, as well as infrastructure improvement, hence the application of this Charter to the current project.

2.3.2 Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations, 2002

JBIC establishes and makes public the above guidelines with the objective of contributing to efforts by the international community, particularly developing regions, towards sustainable development, through consideration of the environmental and social aspects in all projects subject to lending or other financial operations. Environmental and social considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous people.

Procedures for confirmation of environmental and social considerations include:

- Screening: each project is classified in terms of its potential environmental impact, taking into account such factors as the sector and scale of the project; the substance, degree and uncertainty of its potential environmental impact; and the environmental and social context of the proposed project site and surrounding areas;
- Categorization: Three categories A, B, and C exist. A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment; Category B if its potential adverse environmental impact is less adverse than that of Category A projects; and Category C if it is likely to have minimal or no adverse environmental impact. This project is classified as Category B, under Section (1), Paragraph 2, and Article 23 of The Japan Bank for International Cooperation Law.
- Environmental review for each category: This includes evaluation of measures necessary to prevent, minimize, mitigate or compensate for potential negative impact, and measures to promote positive impact if any such measures are available (Category A). The scope of environmental reviews for Category B projects may vary from project to project, but is narrower than that for Category A projects. Environmental reviews for projects in Category C do not proceed beyond screening.
- Monitoring: JBIC in principle confirms through the borrower over a certain period of time, the results of monitoring the items which have a significant environmental impact by the project proponents.

The proposed transmission line falls under Category A.

2.4 World Bank/ IFC Safeguard Policies

2.4.1 Environmental Assessment (Operational Policy, OP 4.01)

The objective of OP 4.01 is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is triggered if a project is likely to have potentially adverse environmental risks and impacts in its area of influence. Op 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and transboundary and global environment concerns. Thus, the construction and rehabilitation of transmission lines is likely to have environmental impacts, which require mitigation.

2.4.2 Natural Habitats (Operational Policy, OP 4.04)

This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

The proposed transmission lines have the potential to cause conversion (loss) or degradation of natural habitats, directly (through construction) as well as indirectly (through human activities induced by the project).

2.4.3 Indigenous Peoples (Operational Policy, OP 4.10)

The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous people; (ii) ensure that

adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous people received culturally appropriate and gender and inter-generationally inclusive social and economic benefits.

The proposed transmission line project will pass through areas, such as the Mau forest complex, that have been associated with the Ogiek. Confirmation should be initially carried out of their presence in these areas, and specific mitigation measures put in place to ensure that they are minimally impacted.

2.4.4 Physical Cultural Resources (Operational Policy, OP 4.11)

The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, 'physical cultural resources' are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

The Rift Valley basin has been well surveyed, and has been found to be an important area archaeologically. It is expected that the proposed transmission line will avoid these sites or provide adequate mitigation as required.

2.4.5 Involuntary Resettlement (Operational Policy, OP 4.12)

The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.

This policy covers not only physical relocation, but any loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets; (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location.

In densely populated areas along the transmission line route, such as market centres, displacement is expected, as well as on small-holder farms, if the towers are to be erected on these land plots. Further, livelihood is expected to be affected if sources of income are derived from the areas from which people will be involuntarily resettled. The limit on crop types and activities within the right of way (1.8m height) will also pose challenges to those affected.

2.4.6 Forests (Operational Policy, OP 4.36)

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

The proposed transmission lines have the potential to have impacts on the health and quality of forests, specifically those falling in the Right of Way (RoW) such as Koibatek, Mau, Timboroa, Kapseret and Nabkoi forest. The proposed transmission lines also have the potential to impact on the rights and welfare of people and their level of dependence upon or interaction with the above mentioned forests.

2.5 International Laws

2.5.1 Multilateral Environmental Agreements (MEAs)

Kenya has ratified a number of Multilateral Environmental Agreements (MEAs) and consequently has duties under those agreements. The most relevant MEAs to this study are:

(a) Convention on Biological Diversity (CBD, 1992)

This convention entered into force on 29 December 1993, and has 3 main objectives:

- To conserve biological diversity;
- To use biological diversity in a sustainable fashion;
- To share the benefits of biological diversity fairly and equitably.

This Convention governs Kenya's international obligations regarding biological diversity. The proposed project will cut across areas with high biological diversity, hence the need to establish the potential impacts on these areas, and suggest appropriate mitigation measures.

(b) UNESCO Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972)

This Convention was adopted by the General Conference of UNESCO in 1972. It aims to encourage the identification, protection, and preservation of earth's cultural and natural heritage. It recognizes that nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops.

The Convention provides for the protection of those cultural and natural 'properties' deemed to be of greatest value to humanity. It is not intended to protect all properties of great interest, importance or value, but rather a select list of the most outstanding of these from an international viewpoint.

In the course of this project, cultural and heritage sites may be discovered. Recommendations will be made according to Kenyan law and international best practices on handling of these sites.

(c) Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention)

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) was signed in Iran in 1971 and came into force in 1975. It represents the first attempt to establish a legal instrument providing comprehensive protection for a particular type of ecosystem. This Convention was ratified by Tanzania in 1998.

The first obligation under the Convention is to designate at least one wetland for inclusion in the List of Wetlands of International Importance (the 'Ramsar List') and to promote its conservation, and, where appropriate, its wise use.

The Ramsar Parties agree to implement their planning so as to promote conservation of the wetlands included in the List and, as far as possible, the wise use of all wetlands within their territories. The wise use of wetlands is described as "their sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem."

Lakes Naivasha, Elementaita and Nakuru are registered Ramsar sites. The significance of project activities to these ecosystems will be established.

(d) UNESCO's Man and Biosphere Programme (MAB, 1980)

UNESCO's Man and the Biosphere Programme (MAB) works to improve the relationship between people and the environment. The MAB Programme was inspired by UNESCO's 1968 Conference on the Conservation and Rational Use of the Biosphere. With specific interest on protected areas, objectives include promoting scientific research, gathering information and linking with traditional knowledge. As of May 2002, 94 countries have established 408 Biosphere Reserves, which are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. The aim of MAB's Biosphere Reserves was originally to maintain a balance between biodiversity conservation, support for development, and the preservation of cultural values. Biosphere Reserves were conceived as areas where this objective could be tested, refined and implemented. Biosphere Reserves perform three functions:

- Conservation of species and genetic resources;
- Economic and human development that is socio-culturally and ecologically sustainable;
- Provision of support for research, monitoring, education and information exchange.

(e) Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS, 1980)

This Convention was signed in Bonn in June 1979, and entered into force on November 1, 1983. It covers the protection of migratory species and their habitats and is the only global convention established exclusively for the conservation and management of migratory species. It is also concerned with wild animals that migrate across or outside national jurisdictional boundaries.

The project area is situated close to the Nakuru National Park, and Soysambu Conservancy. This Convention should therefore be considered in the course of the project, and where applicable, best practices should be followed on the safe and appropriate handling of migratory species of wild animals.

(f) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This Convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of international trade. CITS is an important line of defense against the threat posed to diversity by invasive species.

Initial project activities will include identification of species in the project area, to avoid introduction of harmful alien species during landscaping and re-vegetation.

(g) The Africa-Eurasia Migratory Water Bird Agreement (AEWA, 1995)

This Agreement was signed on 16 June 1995 in The Hague in the Netherlands, and took effect on 1 November 1999 with the accession of seven European and seven African countries. It covers 119 countries, found in Africa, Europe, Central Asia, the Middle East, Greenland, and the Arctic Archipelago in Canada. The goal of the agreement is to protect migratory waterfowl by ensuring that they are protected for the entire length of their migratory routes. The list of birds protected under the AEWA convention covers 235 species of birds.

(h) African Convention on the Conservation of Nature and Natural Resources (1968)

This Convention of the African Union is ratified by 40 African countries, including Kenya. The fundamental principle requires contracting states to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people. The contracting states are also required to take effective measures for the conservation and utilization of soil, water, floral and faunal resources. Protected species should be accorded

special protection, including the maintenance of habitats necessary for their survival. In the Convention is included 2 lists of protected species, Class A and Class B.

The project is situated close to the Elementaita and Nakuru National Parks. This Convention should therefore be considered in the course of the project, and where applicable, best practices should be followed on the safe and appropriate handling of soil, water flora and faunal resources.

2.5.2 Regional Treaties and Protocols

Kenya is party to the following regional treaties and protocols. The most relevant of these to the current project are:

(a) The East African Community Treaty

This Treaty was signed on November 30, 1999 in Arusha Tanzania, between the then Presidents of Kenya, Uganda, and Tanzania. The accord established the East African Community (EAC) whereby all three nations agreed to establish more cooperative commercial and political relations. The treaty went into effect on July 7, 2000.

In this sense, any developments in Kenya are expected to consider possible effects on Tanzania and Uganda.

(b) East African Community Protocol on Environment and Natural Resources (2006)

This Protocol applies to all activities, matters and areas of management of the environment and natural resources of the partner states. Its objectives are to:

- Promote sustainable development and sustainable utilization of the partner state's environment and natural resources through prevention of activities that are detrimental thereto;
- Foster closer cooperation for judicious, sustainable and coordinated management, conservation, protection and utilization of the environment and natural resources;
- Promote capacity building and environmental awareness in environment and natural resources management;
- Promote cooperation in the management of environment and natural resources including those that are transboundary in nature among partner states; and
- Promote development and harmonisation of policies, laws and strategies for environment and natural resources management to support sustainable development.

Key areas within the Protocol include the following:

- Sustainable environment and natural resources management;
- Management of transboundary resources;
- Conservation of biological diversity;
- Management of forest and tree resources;
- Management of wildlife resources;
- Management of water resources;
- Management of wetland resources;
- Management of coastal and marine resources;
- Management of fisheries resources;
- Management and access to genetic resources;
- Management of mineral resources;
- Management of energy resources;
- Management of mountain ecosystems;
- Soil and land use management;
- Management of rangelands;
- Combatting desertification and mitigating the effects of drought;
- Protection of the ozone layer;

- Tourism development;
- Biosafety and biotechnology;
- Management of chemicals;
- Management of wastes and hazardous wastes;
- Pollution control and management;
- Environmental impact assessment and environmental audits;
- Environmental standards;
- Military and hostile activities;
- Environmental education and capacity building;
- Public participation, access to information and justice; and
- Environmental disaster preparedness and management.

Under Environmental Impact Assessment and Audits (Article 31), the partner states shall:

- Harmonise and adopt common policies, laws and programmes requiring the conduct of EIAs for planned activities and projects which are likely to have significant adverse impacts in the community;
- At an early stage plan for transboundary activities and projects that may have significant adverse environmental impacts, and undertake a comprehensive assessment of the impacts with regards to their own territories and the territories of other partner states;
- Adopt common guidelines on environmental impact assessment in shared ecosystems including the criteria and procedures for conducting environmental assessments for planned activities and projects which are likely to have significant adverse environmental impacts;
- Develop and adopt common guidelines and procedures for periodic environmental audits of the environmental soundness of activities or projects being implemented in the Community.

(c) Protocol for Sustainable Development of Lake Victoria Basin

This Protocol outlines the scope of cooperation and the guiding principles regarding the utilization and management of Lake Victoria Basin by the partner states of Kenya, Uganda, and Tanzania. These principles include equitable and reasonable utilisation of water resources, protection and conservation of the Basin and its ecosystems, sustainable development of natural resources, Environmental Impact Assessment, Environmental Audits, public participation, mainstreaming of gender concerns at all levels of socio-economic development, management plans, and monitoring and precautionary measures. Areas of cooperation relating to the conservation and sustainable utilization of the resources of the Basin include:

- Sustainable development, management and equitable utilization of water resources;
- Environmental protection and management of the Basin;
- Promotion of public participation in planning and decision-making.

The principle of Environmental Impact Assessment requires:

- The partner states shall develop national laws and regulations requiring developers of projects to undertake environmental impact assessment of planned activities, which are likely to have a significant impact on the resources of the Basin;
- The significance of the above shall be determined in accordance with the procedures and guidelines development through a process of public participation by the Secretariat, and approved by the Council;
- Where pursuant to an environmental impact assessment, a partner state determines that a project is likely to have a significant transboundary effect on the resources of the Basin – such a State shall avail to other partner states and the Secretariat, the environmental impact statement for comments;

- In determining whether to approve an environmental impact statement for a project with transboundary effects, the partner state in whose jurisdiction the project is proposed, shall take into account the comments of other partner states;
- A partner state whose views on the environmental impact statement or report are not taken into account may invoke the dispute settlement procedure under Article 46 of this Protocol by notifying the partner state and the Secretariat of its intention.

The principle of Environmental Audits requires:

- The partner states shall adopt policies, laws and regulations within their respective jurisdiction to guide the operator's facilities likely to have a significant impact on the environment in undertaking environmental audits of existing activities;
- The policies, laws and regulations mentioned above shall be developed in accordance with the guidelines developed through a process of public participation by the Secretariat and adopted by the Council;
- The partner states shall harmonize their laws and regulation to conform to the guidelines formulated by the Community.

The principle of management plans requires:

- Each partner state to develop national strategies, plans or programmes for conservation and sustainable use of the resources of the Basin, or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia*, the measures set out in this Protocol, including the development of infrastructure, commerce and trade, tourism, research and development;
- Each partner state to integrate, as far as possible and as appropriate, the conservation and sustainable use of the resources of the Basin into relevant sectoral or cross-sectoral plans, programmes and policies;
- The Commission to develop a management plan for the conservation and sustainable utilization of the resources of the Basin.

3 DESCRIPTION OF THE PROJECT ENVIRONMENT

3.1 Introduction

The proposed project traverses approximately eleven Districts, and a variety of environmental settings. The general topography of the area is quite varied, with two major physical environments being traversed by the project: the Rift Valley and Lake Victoria basins. The regions are also associated with high plant and animal diversity, as well as sensitive ecosystems and endangered plant and animal species.

3.2 Physical Environment

3.2.1 Climate / Meteorology

Climatic features in the project areas, especially the temperatures and rainfall are closely related to altitude changes and with variations induced by local topography. Variations in temperature in the project area mainly depend on the altitude of the location. The floor of the Rift Valley experiences higher temperatures than the highlands, as exemplified by recordings at Naivasha and Nakuru. At Naivasha (1829m asl) the mean monthly temperature has been recorded to range from 15.9 to 17.8^{0}C with a mean of 16.8^{0}C while at Nakuru (1836m asl) the mean temperature ranges from 17.2 to 19.5^{0}C with a mean temperature of 18.2^{0}C. The mean monthly maximum temperatures in the above towns range from 24.6 to 28.3^{0}C and 24.1 to 29.4^{0}C respectively. July is the coldest month, while the hottest is February. As the altitude increases up the Mau Range, the temperatures decrease. Molo, at a high elevation of 2500m asl, has a mean temperature of 13.7^{0}C and a range from 12.7 to 14.7^{0}C, while the mean maximum temperature has been recorded at 20.6^{0}C, with a range of 18.6 to 22.8^{0}C (Jaetzold & Schmidt, 1983).

Other towns located at high altitudes of the project area include Londiani (2317m asl) and Nandi Hills (1999m asl), which experience similar temperatures. However, temperatures are much higher in the lowlands of the Kano Plains than in the highlands described above. Kisumu Meteorological Station (1145m asl) has a mean temperature of 23.1^{0}C and a range from 22.0 to 23.9^{0}C, while the mean maximum temperature ranges from 27.3 to 30.2^{0}C.

The rainfall in the project area is mainly determined by the altitude and the prevailing winds. Generally the floor of the Rift Valley in Nakuru District has lower rainfall than the flanking highlands. Rainfall is low in Naivasha area as shown by recordings of 634mm at Naivasha town (1900m asl) and 807mm at Nakuru Meterological Station (1850m asl). Rainfall increases with increase in altitude to higher amounts of 1177mm as recorded at the Molo Pyrethrum Research Station (2500m asl). Nandi District receives high rainfall, as shown by the rainfall recording of 2024mm at Kaimosi Tea Estate (1767m asl) in Nandi District. Unlike high amounts of rainfall received in Nandi District, rainfall received in Kisumu District, especially in the Kano Plains, is relatively lower. Rainfall in the district shows considerable variations. Mean rainfall varies from less than 1000mm along the shores of Winam Gulf to over 1800mm per annum along the northern boundary.

3.2.2 Geology

The geology of the project area is complex and consists of several geological formations. Around Naivasha area, including Olkaria, the rocks are volcanic with lake and fluvaitile sediments. The volcanic rocks in the area consist of tephrites, basalts, trachytes, phonolites, ashes, tuffs, agglomerates and the acid lava rhyolite, commendite and obsidian. The lake beds are mainly composed of reworked volcanic material or sub-aqueously deposited pyroclistics.

Around Nakuru, the topography was formed by volcanic activities and faulting that created the Great Rift Valley. From Miocene times to the present day, eruptions of lave have taken place at intervals from fissures sources. Volcanic activity occurred in episodes of decreasing magnitude, and each outpouring was succeeded by movement and normal faulting compatible with distension of the earth's crust. Nowadays, the movements are less important, but it is certain that the Nakuru area is situated on an unstable zone and the possibility of recurrence of severe earthquakes still exists. The volcanic rocks of the Bahati escarpment are thought to be the oldest volcanic rocks exposed within the area. The following formations can be identified within the Nakuru area:

- Trachyte flows issued from the Menengai Crater. They are glassy, ropy and blocky (Upper Menengai Series);
- A series of tuffs and pyroclastics, with very few rock exposures in flat areas, except in stream valleys, road cuttings and on the scarps; few of them are on the slope of the crater; and
- A thick overburden of grey volcanic soils and tuff.

In most of the floor of the Rift Valley, the common rocks are basically Quarternary deposits mainly the pyroclastic rocks, which consist of tuffs and ashes. The tuffs are usually medium to pale grey in colour but are sometimes green, yellow, pink or purple, occasionally calcified and brown when weathered. The tuffs are quarried for building purposes in the project area. The lavas are also a main geological feature of the Rift Valley. They range from undersaturated basic rocks (tephrites) to acid rocks (rhyolites and obsidians) with numerous gradations in between.

As one climbs the escarpment, the entire area in Molo and the vicinity (stretching from Njoro through Molo, Mau Summit to Londiani and covering a large extent of the Mau Escarpment) is covered by volcanic rocks ranging in age from Tertiary to Recent and lacustrine and fluviatile sediments derived from them. The bulk of rocks form a succession of pyroclastics, apparently derived from several different sources. Lava flows are less common. The major rocks are phonolites, basalts, trachytes and variable pyroclastics.

Kisumu District mainly consists of rocks and sediments ranging from Nyanzian (Precambrian) to recent times. On the plains, the alluvial deposits and the lacustrine sediments cover the lacustrine and alluvial area of Quaternary sediments lying on the floor of the Kavirondo Rift Valley. To the east, the Kano Plains merge with the volcanic area of Tinderit Hills while to the north are the scarps of the Nandi Hills.

3.2.3 Soils

In conformity with the geology of the area, the soils are also of great variety. They range from the soils developed on the mountains to those developed in the plains, especially on the Rift Valley floor. The basic characteristics are outlined below.

(a) Soils on Lacustrine Plains

These are mainly soils developed on sediments from volcanic ashes and other sediments and cover the areas covered by the Gamblian Lake of Central Rift Valley between Lake Naivasha and Lake Nakuru. The types of soils developed from the above sources are Solonetz, Phaeozems and Cambisols.

By far, soils developed on lacustrine plains are found in Kisumu District around Lake Victoria and especially on the upper level of Kano Plains. They are developed on sediments from lacustrine mudstones. The soils so developed are usually poorly drained, shallow to deep, very dark brown to very dark grey, firm to very firm, slightly sodic, cracking clay. These soils are commonly referred to as Vertisols.

(b) Soils on Flood Plains

Flood plains in the project area are found in the Kano Plains of Kisumu District where pockets of eutric Fluvisols are found. These are a complex of well drained to imperfectly drained, very deep, very dark grayish brown to dark reddish brown, stratified soils of varying consistence and texture.

(c) Soils on Piedmont Plains

A large extent of the Kisumu District is covered with soils developed on alluvium from undifferentiated Basement System rocks. The main soil type developed from alluvium is verto-eutric Planosols. These soils are imperfectly drained, very deep, very dark grey to black, very firm, cracking, gravelly clay to clay, with calcareous deeper sub soil and in places gravely. In addition, there are pockets of other related soil groups which are a complex of moderately well drained to poorly drained, very deep, dark brown to dark grey, firm to very firm, sandy clay to clay, in places stratified, sodic and or cracking. Soils developed under these conditions are Planosols, Gleysols, Solonetz, Vertisols, and Fuvisols.

(d) Soils on Volcanic Plains

These are soils developed on ashes and pumice from recent volcanoes to the west of Lake Naivasha and the west and northwest of Lake Nakuru. They are excessively drained to well drained, very deep, dark greyish brown to olive grey, loose to very friable, stratified, calcareous, fine sand to fine sandy loam or silt. They belong to the class of ando-calcaric Regosols. Other soils found in the volcanic plains include vitric Andosols that are well-drained, moderately deep to deep, brown to dark brown, very friable, loam to sandy clay loam.

(e) Soils on Foot Slopes

In the foot slopes at the border between Kisumu and Nandi Districts are soils developed on the colluvium from undifferentiated Basement System rocks. The soils are a complex of well drained, deep to very deep, dark reddish brown to dark yellowish brown soils of varying consistency and texture, in places gravely and stratified. The major soils developed are ferralic Arenosols, with ferralo-chromic orthic Luvisols.

(f) Soils on Volcanic Footridges

These are soils similar to those developed on the Upper-level Middle Level Uplands. They are developed on Tertiary or older basic igneous rocks such as basalts, nepheline phonolites including basic tuffs. They are mainly Nitosols, which are well-drained, extremely deep, dark reddish brown, friable clay with humic topsoil. They are mainly found in the area extending from Lessos to the area below the Nandi Hills town.

(g) Soils on Hills and Minor Scarps

These soils are developed on undifferentiated Tertiary volcanic rocks including olivine basalts, rhyolites and andesites. They are well drained, shallow, dark reddish brown, friable, very calcareous, bouldery or stony, loam to clay loam and in many places saline. Thes soils are basically Lithosols with calcic Xerosols in bouldery and saline phase and rock outcrops. These types of soils are mainly found in the vicinity of the Olkaria Hills to the south and south west of Lake Naivasha and to the north of Lake Naivasha close to Lake Elmentaita. Around the Eburru Mountains, soils are developed on ashes and other pyroclastic rock or fecent volcanics. They are somewhat excessively drained, shallow dark brown to brown, friable and slightly smeary, rocky and stony clay. These soils are categorized as ando-eutric Cambisols.

In Nandi District, especially at the border with Kisumu District are pockets of soils developed on undifferentiated Basement System rocks, predominantly gneiss and granites. These soils form a complex of excessively drained to well drained, shallow, dark red to brown, friable sandy clay loam to clay and in many places rocky, bouldery and stony and in places with acid

humic topsoil. The soils so formed are basically dystric Regosols with Lithosols and humic Cambisols and rock outcrops.

(h) Soils on Uplands and Undifferentiated Levels

These soils are developed on undifferentiated volcanic rocks mainly basalts. They are well drained, shallow, dark brown, friable, strongly calcareous, stony loam, often strongly saline and moderately sodic with some stone mantle. The soils are characteristic calcaric Regosols. They are associated with the Eburru Mountains located to the west between Lake Naivasha and Lake Nakuru.

(i) Soils on Lower Middle Level Uplands

These are soils that cover extensive areas to the west as you climb the Mau Escarpment in Nakuru District including areas such as Njoro, Elburgon and Molo. They are developed on ashes and other pyroclastic rocks from recent volcanoes. The soils are well drained, deep to very deep, dark reddish brown, friable and smeary, silty clay to clay with humic topsoil. The characteristic soils are mollic Andosols.

(j) Soils on Upper Middle Level Uplands

These soils include those developed on Tertiary or older basic igneous rocks such as basalts, nepheline phonolites including basic tuffs. They are mainly Nitosols, which are well-drained, extremely deep, dark reddish brown, friable clay with humic topsoil. They cover a large extent of the project area between Londiani through Timboroa to Lessos.

In addition, soils developed on the Upper Middle Level Uplands include those developed on quartzites, granites and biotite gneiss. Soils developed from granites are mainly humic Cambisols. They are well drained, very deep, reddish brown to brown, friable, sandy clay loam to clay, with very thick acid humic top soil. Soils developed from granites are mainly humic Acrisols. They are well drained, very deep, dark red, friable dark sandy clay to clay with acid humic top soil. The soils developed from the biotite gneisses are well drained, extremely deep, dark reddish brown, friable clay, with thick humic top soil. The soils so developed are referred to as humic nitosols. The above soils are found in Nandi District South of Nandi Hills.

3.2.4 Hydrology

The project area falls under two drainage systems, the Rift Valley (which covers 22.5% of Kenya) and the Lake Victoria (provides 8% of the country's needs) drainage basins. A map presenting the hydrology of the area is included in Appendix 8 of this report.

(a) The Rift Valley Drainage Basin

The hydrology associated with the Rift Valley drainage system is characterized by internal drainage and generally scarce surface and underground water resources. The principal river in the floor of the Rift Valley drainage basin is River Malewa which drains into Lake Naivasha. The Rift Valley Catchment Area is an inland drainage basin forming a majority of inland Lakes in the country namely; Lake Turkana, Lake Baringo, Lake Bogoria, Lake Nakuru, Lake Elementeita, Lake Naivasha and Lake Magadi.

Lake Naivasha is a remarkable lake in the Rift Valley in that although it is endorheic, it is a fresh water lake with a catchment of 2378 Km^2. The Malewa River has a catchment of 1730 Km^2 and provides 90% of the inflow. The lake also receives water inflow from the seasonal rivers of which the most important are rivers Karati and Gilgil. Ground water seepage, particularly along the north and north eastern shores contributes up to 16% of the total influx.

Lake Nakuru is a saline shallow lake with a maximum depth of 4.5m and a mean depth of 3.5m at high water, and covers an area of 4900ha. There are two perennial affluents, the Nderit and Njoro Rivers, and three intermittent affluents, and no effluent. Most of the runoff comes from the western side of the Rift Valley. All but one affluent comes from the Mau

Escarpment. There are alkaline springs along the north, northeastern and eastern shores of Lake Nakuru.

Lake Elementaita is a shallow saline lake covering an area of 1800ha with a maximum depth of 1.9m. The lake is fed by a small stream from the eastern plateau which enters at the north end of the lake, and there is no outlet.

Overall, the Rift Valley Catchment Area has an estimated population of 4 million people, and thus faces enormous challenges in management of its limited water resources. The Catchment area covers a total area of approximately 130,452Km^2. The magnitude of issues, challenges and severity of the water crisis that currently face the Rift Valley Catchment Area cut across most sectors of the socio- cultural and economic background, making water resources management a high priority.

The major sources of water are both surface and ground water. Rainfall patterns within the Catchment are extremely variable not only spatially and temporary, but also in terms of rainfall intensities. This makes the natural flows of water in the water courses highly variable in space and time. Catchment degradation has caused reduced infiltration, increased flash floods, soil erosion and siltation in the reservoirs which undermines the limited available water resources in the Catchment. The main causes of catchment degradation have been deforestation, encroachment of water sources and population pressure. This has invariably affected surface water availability and ground water recharge.

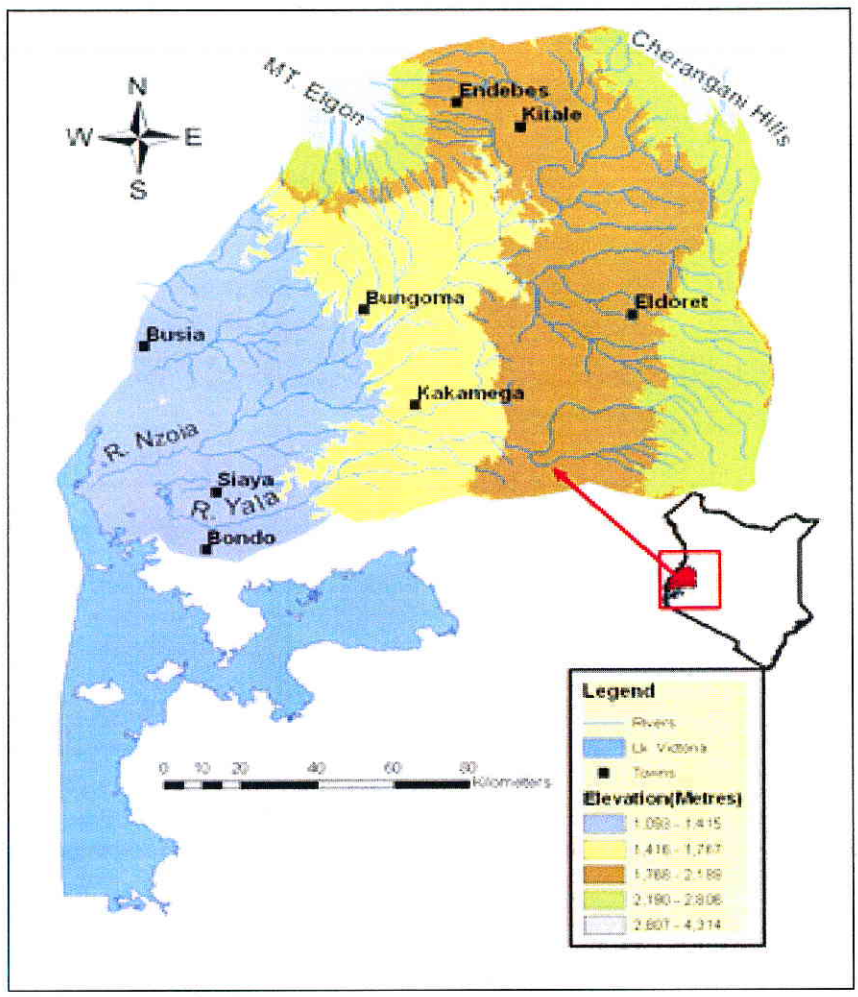
The quality and quantity of water in some parts of this region have been adversely affected due to over-abstraction of surface water, inappropriate land use practices, soil erosion and encroachment of riparian lands. Other major pollutants of our water bodies are effluent discharge from urban centers, sewage outfalls, excessive nutrient and agro-chemicals from rural sources. An example of the negative impact is the dramatic reduction in depth of Lake Baringo, from over 15 metres in 1921 to an average of 1.8Metres today, which is due to reduced inflows and increased sediment load from surrounding unprotected and degraded catchments.

The hydrometric network, data recording, reporting systems for monitoring and access to river flows had deteriorated and could no longer support adequate assessment of water resource base of the catchment. Also the monitoring of groundwater in term of quality and quantity had not been given the necessary attention it deserved. The Rift Valley Catchment Area has also the responsibility of some of the trans-boundary waters. This includes Lake Turkana (Ethiopia), Suam River (Uganda) and Ewaso Ngiro South, (Tanzania). The major sources of rivers within the catchment are Mau, Cherangani, Elgon and Aberdare Water Towers.

(b) The Lake Victoria Drainage Basin

The largest water body associated with the project area is Lake Victoria. This is a large lake that connects the three East African states of Kenya, Uganda and Tanzania. The Lake Victoria Catchment Area comprises of 18 districts namely: Kakamega, Bungoma, Busia, Butere, Mumias, Teso., Mt Elgon, Vihiga, Lugari, all in western Province; Trans Nzoia, Marakwet, Uasin Gishu, Keiyo, West Pokot, Nandi North and Nandi South all in Rift Valley Province in addition to Siaya and Bondo in Nyanza Province.

Figure 3-1: Map showing the Lake Victoria drainage basin



In terms of surface area, Lake Victoria is the 3rd largest lake in the world. The lake covers an area of 6,889,000ha, of which 413,340ha are in Kenya. Several rivers in the project area drain into Lake Victoria. They include the Nyando, Sondu, Kibos and Awach/Nyangori rivers and their tributaries. These rivers have their headwaters originating from the western flanks of the Rift Valley. The Nyando has its source near Mt. Tinderit (2464m asl) while the Sondu River rises in the dip (western) slopes of Mau Escarpment. Other important rivers have their main sources in the Nandi Hills and flow sough through Nyando Escarpment to Lake Victoria as a single river called Nyamasaria through the Kano Plains. Due to the flat nature of the lacustrine plains, the above rivers form extensive swamps in the lower reaches as they enter the lake.

3.2.5 Topography

The study area generally falls within the Rift Valley and the Lake Victoria Basin. The general topography of the area is quite varied. There are four major topographical features associated with the study area. They include the Rift Valley floor, the Mau Escarpment, the Nandi Hills and Escarpment, and the Kano Plains.

(a) Rift Valley Floor

The Rift Valley shows a great variety of topographical features caused by earth movements. They include craters, remnants of pre-existing craters, fault scarps, fissures and steam jets. There are several lakes in the Rift Valley floor including Lakes Nakuru, Naivasha and Elmentaita. In addition, there are extinct volcanoes that rise above the volcanic plains and uplands. These include Menengai, Longonot and Suswa. East and west of the plains, there

are Mau and Kinangop escarpments respectively that mark the transition to higher plains and footridges.

(b) Mau Range

Mau Range is one of the most important topographical features in the project area. It is an imposing scarp that rises to over 3050m asl. The Mau Range forms the western wall of the Rift Valley. The southern part of the Mau Range is situated between Nakuru and Narok Districts, while the northern part lies in Kericho and Nandi Districts.

(c) Nandi Hills and Escarpment

The physiography of the major part of Nandi District may be described as undulating upland. The district has a hilly topography and a high altitude, which ranges from 1525 to 2135m asl. The main topographical features include the rolling hills in the west, the Kapsabet Plateau and the Nandi Escarpment, which descends steeply to the Kano Plains in Kisumu District.

(d) Kano Plains

The Kano Plains cover most of Kisumu District. They are situated in a down warped part of a large lowland surrounding the Winam Gulf of Lake Victoria, the third largest fresh water lake in the world. The Kano Plains comprise a flat tract of land, which is at altitudes between 1300 and 1135m asl. The plains have flat to very gently undulating topography with slopes of 0-3%. Occasionally, the plains are broken by low ridges and rivers. To the north, the Kano Plains are bound by the Nandi Escarpment, which steeply rises from the Kano Plains reaching an altitude of over 1800m asl. The landscape in this area is gently undulating and underlain by granitic and basement complex rocks, which weather to give deep, well-drained, moderately fertile soils.

3.3 Biological Environment

3.3.1 Flora

The natural vegetation of the project area has been substantially disturbed by human activities. Natural vegetation is currently found in the protected forest reserves and the national parks. Most of the land in the project area is used for human settlement, urban development, small and large arable farming, ranching, floriculture and other land uses. What has remained of the natural vegetation is basically a mosaic of various vegetation types interspersed with human settlement and farmlands. Most prominent remnants of vegetation in the project area are forests, woodlands, bush lands and wetlands (see Appendix 10).

Within the Lake Victoria region, not much information is recorded for this area, except for the adjacent Nandi Escarpment, which has some recordings of rare species, and interesting vegetation. This area is a mid-elevation forest lying not far from Kakamega forest an Important Bird Area (IBA). Sensitive habitats in this area include South Nandi Forest, as well as Kimondi and Sirua rivers, all which drain into the river Yala, a major catchment of L Victoria. Biogeographically, South Nandi is often considered an eastern extension of Kakamega. In effect, South Nandi is transitional between the lowland forests of West and Central Africa (the easternmost outlier of which is Kakamega) and the montane forests of the Central Kenya highlands.

(a) Woodland

This is land supporting a stand of trees up to 20m in height with an open or continuous but not thickly interlaced canopy. The woodland vegetation in the project area is rare. A good representation is however, found around Lake Naivasha area especially to the north. This woodland is dominated by the fever tree (*Acacia xanthophloea*) with trees up to 35m tall.

Sixteen species of trees and shrubs were identified within the vicinity of the line, a fraction of which will be directly affected by the new electricity line (see Appendix10).

Of the species observed the following occur along the ROW and will have to be cleared. None of the species has been listed as endangered or rare by the IUCN Red Data Species book, so their clearing will have no adverse effect to ecology. These include:

- Common Acacia (*Acacia drepanolobium*);
- Hottentot tobacco (Leleshwa) - *Tarconanthus camphorates;*
- Kikuyu grass (*Pennisetum clandestinum*);
- Couch grass (*Digitaris macroblephara*);
- Natal thatching grass (*Hyparrhenia filipendula*);
- *Senna didymobotya;*
- Hibiscus fuscus;
- Kangaroo grass -*Hyparrhenia filipenda;*
- Bermuda grass (*Cynodon dactylon*);
- Candelabra tree (*Euphorbia candelabrum*);
- *Hypoestes forskailii*

Along the line between Hells Gate, all the way through the vicinity of Moi- South Lake, to the Naivasha Substation, the Delamere farms as well as Eburru to Elementeita, a few tree species lie within the ROW and will need to be cleared. Most of the area affected is Tarconanthus camphoratus bush and grassland. Others include:

- *Acacia drepanolobium;*
- Kangaroo grass -*Hyparrhenia filipenda;*
- Couch grass (*Digitaris macroblephara*);
- *Cotyledon barbeyi;*
- Bermuda grass (*Cynodon dactylon*);
- *Eucalyptus spp;*
- *Grevillea robusta;*
- Kikuyu grass (*Pennisetum clandestinum);*
- *Senna didymobotya;*
- *Hibiscus fuscus;*
- *Hypoestes forskailii;*
- Brown Acacia (*Acacia xanthophloea*)- a few stands near the Lord Delamere estates;
- *Tarconanthus camphoratus*

The Lake Elementaita/ Soysambu area is mainly grassland, *Tarconanthus camphoratus* bush vegetation. A few trees will also be affected by the line, among them

- *Albizia gummifera ;*
- *Podocarpus latifolius;*
- *Acacia seyal;*
- *Balanites aegyptica;*
- *Acacia drepanolobium;*
- *Euphorbia candelabra;*
- *Acacia xanthophloea*

Plant and grass species observed along the line, within the Rongai/ Nakuru/ Nakuru Lake Forest areas include those stated below. Most of these may however not have to be cleared because they are short and bushy, and do not exceed the required height for the conductors:

- *Cyperus laevigatus;*
- *Typha domingensis;*
- *Eucalyptus saligna;*
- *Grevillea robusta;*
- *Euphorbia candelabrum;*

- *Cussonia holstii;*
- *Tarchonanthus camphoratus*
- *Sporobolus spicatus;*
- *Themeda triandra;*
- *Digitaria abyssinica;*
- *Cynodon nlemfuensis;*
- *Hyparrhenia hirta;*
- *Lippi a ukambensis;*
- *Lantana trifolia*

Within the ROW in Nabkoi forest and Nandi Escarpment, not many mature tree species were encountered that have to be cleared. *Cuppressus lusitanica* and *Juniperus procera* that are mainly exotic were most abundant. Among them were sedges and papyrus reeds, together with the following

- *Balanites aegyptica;*
- Papyrus (*Cyperus papyrus*);
- Sedges (*Cyperus immenses*);
- Cattails (*Typha domingensis*);
- Reeds (*Phragmites mauritianus)*;
- East African doum palm (*Hyphaene compressa*);
- Tamarind (*Tamarindus indica*)

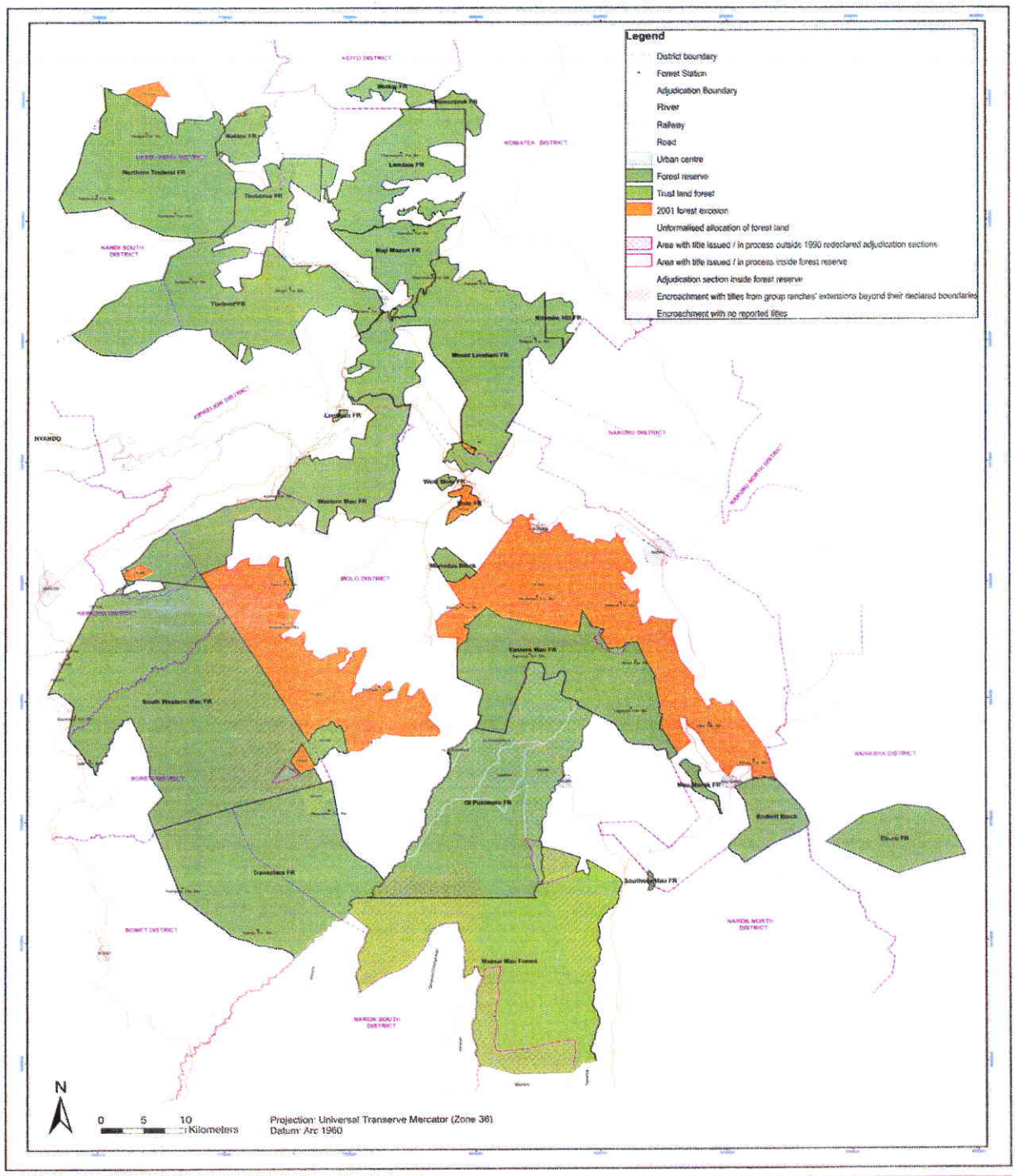
(b) Mau Forest Complex

Forests that constitute the complex include Transmara, Ol Posimoru, Maasai Mau, Eastern Mau, Mau Narok, South West Mau, Western Mau, Mt. Londiani, Eburru, Molo and South Molo. The northern part comprises Tinderet, Northern Tinderet, Timboroa, Nabkoi, Kilombe Hill, Metkei, Maji Mazuri, Chemorgok and Koibatek (Lembus) forest (See Fig 3-2 and Appendi 9.4).The above forests form the largest closed-canopy forest ecosystem of Kenya. Before the disputed 2001 excisions, the Mau Complex forests covered some 420,851 hectares, an area as large as the forests of Mt. Kenya and the Aberdares.

Within the Mau, only a small number of forests will be directly affected by the new electricity line. These include Koibatek, Eburru, South Mau and Maji Mazuri. Most of these forests comprise of exotic tree species such as Cuppressus lusitanica and Juniperus procera, therefore biodiversity loss shall be minimal. Along the proposed ROW, a few other tree species will be affected, especially within the Eastern Mau (Londiani Forest, Mount Londiani Forest, Timboroa Forest, Nabkoi Forest, and N. Tinderet Forest). Of the other tree species to be affected, only *Olea capensis* and *Prunus africana* are priced though not endangered. Other tree species include:

- *Cuppressus lusitanica;*
- *Strombosia scheffleri;*
- *Syzygium guineense;*
- Yellow wood

Fig 3-2 Mau Forests Complex Map



Map prepared by Survey of Kenya
with support from Kenya Forest Service and Kenya Wildlife Service

Data sources: Ministry of Lands and Ministry of Forestry and Wildlife

Date: September 2008

Map endorsed by:

On behalf of Survey of Kenya	On behalf of Kenya Forest Service
Name: Mr. E. M. Murage Position: Director of Surveys	Name: Mr. David K. Mbugua Position: Director, Kenya Forest Service
Signature:	Signature:
Date:	Date:

The Mau forest complex is the largest of the five "water towers" of Kenya, the others being Mt. Kenya, Aberdares, Cherangani Hills and Mt. Elgon. The Mau Complex forms part of the upper catchments of all (but one) of the main rivers on the west side of the Rift Valley, including Nzoia, Yala, Nyando, Sondu, Mara, Ewaso Ngiro (south), Naishi, Makalia, Nderit, Njoro, Molo and Kerio (Figs 3-3a and 3-3b). Through these rivers, the Mau Complex feeds major lakes, including Victoria, Turkana, Baringo, Nakuru and Natron, of which three are cross-boundary lakes. The Marmanet forests are catchments for four rivers: Ewaso Nyiro (north); Mukutan, Ol Arabel and Sandai. Those rivers drain into two lakes, Baringo and Bogoria, and into one major swamp: Lorian Swamp. This makes Mau a very important resource for Kenya.

Fig 3-3a: Mau Complex water catchments

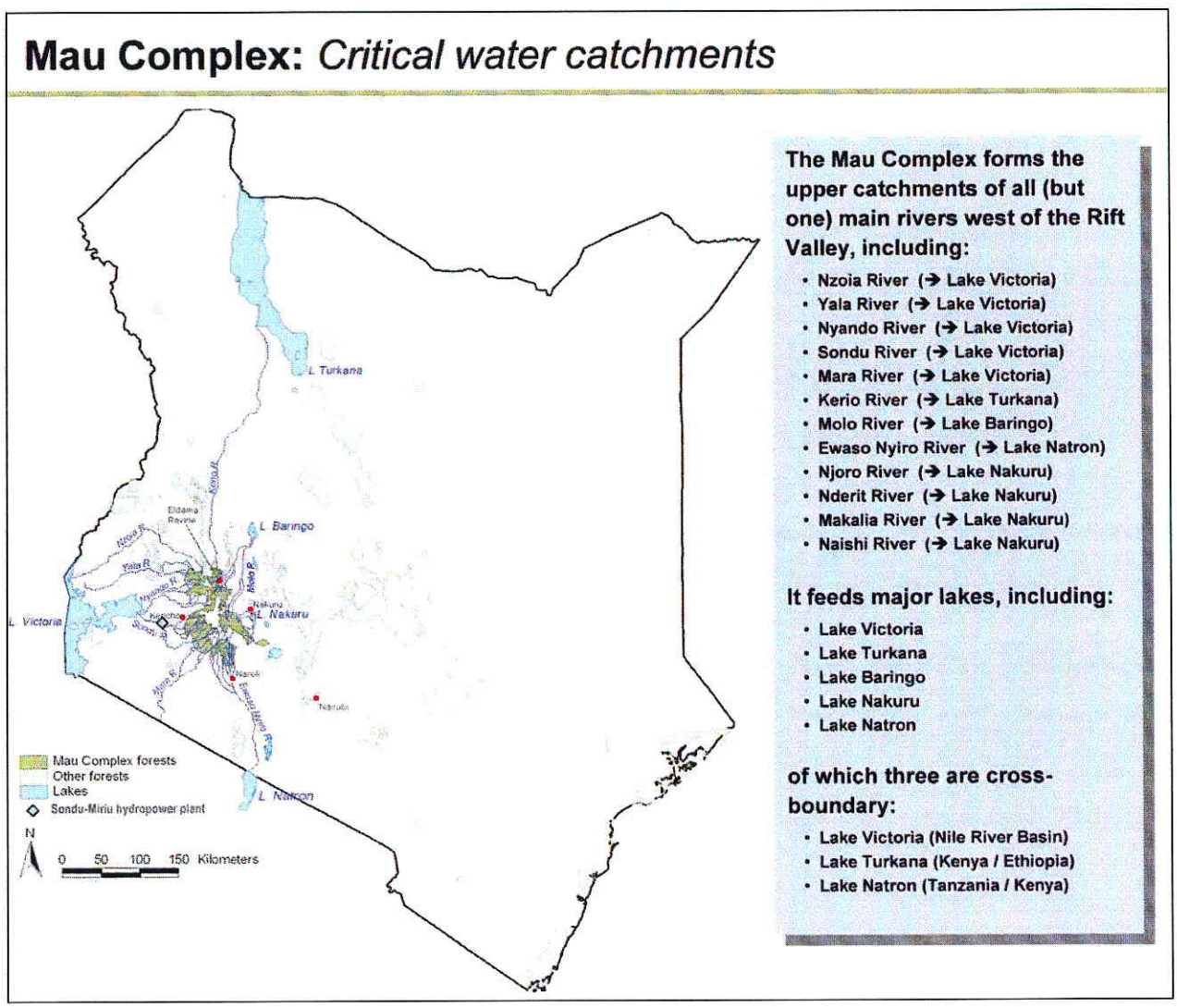
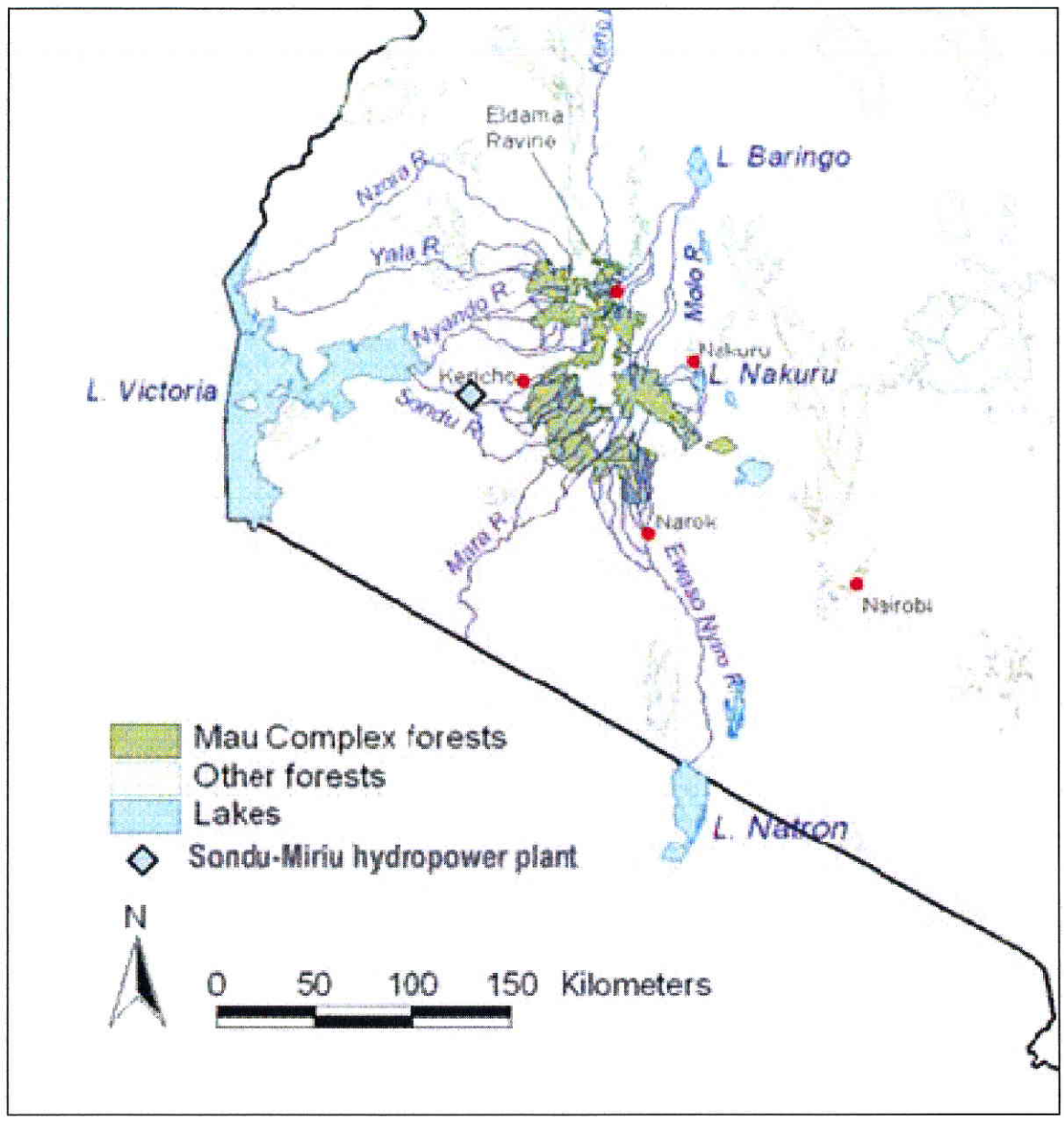
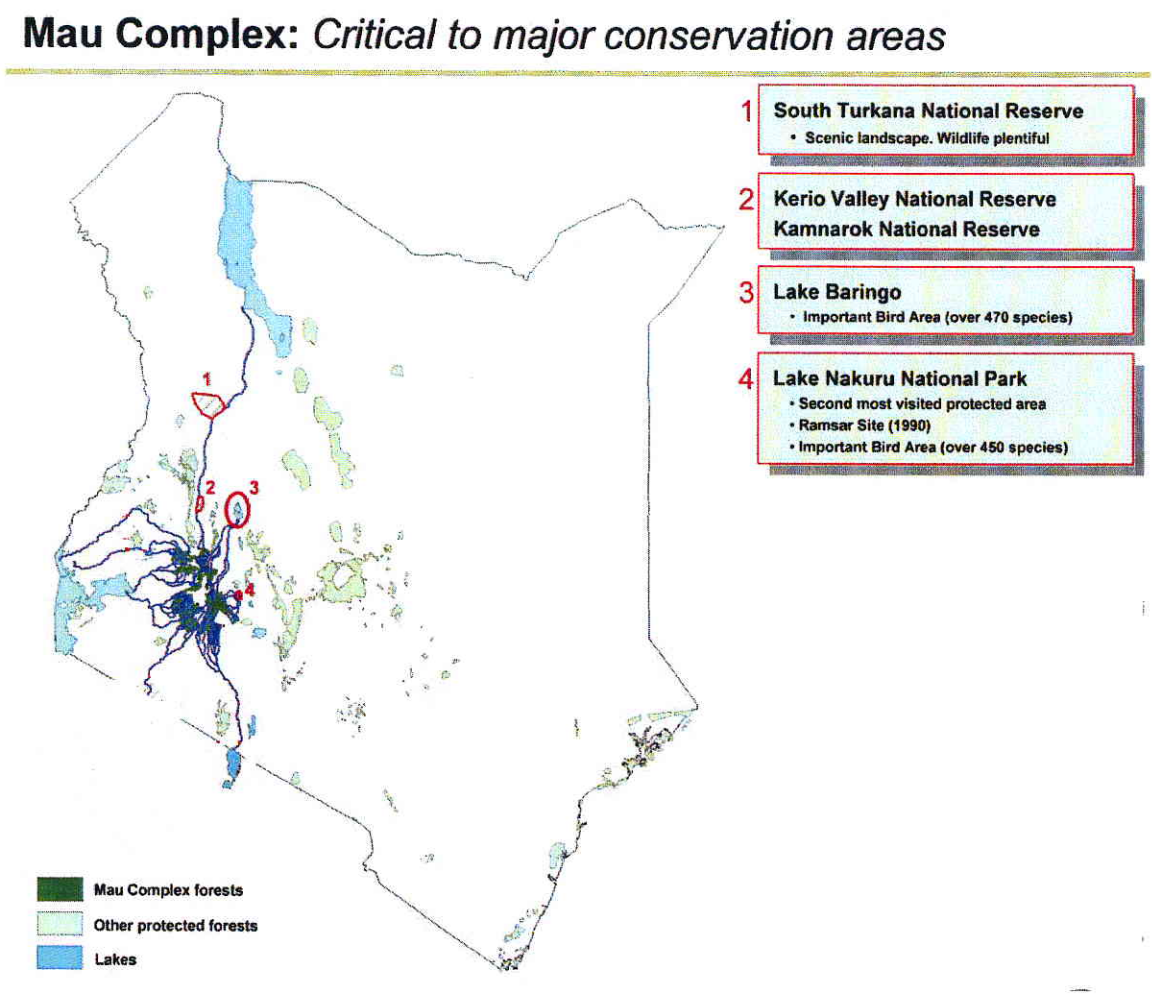


Fig 3-3b: Mau Complex water catchments



The Mau forest complex covers a substantial area of the southwestern area of the highlands of Kenya, and probably represents the largest remaining near continuous block of montane forest in Eastern Africa. Vegetation patterns are complex but there is a broad altitudinal zonation from west of east. The lower montane forest below (2,300m asl) gives way to thickets of green mountain bamboo, mixed with forest and grassland and finally to montane Scirophyllous forest near the escarpment crest. The lower montane forest is in the best condition in the southwestern Mau Nature Reserve, where characteristic trees include *Aningeria adolfi friedericii* and *Strombosia scheffleri*. Other trees include *Polyscias kikuyuensis*, *Syzygium guineense*, Neoboutonia macrocalyx, *Olea capensis; Prunus Africana*, red nongo (*Albizia gummifera*) and yellow wood. The Mau Forest Complex is also critical to major conservation areas (Fig 3-4) such as the South Turkana National Reserve, Kario Valley National Reserve, Lake Baringo and Lake Nakuru National Park.

Fig 3-4: Mau Complex major conservation areas



Alternative 1 of the proposed transmission line would cut through the Nakuru Lake forest, Londiani Forest, Mount Londiani Forest, Timboroa Forest, Nabkoi Forest, and N. Tinderet Forest. The total forest area covered by this alternative is 113ha. Alternative 2 of the proposed transmission line, on the other hand, would cut through East Mau Forest, the Mau Forest, the West Mau Forest, and the Tinderet Forest. The total forest area covered by this alternative is 327ha (See Appendix 9). Northern Tinderet, Timboroa and Mount Londiani forests are plantation forests, specifically *Juniperus procerus* & *Cupressus lusitanica,* while Nakuru Lake, part of Mt. Londiani and Nabkoi forests are indigenous.

3.3.2 Bushland

During the field study, a large expanse of bushland community was encountered mainly within the Rift Valley (Naivasha, Elementaita, Nakuru area). Most of the area to be affected by the ROW within Hells Gate National Park comprises of *Acacia drepanolobium* and Tarchonanthus *camphoratus* bushes. The lower slopes of the Mau Escarpment had the red thorn (*Acacia lahai*) bushes. Other common grasses in the bushland community of the project area include kangaroo grass, *Hyparrhenia filipenda*, Bermuda grass (*Cynodon dactylon*), Kikuyu grass (*Pennisetum clandestinum*), and couch grass (*Digitaris macroblephara*) among other grasses. Kangaroo grass is widespread in the entire project area. This is a dominant perennial grass averaging a metre in height. It is found mainly among the fire induced plant communities where it is associated with other grasses including natal thatching grass (*Hyparrhenia filipendula*).

In the Kano plains of the project area remnants of bush land vegetation are dominated by Shittim wood *Acacia seyal* and *Balanites aegyptica*. The climax vegetation of this area has been modified by human activities to the extent that what now remain are scattered thorny woodlands and an occasional candelabra tree *Euphorbia candelabra.* Generally the new electricity line will not adversely affect the bushes because the maximum allowable distances from the bushes and the conductors will not be reached.

3.3.3 Fauna

Wildlife near the project area is generally quite low due to human influence. However in the protected areas and in areas where land use ranching is compatible, wildlife is present in significant numbers. Most of the wildlife near the project area is found in the Hell's Gate National Park and Lake Naivasha area, Lake Elementeita, Soysambu Wildlife Sanctuary, Lake Nakuru National Park, Koibatek Forest Reserve and Mau Forest Reserve. A map presenting some of the conservation areas near the proposed project is included in Appendix 9.6 of this report.

(i) Hell's Gate National Park, Lake Naivasha, and adjacent ranches

Hell's Gate National Park, the area around Lake Naivasha including private ranches and the wildlife sanctuaries have significant wildlife populations. The National Park is an important protected area known for its wildlife and scenic beauty. It is a suitable habitat for large herds of Zebras (*Equus burchelli*), Kongoni (*Acelaphus buselaphus*), Gazelles (*Gazella thomsonii* and *Gazella grantii*), Impalas (*Aecpyceros melampus*), Dik dik (*Rhyncotragus kirkii*), Giraffe (*Giraffa camelpardis*) and Buffalo (*Syncerus caffer*) among other wildlife species. Lake Naivasha is in close proximity to Hell's Gate National Park and supports large populations of the hippopotamus (*Hippopotamus amphibious*). Around the lake there are now several private animal sanctuaries that have been established for the protection of wildlife and promotion of tourism.

Lake Naivasha is known for its varied bird life. The lake supports a diverse water bird community with more than 80 species regularly recorded during censuses. There are large concentrations of Fish Eagles (*Hallaeetus vocifer*), Kingfishers (*Ceryle rudis* and *Alcedo cristata*), sacred ibises (*Threskiornis aethiopicus*), and coots (*Fulica cristata* and Ducks (*Anas spp*). Several bird species are threatened. This includes the Great Crested Grebe, the African Darter, Great Egret, and Saddle - billed stork, White-backed Duck, the Baillon's Crake and African Skimmer.

During the study, specific fauna species observed include:

- Kongoni (*Acelaphus buselaphus*);
- Thompsons Gazelle (*Gazella thomsonii*);
- Grants Gazelle (*Gazella grantii*);
- Impalas (*Aecpyceros melampus*);
- Dik dik (*Rhyncotragus kirkii*);
- Warthog;
- Waterbuck

Avifauna species observed included:

- Fish Eagle (*Hallaeetus vocifer*);
- Kingfisher (*Alcedo cristata*);
- Sacred ibises (*Threskiornis aethiopicus*);
- Coots (*Fulica cristata*);
- Ducks (*Anas spp*);
- Great Crested Grebe;
- African Darter, Great Egret;
- Saddle - billed stork;

- White-backed Duck;
- Baillon's Crake;
- African Skimmer

(ii) Lake Elementaita and Soysambu Conservancy

Lake Elementeita and the north and west of the lake which forms part of the Soysambu Wildlife Sanctuary (part of the Delamere Estate) are an important wildlife area. There are populations of large mammals including an introduced population of Rothschild's Giraffe (*Giraffa camelopardalis rothschild*), Zebra (*Equus burchelli*), Thompson's and Grant's gazelles (*Gazelle thomsonii* and *Gazella grantii*) and Impala (*Aecopyceros melampus*).The Kenya Horned viper (*Bitis worthingtonii*), endemic to the central Rift Valley above 1500m, is also found in this area.

Lake Elementeita is an important site for resident and migratory bird species. The lake holds important populations of greater and lesser flamingoes and pied Avocet. At least 49 wild bird species are recorded including 10 pale-arctic migrants. The lake is a host to large numbers of Greater White pelicans. The pelicans move daily to Lake Nakuru to feed. This area is rich in bird life and 400 species have been recorded, particularly the raptors. Globally threatened species including the lesser flamingo, Grey-crested Helmet-shrike and Jackson's widowbird are also found here. The regionally threatened species include Greater Crested Grebe, Great Egret, White-headed Vulture, Ayre's Hawk Eagle, African Crowned Eagle, Martial Eagle, Yellow-billed Oxpecker and Long-tailed Wild bird.

Fauna observed during the field visit include:

- Rothschild's Giraffe (*Giraffa camelopardalis rothschild*);
- Zebra (*Equus burchelli*);
- Thompson's Gazelle (*Gazelle thomsonii*);
- Impala (*Aecopyceros melampus*);
- Grant's gazelles (*Gazella grantii*)

Avifauna observed during the field visit include:

- Greater flamingo;
- Lesser flamingo;
- Pied Avocet;
- Greater White pelican;
- Grey-crested Helmet-shrike;
- Jackson's widowbird;
- Greater Crested Grebe;
- Great Egret;
- Mourning Dove;
- Cattle Egret;
- White-headed Vulture;
- Ayre's Hawk Eagle;
- African Crowned Eagle;
- Martial Eagle;
- Yellow-billed Oxpecker;
- Long-tailed Wild bird.

(iii) Lake Nakuru National Park

Lake Nakuru is a designated national park and a Ramsar site, meaning it is an important wetland with great biodiversity significance. Lake Nakuru exhibits a wide variety of plants, with over 550 plant species, from 85 families. The sedge marshes are waterlogged areas with alluvial deposits. They are regularly flooded, except during the dry season. Vegetation is dominated by *Cyperus laevigatus*, a salt-tolerant sedge, and *C. dichrostachys*. The floodplain grasses are also seasonally flooded. The flood plain is colonised by alkaline grasses, such as

Sporobolus spicatus and *Cynodon dactylon*. These grasses are interspersed by sand bars and muddy shorelines with patches of sedges. The swamps are found where freshwater seeps into the lake, at river mouths, and around the springs on the northern shore. The dominant swamp plants are *Typha domingensis*, *Cyperus immensus* and *C. laevigatus*. Riverine vegetation is rich, with dense undergrowth. It consists mainly of trees such as *Acacia xanthopoea* and *Dombeya burgessiae*, and several shrub species.

The National Park is an important sanctuary for the Black Rhinoceros (*Diceros bicornis*) and the square lipped (white) Rhinoceros (*Ceratotherium simum*), the latter introduced from South Africa. Rothschild's Giraffe (*Giraffa camelopardalis rothschild*) was introduced into the park in 1977. Other large mammals protected in the park include Bohor reedbuck (*Redunca redunca*), Defassa waterbuck (*Kobus ellipsiprymnus*), Bushbuck (*Tragelaphus scriptus*), lion (*Panthera leo*), spotted hyaena *(Crocuta crocuta*) and Cheetah (*Acinonyx jubatus*).

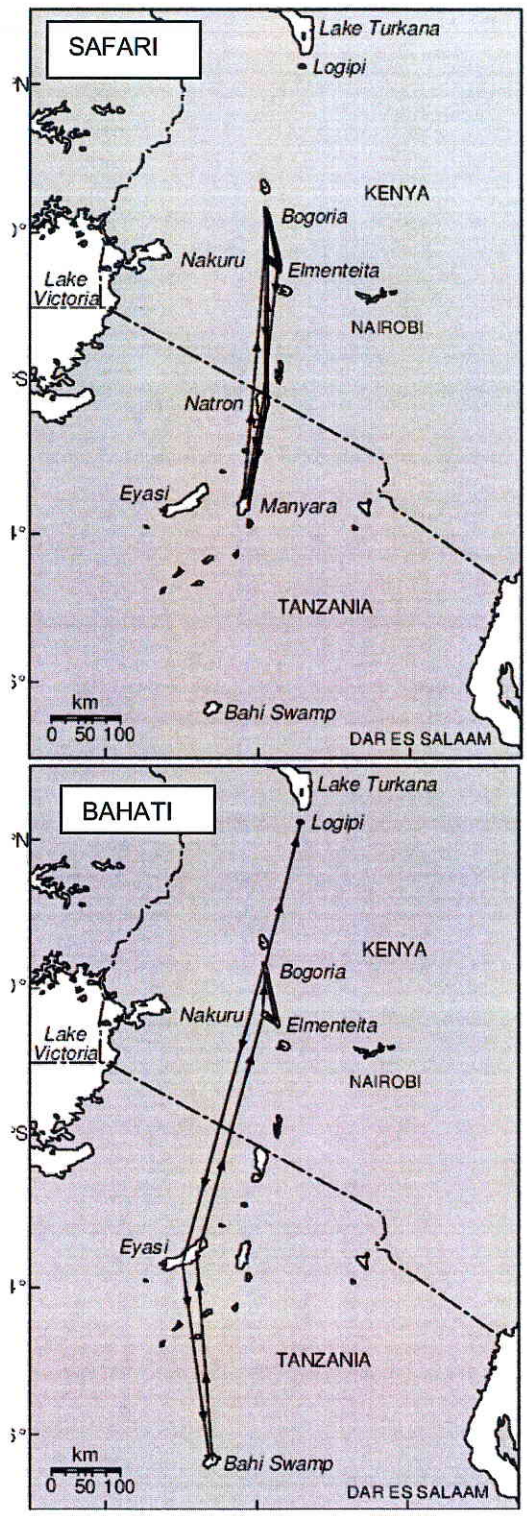
Lake Nakuru is also rich in bird life and some 450 bird species have been recorded in and around the lake. It has a surface area of approximately 40 to 50 Km^2 and a depth of approximately one to two meters. The lake catchment, which is approximately 1600 Km^2, is bounded by the Menengai Crater to the north, the Bahati Hills to the north east, the Lion Hill Ranges to the east, the Eburru crater to the south, and the Mau escarpment to the west. The Lake is internationally famous for its populations of lesser flamingoes which can reach 1.5 million at times. The foundation of the park's food chains is the cyanophyte *Spirulina platensis*, which can support huge numbers of lesser flamingo. It has no outflowing river, and its water level is mainly controlled by the balance between inflows from rivers, groundwater (springs) and precipitation, and outflows by evaporation and infiltration. The globally threatened Grey-crested Helmet shrike is resident in the Acacia woodland around the lake. Regionally threatened bird species include the Greater Crested Grebe, Maccao Duck, Great Egret, Martial Eagle, and African Skimmer and long tailed Widowbird. Other waterbirds include *Pelecanus onocrotalus*, *P. rufescens*, *Tachybaptus ruficollis*, *Phalacrocorax carbo*, *Bubulcus ibis*, *Mycteria ibis*, *Leptoptilos crumenifrus*, *Aythya erythropthalms* and many other species, like waders and gulls. In addition, the park's grasslands, escarpments and cliffs provide habitat for terrestrial birds and birds of prey like *Kaliaeetus vocifer* and *Aquila verreauxi*.

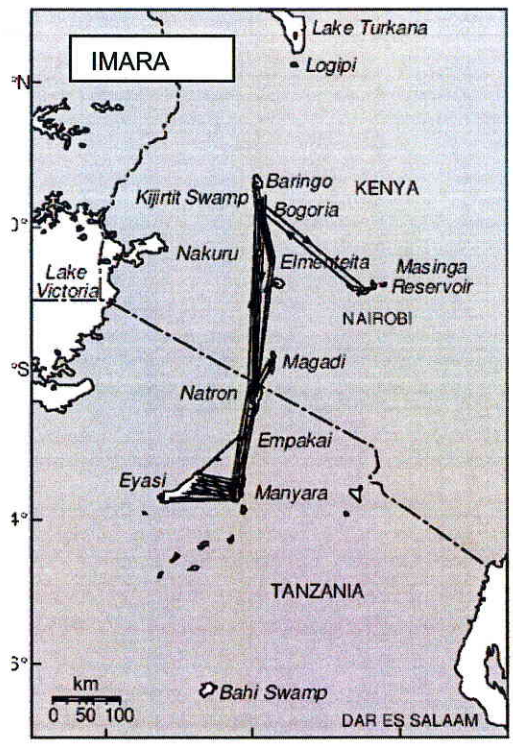
(iv) Bird Migratory Routes

The Great Rift Valley lakes include Turkana, Longipe, Bogoria, Baringo, Solai, Naivasha, Magadi, Elementaita and Nakuru. Lakes Baringo and Naivasha are freshwater lakes, the others being alkaline, and serve as important waterfowl habitats. According to a waterfowl census conducted on July 2009, the most abundant species in the freshwater lakes include the lesser flamingo (*Phoeniconaias minor*), the great white pelican (*Pelecanus onocrotalus*), and little grebe (*Tachybaptus ruficollis*). Lake Nakuru had the largest number of waterbirds, mainly the lesser flamingos and the great white pelicans, followed by Lake Bogoria. Lake Elementaita is the breeding area for the great white pelican in East Africa.

Due to the proximity of the lakes within the central rift valley (Bogoria, Baringo, Solai, Naivasha, Elementaita and Nakuru), there is constant migration by birds between them, as evidenced by the study conducted by Childress *et* al (2004), with key findings presented below:

Fig 3-5: Movements of 3 individual lesser flamingos between October 2002 and July 2003 (Childress *et* al, 2004)





SAFARI: During the nine-month study, (15 October 2002–14 July 2003), Safari made 16 inter-lake flights, visited five different lakes, spending a mean 16 days at each stop and travelling 1,866 km.

BAHATI: During nine months of tracking him (18 October 2002–17 July 2003), Bahati made 12 inter-lake flights, visited six different lakes and wetlands, spent an average 20.9 days at each stop, and travelled a total of 1,917 km.

IMARA: During the first 101 days, Imara travelled 4,792km moving among nine different lakes 44 times. The mean time spent at each was only 2.3 days. Following this initial period of frenetic activity, Imara seemed to settle and began spending much longer periods at many of his stops. During the remaining 171 days of the pilot study, he travelled 1,307km moving among six different sites 15 times, spending an average 11.4 days. Overall, he visited 11 different lakes and wetlands, many several times, between Lake Baringo in Kenya and Lake Eyasi in Tanzania (500km). In total, his inter-lake flights covered 6 099 km.

(v) Mau Forest Reserve

Mammals of the Mau forest complex include the rare Yellow-backed Duiker (*Cephalophus silvicultor*, the African golden Cat (*Felis aurate*) and the sparsely distributed Mountain fruit bat (*Stenonycteris lanosus*). Other animals include the African elephant (*Loxondonta africana*), Bongo (*Tragelaphus eurocerus*) and Giant forest Hog (*Hylochoerus ascanius*) are abundant in the mau forest. The Potto (*Perodicticus potto*) also occurs in the Mau Forest complex.

The Mau forest generally has a rich highland bird community, characteristic of central Kenya highlands but with some western affinities, and is ranked second among the forests west of the Rift Valley. The Mau forest holds one of the richest examples of a central East African montane avifauna, and its size means that populations of most species are likely to be viable. Forty nine of Kenya's 67 Afro-tropical Highland biome species are known to occur in Mau forest. A number of species of regional conservational concern occur here as well as regional endemics such as Hartlaub's Turaco and the restricted range Hunter's Cisticola and Jackson's Francolin. Regionally threatened bird species in this forest include Ayre's Hawk Eagle, African Crowned Eagle, Cape Eagle Owl, Red-chested Owlet, Least Honey Guide, Grey-winged Robin and Purple throated Cuckoo-shrike.

Fauna species observed during the field study include:

- Yellow-backed Duiker (*Cephalophus silvicultor*);
- Golden Cat (*Felis aurata*);
- Mountain Fruit Bat (*Stenonycteris lanosus*);
- Elephant (*Loxodonta africana*);
- Bongo (*Tragelaphus euryceros*);
- Giant Forest Hog (*Hylochoerus meinertzhageni*);
- Black-and-white (*Colobus Colobus guereza*);
- Blue Monkey (*Cercopithecus mitis*);
- Redtailed Monkey (*C. ascanius*);
- Potto (*Perodicticus potto*)

Avifauna observed during the field study within the Mau forest complex include:

- Hartlaub's Turaco;
- Hunter;s Cisticola;
- Jackson¹s Francolin;
- Ayres's Hawk Eagle;
- African Crowned Eagle;
- African Grass Owl;
- Cape Eagle Owl;
- Red-chested Owlet;
- Least Honey Guide;
- Grey-winged Robin;
- Purple throated Cuckoo-shrike.

(vi) Lake Victoria Region

The Nandi Escarpment is certainly the most important site in the world for the threatened *Eremomela turneri*. The area supports exceptionally high densities of this little-known species (around 0.27 groups/ha, equating to 1.1 birds/ha), and an estimated population of 13,000 birds. The avifauna is mainly Afro-montane, but with strong western affinities. There is so far no comprehensive bird list, but a survey in 1996 recorded 111 species of forest birds, including 47 forest specialists. Regionally threatened species include *Stephanoaetus coronatus* (uncommon resident), *Glaucidium tephronotum* (status unknown), *Indicator conirostris* (local and uncommon), *Indicator exilis* (local and uncommon), *Kakamega poliothorax* (scarce and very local), *Sheppardia polioptera* (local and uncommon), *Dyaphorophyia concreta* (scarce) and *Hyliota australis* (uncommon).

Other bird species include:

- *White-spotted Flufftail (Sarothrura pulchra)*;
- Red-chested Owlet (*Glaucidium tephronotum*);
- Blue-headed Bee-eater (*Merops muelleri*);
- Black-and-white-casqued Hornbill (*Bycanistes subcylindricus*);
- Yellow-spotted Barbet (*Buccanodon duchaillui*);
- Yellow-billed Barbet (*Trachyphonus purpuratus*);
- Buff-spotted Woodpecker (*Campethera nivosa*);
- African Shrike-flycatcher (*Megabyas flammulatus*);
- Chestnut Wattle-eye (*Platysteira castanea*);
- Jameson's Wattle-eye (*Platysteira jamesoni*);
- Grey-green Bush-shrike (*Malaconotus bocagei*);
- Petit's Cuckooshrike (*Campephaga petiti*);
- Western Black-headed Oriole (*Oriolus brachyrhynchus*);
- Dusky Tit (*Parus funereus*);
- Buff-throated Apalis (*Apalis rufogularis*);
- Olive-green Camaroptera (*Camaroptera chloronota*);
- Ansorge's Greenbul (*Andropadus ansorgei*);
- Plain Greenbul (*Andropadus curvirostris*);
- Honeyguide Greenbul (*Baeopogon indicator*);
- Common Bristlebill (*Bleda syndactylus*);
- Green Hylia (*Hylia prasina*);
- Uganda Woodland-warbler (*Phylloscopus budongoensis*);
- Turner's Eremomela (*Eremomela turneri*);
- Scaly-breasted Illadopsis (*Illadopsis albipectus*);
- White-tailed Ant-thrush (*Neocossyphus poensis*);
- Blue-shouldered Robin-chat (*Cossypha cyanocampter*);
- Green Sunbird (*Anthreptes rectirostris*);
- Green-throated Sunbird (*Nectarinia rubescens*);
- Vieillot's Black Weaver (*Ploceus nigerrimus*)

The Yala Swamp, hosts two globally threatened (vulnerable) species: the Great White Egret (*Egretta alba)*, and Baillon's Crake (*Porzana pusilla obscura)* with Kanyaboli and Kisumu swamps, largely because of destruction of wetland habitats, having smaller populations of these species.

The Lake Victoria Basin hosts large populations of African Hippopotamus (*Hippopotamus amphibious*) as well as some antelopes, such as waterbuck (*Kobas ellipsiprymnus)* bushbuck (*Tragelaphus scriptus*), and the sitatunga (*Tragelaphus spekei)*. The sitatunga has successfully adapted to life in the papyrus swamp though it does not consume papyrus along River Nzoia; but their population is shrinking rapidly due to hunting, and reclamation of wetlands. Other animals living in wetlands include crocodiles, monitor lizards, pythons, otters, water mongooses and many species of rodents.

The Nile crocodile *(Crocodilus niloticus)* is common but not abundant in the wetlands. The sandy beaches, where female crocodiles lay their eggs are also used by fishermen and in some places the beaches are completely covered by water hyacinth. Two species of otter occur in Lake Victoria: Clawless Otter *Aonyx capensis* and Spotted-necked Otter *Lutra maculocollis.* The Clawless Otter feeds on crabs, crayfish and mussel while the Spotted-necked otter feeds on fish. The ecology of otters has not been investigated in detail in Lake Victoria Basin. The impact of deteriorating water quality and habitat modification on these freshwater animals is unknown and should be investigated. Similarly, the status of other wetland animals, such as the freshwater terrapins and amphibians has not been investigated in detail, yet they may be seriously threatened by ecological changes that have taken place in the Lake Basin. Most of these species, such as the Crocodile and hippopotamus will not be affected by the electric line because it does not pass the area where they are found.

3.3.4 Wetlands

Two basic types of wetlands are found in the project area. They include the freshwater wetland (Lakes Naivasha and Victoria) and wetlands associated with saline water bodies such as Lakes Nakuru and Elementeita. Lake Victoria is fringed by papyrus (*Cyperus papyrus*). Other dominant aquatic plants associated with the swamps include sedges such as *Cyperus immensus*, cattails (*Typha domingensis*) and reeds (*Phragmites mauritianus*). Lake Naivasha has similar flora as described for Lake Victoria. It is fringed by *Cyperus papyrus* and *Typha domingensis* mainly along the eastern and northern shores. There is large development of both submerged and floating aquatic plants. The former is dominated by common hornwort *(Ceratophyllum demersum*), saw-weed (*Najas pectinata*) and pondweed (*Potamogeton spp*), while the latter are dominated by the water hyacinth (*Eichhornia crassipes*). Wetlands are also common around many ponds and along the rivers in the project area.

Vegetation associated with saline lakes is more developed around Lake Nakuru. Around the margins of the lake, the vegetation is dominated by *Cyperus laevigatus* at the fringes of the mudflats, with swards of salt grass (*Sporobolus spicatus*) towards the terrestrial zone. Common cattail (*Typha domingensis*) occurs at the mouths of affluent streams.

3.4 Socio-economic and Cultural Environment

3.4.1 Land Use

The natural potential of the land covered by the project area has been described by Jaetzold and Schmidt (1983). Land use in this region depends mainly on the altitude above sea level and the amount of rainfall received in various locations, among other minor factors. The area falls under five major Agro-ecological Zones (AEZs), including Tropical alpine (TA), Upper Highlands (UH), Lower Highlands (LH), Upper Midland (UM), and Lower Midland (LM). Based on the above classification, the most prominent land use categories of the project area are forest, tea, wheat/barley, coffee/maize, cotton, sugar cane and ranching zones.

(a) Tropical Alpine and Upper Highlands

The high altitude areas (above 2300m asl) classified as TA and UH along the Mau Escarpment are covered by high altitude grasslands and forest. Bordering the forest zone where the climate is cold and wet, the area falls under AEZ UH1 and is mainly used for keeping of sheep and dairy cattle.

(b) Lower Highlands

The Lower Highlands in the project area extend from 1850 to 2350m asl. A large extent of the area is covered by forests (LH0). Where the forest has been cleared the area supports tea plantations, keeping of dairy cattle, and sheep. This AEZ is also important for the growing of wheat, maize, barley and pyrethrum, especially in the area around Molo.

Tea is extensively grown in the Lower Highlands under the Tea/Dairy Zone where it is an important cash crop of the area. Nandi District is one of the areas best endowed with favourable conditions for tea growing and is a leading district in tea production in Kenya. It is only surpassed by Kericho District. Tea plantations cover large areas of the district, and extend along the western fringe of the Mau Forest. In addition to tea, maize is widely cultivated in the two districts, especially in the wheat/maize/pyrethrum zone (LH2).

Between Njoro and Molo at a lower altitude of 2100 to 2300m asl where the area is too dry for the growth of pyrethrum, the sub-zone (LH3) is an important wheat/maize and barley-growing area.

(c) Upper Midlands

This is mainly land that lies between 1600 and 2000m asl in Nakuru and Nandi districts of the project area. The South Nandi area has high agricultural potential and human densities around it are also high, particularly to the west.The major land use practiced in the area is the growing of crops such as maize, coffee, tea and livestock keeping. Apart from the above main important crops, other crops grown in the district are beans, sorghum, fingermillet, bananas, onions and vegetables. Coffee, pyrethrum and sunflower are grown on a limited scale although there is more potential for growing the crop. Livestock keeping is an important activity throughout the district. The most important animals kept are cattle, including pure breeds, crosses, and zebu. The keeping of goats is not popular in the district.

The floor of the Rift Valley is too dry and hot for the growth of wheat and maize. The area falls under UM5-UM6 zone, where rainfall is low (600-950mm) and unreliable. This area is mainly used for ranching. Successful cultivation of crops in this zone can only be realized through irrigation as is practiced in the area around Lake Naivasha. Although being a ranching zone, the area around the above lake has become an important centre for flower and vegetable production. In the last ten years, the area around Lake Naivasha has seen an extraordinary explosion of horticulture and floriculture for European export. Lucerne, grown under sprinkler irrigation, supports a large dairy industry. Large tracts of land have been cleared to make way for green houses. The favourable climate and soils and ample supply of irrigation water from the lake offer ideal conditions for intensive production of cut flowers and horticultural crops such as green beans. Large areas of woodland and fringing swamps have been cleared, with cultivation sometimes extending right down to the lake edge.

Tourism is also an important activity in this zone, and several tourist facilities, including hotels and lodges, have now been put in place to cater for the growing industry. With spectacular scenery, presence of wildlife and avifauna, a fine climate, tranquil surroundings and easy access, Naivasha-Nakuru area has become an important site for local and international tourism. Visitors come for bird watching, hippo viewing and watersports in Lake Naivasha. In addition, the tourists come to watch the great numbers of flamingos in Lake Nakuru and game viewing in Hell's Gate, Longonot and Nakuru National Parks.

(d) Lower Midlands

In the Lower Midlands (LM2, LM3 and LM4) of the project area, especially the Kano Plains in Kisumu District, there are no large forest areas, national parks and forest reserves as found in the other locations of the project area as described above. These areas are designated as the sugar cane/ cotton zones. The current land use involves primarily large scale and small scale cultivation of both cash crops and subsistence farming. The most important cash crop of the area is sugar cane. Sugar cane grows exclusively in areas that receive an average annual rainfall of between 1200 and 1600mm. the growing of sugar can supports large industrial concerns, including Muhoroni and Miwani Sugar Industries. Rice is grown exclusively on the reclaimed Nyando flood plain, main in Ahero, Koru, and several other small holder irrigation schemes. Other cash crops grown albeit on small scale are coffee and groundnuts. Cotton, which used to be an important crop of the area is no longer frown in any significant quantities. Subsistence farming in the Kano Plains involves mixed cropping with maize, sorghum and beans grown together. The most widely grown subsistence crops were maize/sorghum, cassava, bananas, sweet potatoes and finger millet.

Livestock production activities involve the keeping of cattle, goats, sheep, poultry, bees, rabbits and pigs. Livestock production is undertaken on communal grazing grounds which are mainly pasture land, which is largely unimproved. The grazing pattern is communal and there is evidence of overgrazing in the area, as indicated by the presence of *Astraipomea hilderbrantii*.

Fisheries is an important activity in this part of the project area where the shoreline of Lake Victoria has great fishing potential. This potential is commonly exploited by the local people. Fish-related activities employ a large number of fishermen, fish traders and employees of fish processing industries.

3.4.2 Socio-economic Characteristics

(a) Naivasha District

Naivasha District has been recently carved out of Nakuru District, and much of the District information is still present from Nakuru District. This is also the situation for the recent Njoro, Molo and Rongai Districts. Naivasha District occupies an area of 1782Km^2 and lies south east of Nakuru District. It is bordered by Kiambu District to the east, Nairobi to the south, and Narok to the west.

The area especially around Lake Naivasha in the Naivasha District is heavily involved in the production of fresh horticultural products including flowers, fruits and vegetables for export to European markets, with many people, from within as well as outside of Naivasha, employed in these flower farms. There are also present in this area the indigenous Maasai, whose main economic activities are pastoralism, as well as providing security to the nearby flower farms and hotels. Public amenities such as water and toilets in these areas are more commonly used.

(b) Nakuru District

Nakuru District is one of the eighteen districts of the Rift Valley Province and is bordered by Laikipia District to the north east, Nyandarua to the east, Narok to the south west, Bomet and Kericho to the west, and Njoro to the north west. More specifically, it is bounded by the Menengai Crater to the north, Lake Nakuru to the south, the pre-historic Hyrax hill to the east and the Mau Ridges to the west. For purposes of this study, the recently carved Elementaita District will also be included under the greater Nakuru District.

The total population for Nakuru District was estimated at 1,187,039 people with a growth rate of 3.4% as per the 1999 National Population and Housing Census (this includes the current Naivasha District). The average household size is 4 persons. The District growth of 3.4% stands above the national average of 2.4%. This high population growth rate has created a predominantly youthful population, with about 54.8% of the population less than 20 years of age. The 1999 Population and Housing Census results indicate that 562,189 people or 47% of the total population live in urban areas. This is one of the few districts in the country with less than 60% of its population living in rural areas.

Nakuru District has a high agricultural potential, with 48% of household income derived from agriculture (DDP 2002-2008). Agriculture is the mainstay of the economy of the district, the main contribution being in terms of food for both rural and urban populations. The sector contributes to food production and in a normal year the farmers produce 1.5 million bags of maize, 500,000 bags of wheat, and 70,000 tons of potatoes. The main food crops include maize, beans, Irish potatoes and vegetables. The agricultural sector provides raw material for agro-based and forestry related industries.

The district also produces various cash crops including pyrethrum, tea and coffee. Milk production is high with a production rate of up to 200 million kilograms per year. The forestry sub-sector contributes significantly to the economy of the district and the nation at large. The sector supplies raw material to the trade and industry sectors. The forestry sector provides employment to a total of 25,000 people directly while the informal (Jua Kali) sector employs many artisans in timber and wood related activities.

(c) Njoro District

Njoro District has very recently been carved out of Nakuru District, and occupies a land area of 313Km^2. Much of the socio-economic information is still presented within the Nakuru District Development Plan.

(d) Molo District

Molo District has very recently been carved out of Nakuru District, and occupies a land area of 59Km^2. Much of the socio-economic information is still presented within the Nakuru District Development Plan.

(e) Koibatek District

Koibatek District was carved out of Baringo District in 1995, and is one of the 18 districts in the Rift Valley Province. It borders Baringo to the north and north west, Nakuru to the east and south, and Kericho and Uasin Gishu Districts to the west. The district covers 3406Km^2, of which Lake Bogoria covers 34Km^2, while an area of about 512Km^2 is covered by forest.

The District population was estimated to be 138,164 in 199, with an annual growth rate of 2.5%. Life expectancy is estimated at 59 years, and the average household size is 5 persons. High population densities are found in the high agricultural potential zones of Mumberes, Torony and Eldama-Ravine Divisions.

The income of the district is basically derived from sales of livestock and agricultural products. However, these incomes are sometimes affected by cattle rustling and sporadic rainfall patterns. Wage earnings are mainly from the formal sector, and have been increasing over the years, but the trend cannot be sustained as there are job cuts as well as retrenchment in both the public and private sectors. This will undoubtedly lead to widespread poverty. Absolute poverty is currently estimated at 55%. Poverty is much more evident in the Kerio Valley, which is much drier, and with erratic and sporadic rainfall. Prevalent diseases in the area include malaria, upper respiratory tract infections (URTI), and pneumonia.

Poverty in Koibatek District is estimated to inflict 50% of the total population, with the most vulnerable groups being the squatters, the aged, poor, orphans, handicapped, unskilled casual labourers, female household heads, small agricultural farmers and alcoholics. Causes of poverty in the district include inadequate infrastructure, HIV/AIDS (8.1% prevalence rate), low agricultural productivity, poor marketing systems, illiteracy, large family size and high population.

(f) Kipkelion District

Kipkelion District has been recently carved out of Koibatek District. Due to this, it currently stands as an autonomous District, yet much of the documentation is presented under Koibatek District.

(g) Uasin Gishu District

The greater Uasin Gishu District consists of three districts: Eldoret East, Eldoret West, and Wareng Districts. Overall, the greater District has a total area of 3328Km^2, and is bordered by Trans Nzoia District to the north, Keiyo to the west, Koibatek to the south, Nandi to the south west, and Lugari to the north west.

The population size in 2002 was estimated at 682,342. The average household size is estimated at 4.6, and absolute poverty at 42.4%. 62.8% of the population live in the rural areas, while 37.1% live in the urban areas. The annual population growth rate of 3.35% is higher than the national average of 2.9% per annum. This growth rate has, and will continue to have negative effects on the provision of services to the people if left unchecked. Life expectancy is estimated at 65-9 years. The population structure for the district shows a very high population of young people, a factor that determines dependency ratio. This is a challenge as it has negative impacts on savings and investments in the district.

The average small scale farm size is 5ha, and main food crops produced are maize and beans. Wheat, cut flowers and pyrethrum are the main cash crops produced. Although the district ranks as a major food producer in the country, poverty incidence is still high. Those vulnerable to poverty in the district include the persons with disabilities, the elderly, women

(particularly female-headed households) the landless, youth, the unemployed, orphans and children in difficult circumstances. The major cause of poverty in the district is unemployment due to closure of major industries such as KCC, EATEC, Rivatex and Raymond Woollen Mills. Other causes include lack of markets for farm produce, high cost of farm inputs and poor food storage facilities. Prevalent diseases in the district include malaria, respiratory infections, and water-borne diseases.

Tourist attractions in the district are listed as scenic beauty, sports, cultural and eco-tourism.

(h) Nandi District

Nandi District is situated in the western part of the Rift Valley Province, and borders Kakamega District to the north west, Uasin Gishu to the north east, Kericho to the south east, Nyando to the south, Kisumu to the south west, Vihiga to the west and Lugari to the north. The District covers an area of 2,873 Km^2.

The population of Nandi District was 578,751 in 1999, and is projected to increase to 751,351 people in 2008, at an annual growth rate of 2.9%. The average household size is estimated at 5.1 persons. The bulk (68%) of the population is youthful (0-25), and the District has therefore to provide the necessary socio-economic infrastructure for the growing population. Life expectancy is approximately 51 years for females, and 48 years for males. Absolute poverty in the district is estimated at 64.15%. Prevalent diseases include malaria, respiratory tract infections, and skin diseases.

Nandi District is predominantly an agricultural district where 90% of the economic activities are agriculturally oriented. The agricultural sector contributes over 52% of the household income. The sector has a workforce of 350,000 people. The main food crops cultivated in the district are maize, beans, potatoes, sorghum and millet while the cash crops are tea, coffee, sugarcane and pyrethrum. The livestock sector employs over 93,552 people. The main livestock breeds include the dairy cattle, zebu cattle, sheep, goats and poultry.

Tourist attractions in the district are listed as Bonjoge Game Reserve, Chepkiit water falls, Kingwal swamp, and forest reserves.

(i) Nyando District

Nyando District is one of the 12 districts in Nyanza Province, which was curved out of Kisumu district in 1998. It borders Kisumu District to the weste, Nandi to the north, Kericho to the east and Rachuonyo to the south. The district has a small shoreline to the south west where it touches Lake Victoria. The total land area is 1169Km^2.

The population in the district, according to the 1999 population census was estimated at 332, 237 persons, giving a growth rate of 3.4% per annum. Life expectancy is 49 years. The population is characteristically very youthful, with over 44% of the total population falling below 15 years of age (70,036). The average household size is 4.4 persons. This is a development challenge as much of the district resources will be directed towards meeting basic social services for the young members of the population. Absolute poverty (rural and urban areas combined) is estimated at 68.9%.

The soils and climatic conditions of the district are suitable for sugar cane growing in Muhoroni, Miwani and parts of Nyando Division. Sugarcane therefore forms the main cash crop in the district. The swamps along rivers Nyando and Awach in Miwani, Nyando and Lower Nyakach are best suited for rice growing under irrigation. The rest of Kano Plain with its black cotton soil is most suitable for cotton production. The higher altitude Nandi Hills and the Nyando Plateau provide a good environment for dairy farming. It is in these areas that coffee growing is being promoted. Food crops include maize, cassava, sorghum, and sweet potatoes.

The major causes of poverty in Nyando district include: poor agricultural technologies, lack of proper storage facilities, erratic and unreliable rainfall, poor and inaccessible road network,

frequent floods, problems with the sugar, rice, cotton and fish industries, lack of title deeds, poor water and sanitation systems, impact of HIV/AIDS, low accessibility to health services, among others.

Prevalent diseases in the district include malaria, upper respiratory tract infections (URTI), diarrhoea, skin diseases and worms.

(j) Kisumu District

Kisumu District is in Nyanza Province and borders Nyando district to the east, Nandi to the north east, Vihiga to the north, Siaya to the north west, Bondo to the west and Rachuonyo to the south. The District covers a total area of 919 Km^2.

The 1999 Census put the population of Kisumu District at 504,359 people. This population is projected to reach 604,225 people by the end of 2008, at a rate of 2%, and a life expectancy of 49 years. The rapid growth in population has placed great pressure on housing and delivery of services especially in the urban areas. A considerable percentage of the population of Kisumu District is youthful (128,367). Average household size is estimated at 4 persons. About 42% of the population is below 15 years while 73% is below 30 years. The youthful population has put a lot of pressure on the available educational, health and other related facilities, with absolute poverty being estimated at 53%. Prevalent diseases in the area include malaria, anaemia, and HIV/AIDS.

Agriculture employs over 70% of total working population in farms and agro-based industries. Agriculture in the district is mainly based on cultivation of rice and sugar cane as cash crops and the growing of subsistence crops such as maize, sorghum, beans, groundnuts, cassava and sweet potatoes.

Fisheries acts as a great source of employment for a large population of rural and urban residents. Thousands of fishermen and their families derive their livelihoods from fishing. Industrial processing of fish has increased over the last decade and most of the fish processed is exported to European markets where it generates foreign exchange for the country. Earnings from fish production for 2001 are estimated to be KShs 35,312,720.

Tourist attractions in the district are listed as Ndere Island, Lake Victoria, Impala Sanctuary, Kit Mikaye, and National Museum.

3.4.3 Overview of Socio-economic characteristics of land owners/ residents – Preliminary survey results

A minor survey of the socio-economic characteristics of land owners/ residents found within the project area was carried out. It was based on a survey questionnaire (sample included in appendices) provided by JICA Study Team that detailed the following:

- Basic profile of PAPs (landowners and residents);
- Land likely to be lost/ affected;
- Structures likely to be lost/ affected;
- Household budget;
- Accessibilities;
- Perception of the Project;
- Impacts.

(a) Basic profile of PAPs (landowners and residents)

Information sought included establishment of head of family, number of years lived in the area, attainment level of education, religion, number of family members, and occupation.

Respondents within DCK area were primarily young adult men, mostly working in the adjacent flower farms. The majority of these respondents were tenants in the houses they were living in, together with their familities. On average, most of the respondents had completed secondary school education, and could therefore read and write in both English and Kiswahili, the local official language. Christianity was the dominant religion in this area.

Respondents from Sanctuary area in Olkaria were Maasai, who had lived in the area from birth. Levels of education were very low, with many confessing illiteracy, and its negative effect on employment opportunities. Male respondents requested jobs as watchmen for the proposed transmission line, and women lamented on the difficulty of obtaining jobs in the area due to poor or no formal education.

Respondents from Mitimingi centre comprised of both tenants and land owners, with each group having lived in the area for a varying number of years. Respondents had generally completed secondary school education, and could therefore read and write in both English and Kiswahili, the local official language. Christianity was the dominant religion, with few Muslims. Average number of children per family was between four and five, and majorityy of the area members were farmers, followed by self-employed business persons, those in formal employment, and professionals such as teachers.

Kayole centre in Naivasha and Jogoo centre in Elementaita are relatively newly settled areas, with most people having only recently moved into the area. Many respondents have completed secondary school education, and some graduated from university. The dominant religion is Christianity, and the average number of children per family is four.

Most residents in Ngata-Kirobon area are immigrants, having arrived from the neighbouring areas from around 2003. They consist of young and old families and a sufficient number of retired persons (over 65 years of age). Levels of education in the area are mixed, with some of the residents very highly trained (engineers). The dominant religion is Christianity, and households average five children. Many of the respondents consulted are retired, and some self-employed business persons.

Residents of Rironi Village, Koige Sub-Location in Mau Summit Location as well as Timboroa have had a long history of living in the area, with many being born here. Levels of education attained by residents vary, with some attaining college-level education. The dominant religion in the area is Christianity, and average family size is five to nine persons. Residents are engaged in a variety of occupations, including the government / public sector, employees in the private sector, self-employed, farmers, and casual labourers.

Residents of Lessos Division can generally read and write both English and Kiswahili, and some members have attended high school and university. The dominant religion in the area is Christianity, and residents are engaged in the occupations of government/ public sector, private sector, self-employment, farming, casual labour, as well as some being unemployed.

Kibos Village in Miwani Division (Nubian village) presented unique characteristics out of all the areas surveyed along the proposed transmission line. To begin with, the majority of respondents were female, as compared to all the other areas surveyed. However, levels of education were generally low among these women, with many being illiterate and only few having attended high school. The dominant religion was Muslim, unlike the other areas surveyed. Average family size was estimated at twelve, and residents were either casual labourers or unemployed.

Residents of Mamboleo Centre in Kisumu, comprise a highly mixed and cosmopolitan variety. Many are tenants in the houses they live in, and duration of stay varies from months to decades. Additionaly, many of the residents in this area are literate, with majority having

attended high school and employed in the public sector, private sector, self employed as casual labourers, and others unemployed. The dominant religion in the area is Christianity.

(b) Land likely to be lost/affected

This section sought to establish whether the land was residential, agricultural, commercial, set up for workshops, as well as the status of land holding.

Within DCK area, the land likely to be lost/ affected is primarily agricultural land, as this area houses numerous greenhouses for horticultural production, as well as flowers. The respondents were also primarily tenants in the area. Within Sanctuary area in Olkaria, the land likely to be lost was used primarily for pastoralism and settlement. Ownership of land holding was uncertain.

The land most likely to be lost in Mitimingi centre is both for residential and agricultural purposes. Some members of the area have land titles indicating ownership, while others do not, such as Mutukano area.

Kayole centre in Naivasha and Jogoo centre in Elementaita consist primarily of small residential land plots, and small scale agricultural land. These, and the commercial properties fronting the roadside, are likely to be lost/affected by the proposed project. Most occupants of the land hold allotment letters and sale agreements, an indicator of the recent settlement in this area. Land Title Certificates are still in the process of being sought.

Residential land will be most likely lost/ affected in Ngata-Kirobon area. These plots also support small-holder agriculture, and average 1 acre each. Some of the residents hold Title Certificates for their land, while the more recently settled in the area hold Sale Agreement Letters.

Land likely to be lost/ affected in Mau Summit Location is small-scale agricultural land. Residents hold Certificates of Title for the land parcels owned.

Residential land, agricultural land, and forest area in Timboroa is likely to be lost/ affected by the proposed project. Some residents in the area hold Certificates of Title, while others are tenants.

In Lessos and Nandi Hills Divisions, land likely to be lost/ affected is residential land, agricultural land (especially tea estates) and commercial land. Owners of the land either have Certificates of Title, or are tenants.

Land likely to be lost/ affected in Kibos Village is residential type, and small holder agricultural land; and residential and commercial type in Mamboleo centre. Status of land holding is uncertain in Kibos village, but residents of Mamboleo centre hold Certificates of Title, while others are tenants.

(c) Structures likely to be lost/ affected

Information was sought here on structures owned/ occupied and those to be lost/ affected by the proposed transmission line project. Choices offered in the questionnaire included residential and/or commercial buildings, farm houses, boundary walls/ fencing, well/ hand pumps, graveyards, etc. The status of ownership for each of these structures was also sought. Additionally, photos were taken of the structures likely to be affected. A map presenting some of the settlement areas anticipated to be impacted by the proposed project is included in Appendix 9.2 of this report.

In DCK area, the structures likely to be affected are residential privately owned buildings, predominantly the houses established by the flower farms for their workers. Within Sanctuary area in Olkaria, approximately five *manyattas* (Maasai traditional houses) and a church are the most likely structures to be lost/ affected/

Structures likely to be lost/ affected in Mitimingi centre are predominantly self-owned, and used for both residential and commercial purposes.

Currently, Jogoo centre in Elementaita is not heavily settled, as it is still relatively new. This is not the situation in Kayole centre in Naivasha, which is already heavily settled, and numbers continue to rise rapidly. Residential and commercial properties in both centres are likely to be lost/ affected. Ownership of these structures is individual, with houses having an average of between two and four rooms.

Residential houses, animal sheds, and boundary walls/ fences are the structures most likely to be lost/ affected in Ngata-Kirobon area. These structures are self-owned, with the residential houses consisting of natural stone material.

Structures likely to be affected include self owned residential and commercial structures in Mau Summit Location and Timboroa area.

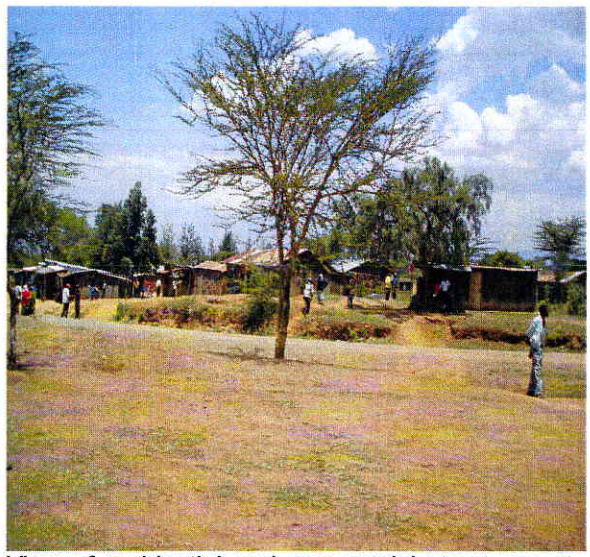
In Lessos, Nandi Hills and Mamboleo, residential and commercial structures are most likely to be lost/ affected, and these ar self-owned, or private-owned and rented out. Sizes of houses vary, from relatively small to very large, such as those viewed between Lessos and Nandi Hills towns.

Structures likely to be affected include self owned and rented residential and commercial structures.

Fig 3-5: Overview of structures likely to be lost/ affected along the entire route of the proposed transmission line

View of residential houses in the background at DCK market centre, Olkaria, Naivasha

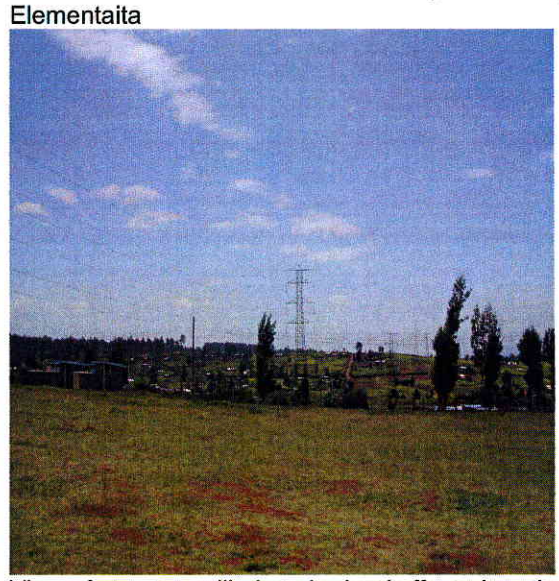
View of *manyatta* in the background (top right) at Sanctuary, Olkaria, Naivasha



View of residential and commercial structures at Mitimingi centre, Elementaita

View of residential houses at Jogoo centre, Elementaita

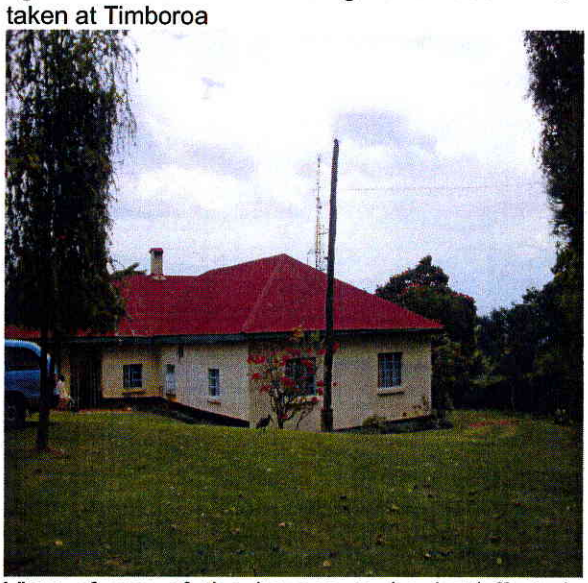
View of farms and residential houses at Ngata-Kirobon area, Nakuru



View of structures likely to be lost/ affected on the right-hand-side of the existing transmission line, taken at Mau Summit Area, Koige Village

View of land-use likely to be lost/ affected on the right-hand-side of the existing transmission line, taken at Timboroa

View of structures and land-use likely to be lost/ affected at Ol'Lessos centre



View of one of the houses to be lost/affected between Ol'Lessos and Nandi Hills

View of the structures likely to be lost/affected at Kibos Village, Miwani Location