Environmental and Social Impact Assessment (ESIA) Report for the Nairobi Transmission Ring Project

Kenya Power and Lighting Company

May 2011

Kenya Electricity Transmission Company Ltd.

PARSONS BRINCKERHOFF

Environmental and Social Impact Assessment (ESIA) Report for the Nairobi Transmission Ring Project

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Environmental and Social Impact Assessment Report for the Nairobi Ring Transmission Project

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CONTENTS

ABBREVIATIONS LIST

AEZ	Agro-Economic Zone
BP	Bank Procedure
CITES	Convention on International Trade in Endangered Species
EA	Environmental Audit
ECD	Early Childhood Development
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMF	Electro-Magnetic Fields
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
IBC	Intermediate Bulk Container
IFC	International Finance Corporation
KCAA	Kenyan Civil Aviation Authority
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
km	kilometre
KPLC	Kenya Power and Lighting Company Limited
KSh	Kenyan Shilling
kV	kilo-volt
KWS	Kenya Wildlife Service
MDG	Millennium Development Goal
MoU	Memorandum of Understanding
MVA	mega-volt-ampere
MW	mega-watt
NEMA	National Environmental Management Authority
NGO	Non Governmental Organisation
OHTL	Overhead Transmission Line
OP	Operational Policy
PAPs	Project Affected Persons
PB	Parsons Brinckerhoff
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RoW	Right of Way
RPE	Respiratory Protective Equipment
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
WRM	Water Resources Management
WSS	Water and Sanitation Services

EXECUTIVE SUMMARY

Executive Summary

Introduction

This Environmental and Social Impact Assessment (ESIA) Report is for a number of proposed projects associated with the transmission scheme around Nairobi (known as the Nairobi Ring) comprising an electricity transmission line and new sub-stations.

This ESIA report covers the following projects:

- Suswa-Isinya 400 kV transmission line
- Suswa 400/220 kV substation
- Thika road and Ngong 220/66 kV substations

ESIAs have already been produced for two other substations associated with the Nairobi Ring (Isinya 400/220 kV substation and Athi River 220/66 kV substation).

The report has been produced in consultation with Kenya Power and Lighting Company Limited (KPLC), on behalf of Kenya Electricity Transmission Company Limited (KETRACO), the Project Proponent, in fulfilment of the Environmental Management and Coordination Act (EMCA), 1999.

This ESIA report has been undertaken to ensure that the significant environmental and social impacts of the proposed projects at the preconstruction, construction, operation and decommissioning stages have been considered and assessed at the project planning phase.

This report provides the background to the proposed projects as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation.

Electricity Demand in Kenya

Currently, Kenya's national access to electricity is estimated at 18%. The Government of Kenya, as part of the 2030 Vision, aims to raise access to electricity to 20% by end of 2010 and to 40% by 2020. This increased level of electrification will result in an increased demand for electricity, which will require major expansion in power generation and transmission infrastructure in the country.

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

To address these constraints, KPLC and KETRACO have identified the need for a number of transmission projects across the country which are now at various stages of development. The Nairobi region accounts for around 50% of the country's demand for electricity. The transmission network around Nairobi will therefore require major expansion and reinforcement in order to deliver power to the main load centres.

KPLC and KETRACO have commissioned PB to conduct a study aimed at producing a long-term strategy for development of Kenyan power transmission system, with a focus on the Nairobi Metropolitan area. The study covers the planning period up to 2030 and includes technical and economic analysis. This ESIA study forms part of that commission.

Study Objectives

KPLC and KETRACO understand the importance of incorporating environmental protection issues as early as possible in the project planning and design stages of such schemes, such that any adverse impacts are foreseen and addressed and development and wealth creation are achieved in a way that

is sustainable and environmentally responsible.

The objective of the ESIA study is to carry out an assessment of the proposed projects to determine whether or not the proposed projects and associated activities will have any adverse impacts on the environment, taking into account environmental, social, cultural, economic and legal considerations.

The main objectives of the ESIA are to:

- Identify and assess the anticipated environmental and social impacts of the proposed projects – both positive and negative;
- Identify and analyse alternatives to the proposed projects;
- Propose mitigation measures for negative impacts and enhancement measures for positive impacts to be undertaken during and after the implementation of the proposed projects;
- Verify compliance with national environmental regulations and policies, World Bank Safeguard Policies, and industry best practice and standards;
- Generate baseline data for monitoring and evaluation of how well the mitigation measures have been implemented during the project life cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Seek the views of affected persons in consultation with KPLC and the National Environment Management Authority (NEMA);
- Prepare an Environmental Impact Assessment Report compliant with the Environmental Management and Coordination Act (1999); and
- Prepare an Environmental and Social Management Plan (ESMP) report compliant with the Environmental Management and Coordination Act (1999).

Firm of Experts

The ESIA studies have been conducted by Kamfor Company Limited, a Registered Firm of Experts (Registratio.No.0182) in conjunction with Parsons Brinckerhoff (PB) of Newcastle, UK.

Approach and Methodology

This study has been undertaken through participatory methods which included discussions with the proponent, public and key stakeholder consultation.

Activities undertaken have included:

- Consultation and public participation along the proposed transmission line route and at substation sites;
- In-depth interviews held with district heads of departments, provincial administrations, NEMA, Kenya Wildlife Service, Kenya Forest Service and the Kenya Civil Aviation Authority;
- Literature review of applicable policies, legislation and regulatory frameworks and of relevant ESIA/ESMP reports previously undertaken;
- Desk study involving the analysis of the project maps of the proposed line route and substation sites; and
- Thorough field investigations and collection of baseline data, and assessment of environmental sensitivity of the areas.

Nature of the Project

KPLC has identified the need for major reinforcement of the Nairobi transmission network. A number of options were considered as part of the feasibility studies.

The recommended option includes the following projects:

- New Suswa-Isinya 400 kV transmission line (for initial operation at 220 kV);
- New 400/220 kV substations at Suswa and Isinya; and
- New 220/66 kV substations at Ngong, Thika Road and Athi River.

ESIA reports have already been prepared for Athi River and Isinya substations and these substations have therefore been excluded from assessment within this ESIA report.

Proposed Transmission Line Route

The proposed 100 km 400 kV Suswa - Isinya transmission line will run from just outside Suswa town, parallel to the existing 220 kV Olkaria-Nairobi North line for approximately 23 km. It will then cross the Ewaso Kedong valley and the Kiambu escarpment to Ngong (passing close to the Ngong wind turbines); and from Corner Baridi pass by Kipeto onto Isinya. From Suswa to Corner Baridi, the overhead transmission line will run across savannah and shrub vegetation, through areas which are sparsely populated and mainly used for grazing. After Corner Baridi, the line will traverse some settlement areas especially between Athi River and Isinya. The line routing has attempted as far as possible to avoid human settlement.

The Geo references for the proposed line route are included in this report.

Proposed Substations Sites

The proposed Suswa 400/220 kV substation is to be located near the Suswa township on a 100 acre plot. The site is located next to Nasero AIC church, Kenchic farm and Umma University amongst other developments in the area. Land uses in the immediate area include pastoralism and agriculture.

The proposed 220/66 kV Ngong substation is to be located just behind the wind turbines near the Savannah Restaurant and campsite at the foot of the Ngong Hills. The site is 30 acres in size and is located off the Ngong-Kimuka-Ewuaso road. The substation will initially be linked into the Suswa-Isinya transmission line by a 3.2 km spur line which runs through a sparsely populated area.

The proposed 220/66 kV Thika Road Substation will be located opposite the Kenyatta University within Gicheha Farm on land which is currently used for growing crops. The land has few shrubs or trees. The proposed area of land take is 30 acres.

Geo references for the proposed substation sites are included in this report.

Policy, Legal and Regulatory Framework

This study has reviewed the Environmental Management and Co-ordination Act 1999, which is the legislation that governs EIA studies in Kenya. The proposed projects fall under the Second Schedule of EMCA 1999, which lists the type of projects that are required to undergo EIA studies in accordance with Section 58 (1- 4) of the Act.

Various other key national laws that govern the management of environmental resources in the country have been discussed in the report. This study has also made reference to international treaties and conventions as well as the procedures of the World Bank and with which the proposed projects will need to demonstrate compliance.

Project Activities

The construction of the transmissions line will require the creation of some temporary access roads to the transmission line construction sites. The construction of the transmission towers themselves will require some localised vegetation clearance. Materials arising from the excavation for the tower foundations (soil, rock etc.) would either be spread in appropriate areas surrounding the line or removed to another site as agreed. The foundations will be in filled with cement supplied via ready-mix-cement trucks or alternatively mixed on site. Following tower erection, conductor stringing, which may involve the use of a mobile crane, will occur and may result in the need for some tree cutting along the Right of Way (RoW).

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

Once constructed, the transmission line will require minimal maintenance. Yearly visual inspection of the towers and conductors is expected. After a period of many years, the entire system would need a detailed survey and overhaul. There may be a requirement for occasional visits to remove trees or branches where these start to grow too close to the over head transmission line (OHTL). Access rights may need to be retained to allow for maintenance works in the future.

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

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

Assessment of Alternatives

The proposed projects will contribute towards the aims of the Government of Kenya, which, as part of the 2030 Vision is aiming to raise national access to electricity to 20% by end of 2010 and to 40% by 2020. In addition, development projects emerging from Vision 2030 will increase demand on Kenya's energy supply. Thus a 'no scheme' alternative is not considered to be a viable option.

KPLC and KETRACO commissioned PB to conduct a study aimed at determining the future transmission system requirements for the Nairobi metropolitan area. A conceptual design was developed for the preferred option which has recommended the staged development of new transmission lines and substation sites. This ESIA report covers the first stage of development.

In proposing the above concept, consideration was given to social and environmental impacts of the projects. Early on, it was identified that a number of the transmission lines could be avoided. The number of transmission lines was thus limited to those that are technically required whilst complying with KPLC/KETRACO's planning criteria. The concept largely avoids built up areas, thus minimising the need for land acquisition and resettlement.

The line route itself has been chosen to avoid settlements and their associated infrastructure as well as tourist areas. The proposed route avoids hills and ridges thus minimising visual impact. New

substation sites have been located to avoid areas of dense settlement and where impacts on local people e.g. from loss of farmland or grazing land are minimal.

Due to Nairobi's high altitude, corona and radio interference noise levels were found to be the deciding factor for conductor size and bundling arrangements. PB has recommended the use of triple Canary conductors on the proposed 400 kV line.

Double circuit towers have been recommended to minimise line corridor width requirements in and around Nairobi and therefore the associated land take and disturbance to people and wildlife. The proposed Suswa-Isinya line route follows the existing Olkaria-Nairobi North line route for a distance of 23 km from Suswa thus reducing the visual impact by siting the transmission line in an area where there is already a degree of visual impact and where residents have already been sensitised to such development.

The Danube tower design (as employed on the Mombasa-Nairobi line) will result in a lower profile, and therefore reduced visual impact, without significantly affecting the cost. The feasibility study recommends that a choice between Danube and standard vertical formation towers should be made during the detailed design stage.

Summary of Potential Impacts and Mitigation Measures

The following provides a summary of the main positive and negative social and environmental impacts of the proposed projects as well as recommended mitigation and enhancement measures.

	IMPACT	COMMENTARY/MITIGATION/ENHANCEMENT MEASURES
	Potential Positive Impacts	
1	Improved electrical capacity in the National Grid and Reliability of Supply	Meeting power demands, reduction in power outages, improved efficiency and productivity to businesses, more connectivity.
2	Employment Creation	Job opportunities for local community members during the project cycle in relation to provision of labour for site works and provision of goods and services.
3	Increased Economic Activity	Short term increase in economic activity in project areas from purchase of construction materials, procurement of services, taxes levied on construction workers.
4	Improved road infrastructure	Roads installed/improved to serve the project could also be of long term benefit to the community.
5	Gender issues	Opportunities for women in income generating activities e.g. through provision of catering services, selling local products. Recommended contractual requirement to employ local women as well as men in tenders prepared for the letting of the construction works.
6	Capacity Building	Training and awareness campaign on Occupational Health and Safety issues to workers, local residents, pastoralists and Project Affected Persons (PAPs).
7	Socio Cultural Impacts	Re-emphasis of the authority of community elders and local leadership when committees are formed to facilitate the rolling out of the projects.
8	Climate Change	Temporary reduction in the carbon sequestration from vegetation loss. Long term global benefits from reduced reliance on fossil fuels as the transmission line will carry electricity generated by renewable energy technologies
	Potential Negative Impacts	
9	Displacement of persons	Some local displacement of people and buildings arising from acquisition of way-leave. Proponent to provide compensation for PAPs. Need for ongoing public

		consultation and sensitisation.
10	Restriction of land use and land rights	Limitation of choice that land owners have on the use and rights to their land. Sensitisation as to suitable future land uses as well as health and safety aspects relating to new transmission line and substation sites.
11	Change in land ownership	Need to register land for compensation leading to changes in local land holding patterns.
12	Impacts on Vegetation	Short term loss of natural / planted vegetation. Longer term loss of woody vegetation throughout project period.
13	Impacts on Land Use	Small, permanent loss of croplands. Construction works to be undertaken after crop harvest, compensation for damaged crops, awareness campaigns on the use of the way leave following project implementation.
14	Impact on Soils	Excavation and vegetation clearance will be limited. Traffic and transport will adhere to existing paved roads/routes as established. Replanting of degraded areas on completion of the works. No significant impacts on soils expected.
15	Impacts on Drainage, Surface waters and Water Resources	No change to water flow regimes or changes to access to water resources anticipated. Adherence to construction good practice environmental management will prevent pollution. Need for consideration of proximity of effluent disposal sites to water resources.
16	Visual Impact	Line routing avoids settlement areas, hills and tourist areas. Public awareness campaign on energy transmission to lessen adverse reaction to the OHTL. Roads/worker camps will be removed were these will not serve the local community following the works.
17	Impacts on Archaeology and Cultural Heritage	Proposed projects will not pass through or close to any known World Heritage or archaeological sites. Contractor to report any chance finds for necessary actions.
19	Traffic and Road Infrastructure	Project associated traffic movements likely to be minimal. Occasional requirements for movement of abnormal loads may result in a need for temporary diversions. Transportation of materials to be undertaken outside peak hours. Location of access roads to be undertaken in consultation with the local communities.
20	Noise and Vibration	Temporary increase in noise during construction works from site machinery. Use of silencers/mufflers, provision of hearing protection devices for workers, careful selection and use plant and working hours in sensitive residential and wildlife areas.
21	Air Quality	Dust generated by excavation/earth moving and exhaust emissions from construction vehicles, plant and equipment. Minimise by covering stockpiles, limiting speed limits in dusty areas, avoid idling of motor vehicles and damping down.
22	Solid Wastes	Increase in pressure on local landfill facilities as well as the potential for unauthorised disposal/littering. Recycling and reuse of construction materials. Managed disposal at designated sites.
23	Electric and Magnetic Fields	OHTLs considered a source of electric and magnetic fields which may have perceived health effects. Internationally accepted standard for ROW width along transmission line to be adopted. Habitable structures to

		be excluded from the ROW.
24	Ozone and Corona	Ozone concentrations around power lines have only very localised impacts with no health consequences. Suitable technologies adopted to minimise corona.
25	Aviation and Communication	Aircraft flying at much greater altitude than the estimated tower height. Maximum height of towers / routing of the line will be in accordance with KCAA requirements. Visual markers to be placed on towers for light aircraft. Minimal radio/television interference anticipated.
26	Offsite Resource impacts	Potential for adverse environmental impact from unsustainable sourcing of construction materials. Use materials from sustainable sources, seek permits and licenses to operate quarries or borrow pits.
27	Flora and fauna,	Potential for bird strikes and mortality. Creation of meadow type biotope via removal of vegetation. Monitoring of birds collisions to be undertaken and installation of wire-marking reflectors as necessary Minimum clearing of vegetation and re-vegetation of disturbed areas. Ban on hunting and collection forest products by construction workers.

Conclusion

The proposed projects are in line with the development and socio-economic needs of Kenya as a whole. They also help fulfil the Economic Recovery Action Plan 2003 and Vision 2030 and the Millennium Development Goals. The projects will facilitate the transmission of electricity generated by a range of renewable energy technologies including geothermal energy, hydro and wind power therefore reducing reliance on fossil fuels. Indeed, the project has many positive socio-economic impacts both locally, regionally, nationally and globally.

In view of positive and negative impacts identified, as well as public consultation conducted in the project areas, it is unlikely that the proposed projects will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the project such that the overall benefits from the projects will greatly outweigh the few adverse impacts.

The main social issues for the projects will revolve around the displacement and relocation of people along the transmission line corridor and the acquisition of the way leave. The proponent will compensate the PAPs with respect to adverse impacts associated with displacement and disturbance.

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Background

1.1.1 This Environmental and Social Impact Assessment (ESIA) Report is for a number of projects associated with the proposed transmission scheme around Nairobi (known as the Nairobi Ring) comprising electricity transmission lines and associated sub-stations. The report has been produced in consultation with Kenya Power and Lighting Company Limited (KPLC), on behalf of Kenya Electricity Transmission Company Limited (KETRACO), the Project Proponent, in fulfillment of the Environmental Management and Coordination Act (EMCA), 1999.

1.1.2 The EMCA requires that an Environmental Impact Assessment (EIA) is undertaken for proposed activities that are likely to have a significant adverse impact on the environment and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The Second Schedule of the EMCA provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority. The proposed transmission line and associated substation projects fall within the second schedule of the EMCA under 'Electrical Infrastructure'.

1.1.3 This report has been undertaken to ensure that the significant environmental and social impacts of the proposed projects at the preconstruction, construction, operation and decommissioning stages have been considered and assessed at the project planning phase.

1.1.4 This report provides the background to the proposed projects as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation.

1.2 Proposed Projects

1.2.1 Currently, Kenya's national access to electricity is estimated at 18%. The Government of Kenya, as part of the 2030 Vision, aims to raise access to electricity to 20% by end of 2010 and to 40% by 2020. This increased level of electrification will result in an increased demand for electricity, which will require major expansion in power generation and transmission infrastructure in the country.

1.2.2 The interconnected system has an installed capacity of 1,375 Megawatt (MW) comprising: 757 MW of hydro; 198 MW of geothermal; 0.4 MW of wind; 279 MW of thermal; 26 MW of co-generation; and 60 MW provided by emergency diesel generators. This power is transmitted countrywide through the transmission network, which comprises of 1,323 kilometres (km) of 220 kilovolt (kV) transmission line, 2,122 km of 132 kV transmission line and 632 km of 66 kV transmission line. Kenya is currently interconnected with Uganda through a 132 kV double circuit transmission line rated at 2 x 86 Megavolt Amperes (MVA).

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

1.2.4 To address these constraints, KPLC has identified the need for a number of transmission projects across the country and which are now at various stages of development. The Nairobi region accounts for around 50% of the country's demand for electricity. The

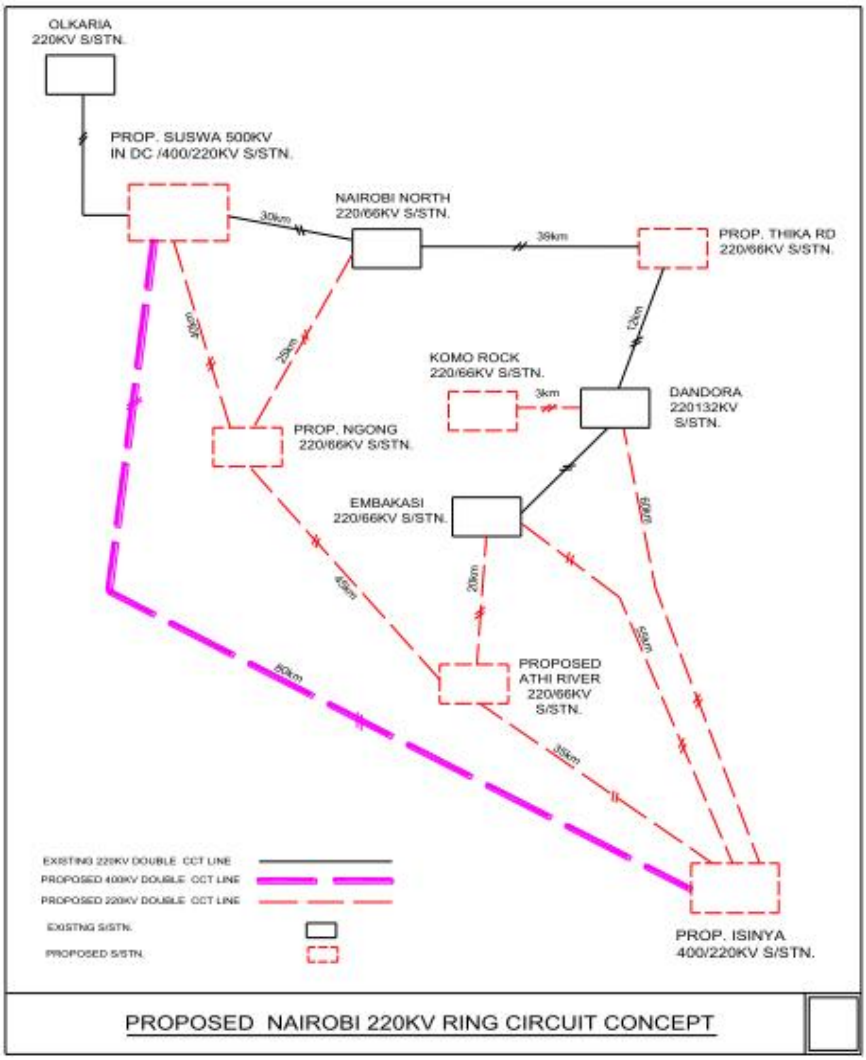
transmission network around Nairobi will therefore require major expansion and reinforcement in order to deliver power to the main load centres.

1.2.5 KPLC has commissioned a study to determine the future transmission infrastructure requirements in the Nairobi region and to confirm the feasibility of specific projects including new substations and transmission lines.

1.2.6 The proposed transmission scheme around Nairobi includes two new 400/220 kV bulk supply substations and a number of new 220/66 kV substations as shown in Figure 1.1.

1.2.7 The proposed Isinya 400/220 kV substation is required for the termination of lines from Mombasa to Nairobi, and in the longer term, for the Kenya–Tanzania Interconnection, whereas Suswa 400/220 kV substation will be to the termination point for the Ethiopia-Kenya Interconnector. The proposed new 220/66 kV substations are required to relieve the existing 220 kV substations in Nairobi, which are now becoming overloaded.

Figure 1.1 – Proposed Nairobi transmission projects[1]



[1] Several options have been considered, based around this proposal, within the technical studies referred to above.

1.3 Objectives of the ESIA

1.3.1 KPLC and KETRACO understand the importance of incorporating environmental protection issues as early as possible in the project planning and design stages of such schemes, such that any adverse impacts are foreseen and addressed and development and wealth creation are achieved in a way that is sustainable and environmentally responsible.

1.3.2 The objective of the ESIA study is to carry out an assessment of the proposed projects to determine whether or not the projects and associated activities will have any adverse impacts on the environment, taking into account environmental, social, cultural, economic and legal considerations.

1.3.3 The main objectives of the ESIA are to:

- Identify and assess the anticipated environmental and social impacts of the proposed projects – both positive and negative;
- Identify and analyse alternatives to the proposed projects;
- Propose mitigation measures for negative impacts and enhancement measures for positive impacts to be undertaken during and after the implementation of the proposed projects;
- Verify compliance with national environmental regulations and policies, World Bank Safeguard Policies, and industry best practice and standards;
- Generate baseline data for monitoring and evaluation of how well the mitigation measures have been implemented during the project life cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Seek the views of affected persons in consultation with KPLC and NEMA;
- Prepare an Environmental Impact Assessment Report compliant with the Environmental Management and Coordination Act (1999); and
- Prepare an Environmental and Social Management Plan (ESMP) report compliant with the Environmental Management and Coordination Act (1999).

1.4 Firm of Experts

1.4.1 The ESIA studies have been conducted by Kamfor Company Limited, a Registered Firm of Experts, Reg. No. 082 in conjunction with Parsons Brinckerhoff (PB) of Newcastle, UK.

SECTION 2

METHODOLOGY

2 METHODOLOGY

2.1 General Approach

2.1.1 An environmental and social impact assessment has been undertaken to fulfil the legislative requirements of the Environmental Management and Coordination Act (EMCA) 1999 and the subsequent Kenya Gazette Supplement on Environmental Impact Assessment and Environmental Audit Regulations 2003. As such, our approach has been guided by these two documents.

2.1.2 The ESIA identifies potential environmental, social, and economic impacts of the proposed transmission line and substation projects. It identifies the positive and negative impacts of the proposed projects and proposes mitigation and enhancement measures.

2.1.3 The studies in support of the preparation of the ESIA have comprised discussions and consultations with the proponent and stakeholders; initial site reconnaissance; desk study and literature review; preparation of data collection instruments; field visits for consultations and observations; data analysis and report writing.

2.1.4 No monitoring (other than spot noise measurements during field visits) or detailed surveys (e.g. ecological surveys) have been undertaken. The ESIA experts have instead gathered environmental data already available in the public domain backed up by observations in the field.

2.1.5 In order to conduct a broad based and inclusive study, the proponent and the consultant have from the onset ensured the exercise is participatory. As such, discussions have been held with community members in the projects area and relevant stakeholders with the assistance and coordination of the proponent.

2.2 Reconnaissance Field Visits / Field Observations

2.2.1 Initial field visits to the project areas were conducted in September 2010 in consultation with KPLC and KETRACO, who will construct and operate (and ultimately decommission) the project infrastructure. Subsequent field visits were then undertaken during the period of September 2010 to March 2011 for data collection, identification of environmentally sensitive issues of the project areas, observations, interviews and preparation for public consultation meetings in collaboration with the Provincial Administrations.

2.2.2 Reconnaissance visits to the study areas were undertaken with the accompaniment of KPLC and KETRACO environmental management, safety, and way leave specialists.

2.2.3 During the field visits, the team also made field observations and further took photographs of the project areas. A photograph gallery is attached as Appendix A of this report.

2.3 Desk Study Review

2.3.1 The ESIA experts have collated and presented baseline information on the environmental characteristics as currently exist along the proposed transmission route and at substation sites with respect to the following:

- Social and cultural environment: both current and projected as appropriate, with respect to population, land use, planned development activities, community structure, employment and labour market, sources and distribution of income, cultural heritage, etc);

- Physical environment with respect to topography, landform, geology, soils, climate and meteorology, air quality, hydrology, etc.; and
- Biological environment with respect to flora and fauna including endangered species and sensitive and protected habitats.

2.3.2 A literature review has been undertaken which includes but is not limited to, a review of the following documents:

- EMCA (1999) and associated Regulations made under the Act;
- The Wildlife (Conservation and Management) Act, Cap 376;
- The Wayleaves Act, Cap 292;
- The Forests Act, 2006;
- The Lakes and Rivers Act, Cap 409;
- The Antiquities and Monuments Act 1983, Cap 215;
- The National Museums and Heritage Act 2006, Cap 216;
- The Water Act 2002;
- The Agriculture Act, 2006;
- The Physical Planning Act, 1999
- The Land Planning Act, Cap 303;
- The Land Acquisition Act, Cap 295;
- The Plant Protection Act, Cap 324;
- The Public Health Act, Cap 242
- The Government Lands Act, Cap 280;
- The Land Control Act, Cap 302;
- The Local Government Act, Cap 265;
- The Energy Act, 2006;
- The Civil Aviation Act, Cap 394;
- International Conventions Applicable in Kenya; and previous Environmental and Social Impact Assessment (ESIA) reports, Environmental Impacts Assessment (EIA) reports and Environmental Audit (EA) reports submitted to NEMA.

2.3.3 The relevance of these and other legislation and guidance to the proposed projects are further described within Section 3 of this report.

2.4 Public Consultation

2.4.1 The EIA experts have, in consultation with KPLC, KETRACO and NEMA, sought the views of persons who may be affected by the proposed projects. The public consultations were preceded by the identification of stakeholders and project affected persons (PAPs).

2.4.2 Public meetings have been undertaken at proposed substation sites and along the transmission line route at Suswa, Ewuaso, Ngong, Corner Baridi, Kipeto/Kisaju, Isinya and Thika Road.

2.4.3 Focused group discussions with PAPs and vulnerable groups have also been held at watering points, shopping/market centres, and local administration offices.

2.4.4 The findings from the consultations have been documented within Section 8 of this report. Lists of attendees at the consultations are provided in Appendix B of this report.

2.5 Key Stakeholder Consultation

2.5.1 Consultation has been undertaken with the following key stakeholders:

- Kenya Wildlife Service (KWS);
- Kenya Forest Service (KFS)
- Kenyan Civil Aviation Authority (KCAA);
- Planning Departments of Local Authorities;
- District Environment Officers;
- District Development Officers;
- District Social Development Officers; and
- District Environment Council.

2.5.2 A summary of the consultation findings is provided in Section 8 of this report.

2.6 Data Analysis

2.6.1 The EIA experts have used their past experience and knowledge to analyse the data from the desk studies and field visits in order to determine the potential impacts of the proposed projects, the severity of effects arising from these impacts and how any adverse impacts can be best mitigated and positive impacts enhanced. This analysis provides the framework for the recommendations on corrective actions and remedial measures and provides the basis for the formulation of the environmental management plan which forms part of this report.

2.6.2 The data have also been considered in terms of occupational health and safety with respect to the construction and operational phases of the proposed projects.

2.6.3 The data has also been considered with respect to project alternatives including technology and routing, and global environmental impacts such as climate change.

2.7 ESIA Report Format

2.7.1 This report follows the format prescribed in the Legal Notice No. 101 of 13th June 2003 which deals with the Environmental (Impact Assessment and Audit) Regulations.

2.7.2 The ESIA report looks at the background of the project; nature of the project; activities of the project; project design, materials and equipment to be used; potential environmental impacts; mitigation and enhancement measures; legislative and regulatory framework; prevention and management of possible accidents; health and safety issues; potential economic and social impacts; the budget; and proposes an environmental management plan for the proposed projects.

SECTION 3

POLICY, LEGISLATIVE AND REGULATORY FRAMEWORKS

3 POLICY, LEGISLATIVE AND REGULATORY FRAMEWORKS

3.1 Introduction

3.1.1 The following section identifies the most pertinent legislation and regulations and standards governing the environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues.

3.2 Social Issues

3.2.1 There is no legal instrument in the country that addresses social issues in development interventions. However, over the years, the Kenya Government has recognised the importance of entrenching social dimensions of development in its development agenda. Notably, development initiatives are required to deliberately ensure that the marginalised and more vulnerable people in society are actively involved in development processes.

3.2.2 In addition to this Government approach is the requirement that a project is screened so as to test its conformity with the World Bank's safeguard policies. These policies are geared towards mitigating any social and environmental negative impacts that may result from projects.

3.3 Environmental Issues

3.3.1 It is the Government's policy that the rights of its citizens to clean and health environment are met. In return, every person has responsibility to protect and manage the environment. In this regard, the Government enacted the EMCA (1999) and the Environmental Impact Assessment and Audit Regulations (2003) to provide a framework law for the coordinated management of environment.

3.3.2 Both the EMCA and the EIA regulations require EIA to be undertaken for certain new enterprises/projects. The umbrella body administering this requirement is NEMA. The Authority has a designated Environmental Committees to oversee the implementation of the EMCA at the Provincial and District levels.

3.4 Applicable Laws and Regulatory Frameworks

3.4.1 **Environmental Management and Coordination Act 1999:** Part 6 of the EMCA (1999) of Kenya, provides for environmental impact assessment. This is in agreement with Principle 17 of the Rio Declaration which extends the rule of prior assessment of potentially harmful activities to include those activities which have impacts solely within a state: "Environmental Impact Assessment (EIA), as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent National authority."

3.4.2 The EMCA 1999 provides under the **Second Schedule,** a list of projects that must undergo screening for EIA. The proposed transmission line and substation projects fall under this schedule and as such require that an EIA Project Report be undertaken and submitted to NEMA for review. The expert review by NEMA of the project report shall then advice on whether each of the proposed projects requires a full EIA study or not. EIA is undertaken by registered experts and their report is submitted to NEMA. Both the project report and the EIA report are open to review by the public and individuals.

3.4.3 The EMCA Section 68 and 69 also states that the proponent must submit an Environmental Audit Report one year after commencement of the project, and thereafter undertake Self Audits.

3.4.4 The mandate of NEMA is to "exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment"

3.4.5 The functions of NEMA under the Act are:

- Coordination of the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations;
- Prepare and issue an annual report on the state of the environment in Kenya;
- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities;
- Public education and awareness creation on environmental matters;
- Compliance and enforcement of environmental legislation;
- Enhancement of the effectiveness of the Provincial and District Environment Committees;
- Development of linkages involving the private sector, inter-governmental organizations, non-governmental organizations and government agencies of other states, on issues related to the environment; and
- Coordination and development of the necessary capacity for environmental management.

3.4.6 **Environmental (Impact Assessment) and Audit Regulations, 2003:** These Regulations stipulate how an EIA will be undertaken and what the EIA study report should contain. It also provides regulations on Environmental Audits (EA), which the proposed project proponent will be required to undertake. The Regulations are presently under review.

3.4.7 **Environmental Management and Co-ordination (Water Quality) Regulations 2006:** The New Water Quality Regulations provide for the protection of lakes, rivers, streams, springs, wells, and other water sources. The regulations also stipulate that all industries should refrain from any actions, which may directly or indirectly cause water pollution. All industries are therefore required to refrain from discharging effluent into water bodies. This regulation gives a minimum distance from a water body for which any development may be undertaken and as such affect the proposed projects with regards to the choice of line route.

3.4.8 **Environmental Management and Co-ordination (Waste Management) Regulations 2006:** The Waste Management Regulations sets out standards for handling, transportation and disposal of various types of wastes. The regulations stipulate the need for facilities to undertake, in order of preference, waste minimisation or cleaner production, waste segregation, recycling or composting. These regulations provide guidelines on how to store, transport and dispose any wastes generated during the construction and maintenance phases of the transmission lines and sub-stations. Some of these wastes may fall under the hazardous wastes category and thus require particular disposal arrangements.

3.4.9 Environmental Management and Coordination (Conservation of Biodiversity, Access to Genetic Resources and Benefit Sharing) Regulations 2006: The Conservation of Biodiversity Act Sections 5-9 provides for the protection of endangered species, creation of

an inventory, and monitoring of their status, protection of environmentally significant areas, provision of access permits, material transfer agreements and benefit sharing. These regulations will guide the routing of the transmission line and substation siting with a view to avoiding areas of environmental significance and protection of endangered species.

3.4.10 **Environmental Management and Co-ordination (Noise and Excessive Vibrations) Regulations 2009:** These have recently been gazetted. The regulations define noise as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. The 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.

3.4.11 **Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations 2006:** The Fossil Fuel Emission Control Regulations provide for acceptable emission standards in Kenya. Section 4 of the regulations states that any internal combustion engine for motor vehicles and generators must comply with the emission standards provided for in the First Schedule of those regulations. Hence anyone who operates such engines whether on the road, street, public highway or any premises, which emits smoke in excess of the emissions standard in the First Schedule contravenes the regulations and is liable to prosecution. Section 8 provides that any person intending to use any fuel catalysts other than those permitted by the authority to disclose it and seek prior approval. Establishments (including construction sites and operational substation sites) that use generators as alternative sources of energy must take account of the regulation on the emission standards.

3.4.12 **Environmental Management and Coordination (Air Quality) Regulations, 2008:** These regulations provide for the safeguarding of the ambient air quality and give guidelines to prevent and control air pollution. The first and seventh schedules of the regulations provide a list with associated emission limits of prohibited, controlled, and un-controlled air pollutants. The regulations also give ambient air quality tolerance limits. The regulations will be particularly relevant to the construction works (including transportation) and also to operational substation sites.

3.4.13 **Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009.** These regulations provide for the protection of all wetlands on both private and public land. The regulations provide for sustainable exploitation of wetlands and are aimed at maintaining both the wetlands and hydrological, ecological, social and economic functions and services.

3.4.14 **Forest Act, 2005**: This Act created a new semi-autonomous body, the Kenya Forest Service (KFS) and supportive institutions for management and conservation of all types of forests. This Act mandates the KFS to conserve and manage all forests. It also sets out the roles and responsibilities of communities in managing forests. KFS is also responsible for formulating policies regarding the management, conservation and use of all types of forest areas in the country. The Act embraces the concept of participatory forest management and gives particular consideration to formation of forest community associations, which are recognized as partners in management. It enables members of forest communities to enter into partnership with KFS through registered Community Forest Associations. It also allows lease arrangements by interested groups to supplement government efforts in plantation forest. The Act is important for the line routing where it may touch on forests of any type (not just protected forests). KFS will need to be kept informed of the impact on trees along the transmission line route, particularly at the construction stage.

3.4.15 **The Water Act 2002:** The Water Act, 2002, provides for the management, development, conservation, use and control of water resources and for the acquisition and regulation of rights to use water, to provide for the regulation and management of water supply and sewerage services. The Act focuses on two key sub-sectors- Water Resources Management (WRM) and Water and Sanitation Services (WSS). The Water Act 2002, commenced by virtue of Legal Notice No. 31 of 18th March 2003 and Legal Notice No. 158 of 29th August 2003, provided for a reformed legal/institutional framework for the management and development of Kenya's water resources and the provision of water services. The Act establishes relevant authorities and creates catchment management bodies and seven regional service boards. It specifies "public participation", in relation to any application made, or action proposed to be taken. The act further provides for the strategic management of the water resources.

3.4.16 **The Agriculture Act (Chapter 318):** The Agriculture Act is the principal land use statute covering inter alia soil conservation, agricultural land use and conservation issues such as the preservation of soil fertility. The Act prohibits any land use practices that may intensify soil erosion. It prohibits cutting down or destroying vegetation on any land of which the slope is 35%, except if the activity is done within the conditions sanctioned by an agricultural officer. Section 48 on land preservation rules prohibits the cultivation, cutting down or destruction of vegetation on any land of which the slope exceeds 20%. The rules stipulate strict regulations on the cultivation of any land whose slope is between 12% and 35% when the soil is not properly protected from erosion. The Act also provides for protection of watercourses setting aside a riparian zone of a minimum 2m equivalent to the width of river to a maximum of 30m.

3.4.17 **The Public Health Act (Cap 242):** Health and hygiene are particularly important where communities congregate for a shared resource such as water. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Part IX Section 115 of the Act states that no person/ institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under Section 118, waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into a public street or into the gutter or side channel or water house, irrigation channel or bed not approved for discharge is also deemed as a nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin. This will be of particular relevance to any temporary worker camps set up during the construction phase of the project.

3.4.18 **The Wildlife Conservation and Management Act, Cap 376:** This Act provides for the protection, conservation and management of wildlife in Kenya. The provisions of this Act should be applied in the management of the project especially where it passes through protected wildlife habitats, migratory areas or dispersal corridors. The Act establishes the Kenya Wildlife Service (KWS) and provides for the establishment of national parks and national reserves and defines how they are to be managed. As per the Act, the overall mandate of KWS is to conserve and manage wildlife in Kenya. Its key responsibilities are:

- Sole jurisdiction over National Parks;
- Supervisory role in the management of National Reserves, Local and Private Sanctuaries;
- License, control and supervision of all wildlife conservation and management activities outside the protected areas;

- Conservation Education and Training; and
- Wildlife Research.

3.4.19 The role of KWS also includes the management and protection of important and critical water catchments areas. KWS also has an additional role of protection and restoration of the Mau forest and controls 125 game stations outside protected areas. KWS plays a role in formulation and implementation of strategies for tourism and the sustainable exploitation of natural resources.

3.4.20 **The Physical Planning Act, 1999:** Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section allows for prohibition or controls the use and development of land and buildings in the interest of proper and orderly development of an area. Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation for any building without development permission granted by the respective local authority. Finally, section 36 states that, if in connection with a development application, the local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the applicant shall be required to submit, together with the application, an EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by NEMA and should be followed by annual environmental audits.

3.4.21 **Way Leaves Act (Cap. 292):** The Act provides for certain undertakings to be constructed e.g. transmission lines, pipelines, canals, pathways etc., through, over or under any lands. This project is under the provision of the Act. Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. Where the line touches buildings or interferes with people's livelihoods, the Act requires written consent of affected parties and compensation thereof.

3.4.22 **Land Acquisition Act (Cap. 295):** This Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. For the acquisition to take place, the minister responsible must issue a gazette notice. The Act also provides for full compensation to the affected parties.

3.4.23 **The Registered Land Act, Cap 300, Laws of Kenya:** This provides for the absolute proprietorship over land (exclusive rights). Such land can be acquired by the state under the Land Acquisition Act. This is of particular relevance to way leave acquisition.

3.4.24 **The Land Adjudication Act, Cap 95, Laws of Kenya:** This provides for ascertainment of interests prior to land registrations under the Registered Land Act.

3.4.25 **The Lakes and River Act, Cap 409, Laws of Kenya**: This Act provides for protection of rivers, lakes and associated flora and fauna. Part IV of the Act specifies that the Minister may make rules for the protecting bird or animal life on or in a lake or river.

3.4.26 **National Museums and Heritage Act 2006:** The Act gives provision for an area of land of cultural significance to be set-aside or acquired under compulsory provision and declared a protected area under Sections 34 and 35 of the Act. This provides for the gazettement of national monuments. Monuments gazetted under this Act fall under the management of the National Museums of Kenya. Several of these monuments include forests of cultural and biodiversity significance. It is therefore appropriate for the proponent to check whether the proposed project falls with sacred sites, ruins, caves or areas of national significance before construction.

3.4.27 **The Antiquities and Monuments Act, 1983 Cap 215:** The Act aims to preserve Kenya's national heritage by empowering the National Museums of Kenya to collect, document, preserve and enhance knowledge, appreciation, management and the use of these resources for the benefit of Kenya and the world. Through the National Museums of Kenya, many sites are protected by law by having them gazetted under the Act.

3.4.28 **The Local Government Act, Cap 265, Laws of Kenya:** This provides for making by-laws and institutions by the Local County Councils. By-laws can be made on the governance of a project under the provisions of this Act.

3.4.29 **Labour Laws of Kenya including Employment Act 2007:** This is the revised employment act in Kenya, repealing the former Employment Act Cap 226. It deals with new employment conditions of employment and the rights of workers including for paternity leave for fathers. All workers, including those employed during the construction phase, will be employed under this Act which includes provision with respect to minimum wage, working conditions and time, and also in the resolution of disputes.

3.4.30 **The Factories and Other Places of Work Act (Cap 514):** This is the core legislation governing requirements for occupational health and safety at the place of work. The Factories Act identifies up to 43 requirements which include; observing high standards of cleanliness, avoiding overcrowding, constructing and maintaining adequate ventilation, and providing and maintaining suitable natural or artificial lighting, as appropriate. This will be once again of particular relevance to the construction phase and operation of temporary worksites as well as to the operation of substation sites.

3.4.31 **The Penal Code (Cap. 63):** Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use, is guilty of an offence. Section 192 of the same act says a person who makes or violates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing by, commits an offence punishable by law.

3.4.32 **Traffic Act Cap 403:** The Traffic Act prohibits air pollution through Section 51 which requires that motor vehicle use proper fuels. The Act requires that every vehicle be so constructed and used as not to emit any smoke, or visible vapour. The amendment further prohibits the use of any stationary internal combustion engine, discharging exhaust gas into the atmosphere without treatment.

3.4.33 **Energy Act, 2006:** The Act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any or all of these purposes. The Act establishes an energy commission, which is expected to become the main policy maker and enforcer in the energy sector.

3.4.34 **The Civil Aviation Act, Cap 394:** This act mandates the Kenya Civil Aviation Authority (KCAA) to authorize and approve the height of any masts put up to ensure the safety of flying aircraft. This will be of particular relevance to the siting and height of overhead transmission line (OHTL) tower heights.

3.5 International Conventions Applicable in Kenya:

3.5.1 Kenya has ratified various international conventions on environment that are applicable to this study. Conventions are agreements that are legally binding on states that have become parties to them. Kenya has the **International Convention on Biological Diversity (1992)** which promotes the protection of ecosystems and natural habitats, respects the traditional lifestyles of indigenous communities, and promotes the sustainable use of resources.

3.5.2 Kenya is also party to the **World Heritage Convention (1972)** which is concerned with cultural and natural heritage. The convention deals with monuments and areas that are deemed to be of "outstanding universal value" in terms of beauty, science and/or conservation. Kenya has several sites that have been declared World Heritage Sites such as Lamu town, Mt. Kenya's natural forests, and Sibiloi National Park near Lake Turkana. Any deterioration or disappearance of such heritage is a loss to all the nations of the world.

3.5.3 The importance of wetlands and water birds are also covered under the **Ramsar Convention 1971**, which governs wetlands of international importance. The convention entered into force in Kenya in 1990 and it governs Lake Nakuru, Lake Baringo, and Lake Natron, which is a shared ecosystem between Kenya and Tanzania. Kenya is therefore committed to avoid degradation of wetlands under its jurisdiction.

3.5.4 Kenya has also ratified the Agreement of the Conservation of Eurasian Migratory Water Birds (2001) and the African Convention on the Conservation of Nature and Natural Resources (1968), the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973 which prohibits trade in species such as Dugongs and also in Ivory. The proponent will need to ensure that these important conventions are not violated during construction, operation or decommissioning of the proposed projects.

3.5.5 The **United Nations Framework Convention on Climate Change** (**UNFCCC** or **FCCC**) is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro from 3rd to 14th June, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

3.5.6 The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the **Kyoto Protocol**, which has become much better known than the UNFCCC itself.

3.6 World Bank Safeguard Policies

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

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

3.6.3 The preparation of the environmental assessment is the responsibility of the borrower, but the Bank's task manager assists and monitors the project and screens it in order to determine the nature and extent of the environmental work required. The Operational Directive includes checklists of potential issues for an environmental assessment. It also proposes outlines and models for the assessment and prescriptions for the assessment and the screening procedures.

3.6.4 Environmental review begins with identifying the seriousness of the potential harm. The Bank screens all new projects and assigns each one of four categories based upon the character, dimension, and sensitivity of the environmental issue.

- Category A: Projects which may have a significant impact on the environment and thus require a complete environmental assessment.
- Category B: Projects that may only have limited, specific environmental effects which should be investigated but do not necessarily require an in-depth environmental assessment.
- Category C: Projects for which an environmental analysis is not normally necessary e.g. education; family planning; health; nutrition; institutional development; technical assistance; and human resource projects.
- Category D: Environmental projects which do not require an assessment for the reason that environmental development is the focus of the project, and it is assumed that any environmental consequences have already been considered.

3.6.5 For those projects for which a full EIA is not required, but are in need of some environmental analysis (Category B), an Environmental Mitigation or Environmental Management Plan often will suffice (these are also prepared for category A projects as a part of the full EIA). The Bank's requirement for mitigation plans includes: a description of all adverse environmental impacts; a description and technical details for each mitigation measure; the assignment of responsibilities for carrying out the mitigation measures; an implementation schedule for the mitigation measures; monitoring and reporting procedures; and; cost estimates.

3.6.6 The Bank expects the borrower to ensure coordination among government agencies and to take into account the views of affected groups and local Non-Governmental Organisations (NGOs). It also requires the borrower to provide relevant information to affected groups and local NGOs and to hold meaningful consultations with them. The environmental assessment should form part of the overall feasibility study or project preparation and be submitted to the Bank which decides on the loan.

3.6.7 While the EIA is being prepared, drafts should be made available, and the final EIA must be available prior to the final appraisal of the project. The borrower submits the final EIA when it is complete to the Bank prior to the Bank's appraisal. During the appraisal phase, the Bank and the borrower together review the assessment. At this time any unclear issues are resolved, and the two parties determine whether the recommendations from the assessment have been incorporated into the project design.

3.6.8 The impact assessment will later provide the framework through which the project is evaluated as it is being implemented by the borrowing country. The borrowing country must inform the Bank of its compliance with the environmental conditions, the status and effectiveness of the mitigating measures, and the findings of the monitoring program. In the final phase of the process, project-completion reports are required to evaluate environmental effects. The reports are to take a particular notice of whether the original

assessment correctly identified the potential environmental consequences, and determine whether the mitigating measures were successful.

3.6.9 Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Other safeguard policies of relevance to this study include:

- Bank Safeguard Policy 4.04 Natural Habitats;
- Bank Safeguard Policy 4.10 Indigenous People; and
- Bank Safeguard Policy 4.12 Involuntary Settlement.

3.6.10 **OP/BP 4.04 Natural Habitats**[2]: This safeguard policy requires a precautionary approach to natural resources management and requires the conservation of critical environments during project development. In order to ensure conservation and project sustainability, this policy requires that:

- Project alternatives are sought when working in fragile environments; and
- Key stakeholders (e.g. KWS) are consulted during the project design, implementation, monitoring and evaluation of mitigation.

3.6.11 **OP/BP 4.10 Indigenous People3:** The World Bank recognises that the identities and cultures of Indigenous Peoples are inextricably linked to the lands on which they live and the natural resources on which they depend. These distinct circumstances expose Indigenous Peoples to different types of risks and levels of impacts from development projects, including loss of identity, culture, and customary livelihoods, as well as exposure to disease. Gender and intergenerational issues among Indigenous Peoples are also complex. As social groups with identities that are often distinct from dominant groups in their national societies, Indigenous Peoples are frequently among the most marginalized and vulnerable segments of the population. As a result, their economic, social, and legal status often limits their capacity to defend their interests in and rights to lands, territories, and other productive resources, and/or restricts their ability to participate in and benefit from development. At the same time, the Bank recognises that Indigenous Peoples play a vital role in sustainable development and that their rights are increasingly being addressed under both domestic and international law.'

3.6.12 **OP/BP 4.12 Involuntary Resettlement**[4]: 'The World Bank's experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost. This policy includes safeguards to address and mitigate these impoverishment risks.'

3.6.13 'This policy contributes to the World Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the

[2] World Bank, 2001, OP 4.04 Natural Resources
[3] World Bank, 2005, OP 4.10 Indigenous Peoples
[4] World Bank, 2005, OP 4.12 Involuntary Resettlement

project by the affected Indigenous Peoples. Such Bank financed projects include measures to (a) avoid potentially adverse effects on the Indigenous Peoples' communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and inter-generationally inclusive'.

3.7 African Development Bank Environmental Guidelines

3.7.1 The Bank has Integrated Environmental and Social Impact Assessment Guidelines and Environmental and Social Assessment Procedures (ESAP). The guidelines integrate environmental and social concerns into the life cycle of a project and also stipulate requirements for specific projects. The guidelines aim to identify and then avoid or mitigate potential adverse impacts early on in the project cycle and enhance beneficial impacts at a minimal cost. Overall, the mitigation approach adopted in the guidelines focuses on preventing, minimising, mitigating or compensating adverse impacts rather than curative interventions that handle adverse outcomes after the emergence of the anticipated problems.

3.7.2 The guidelines also give prioritised Bank cross-cutting themes, namely:

- Poverty - so as to ensure that projects assist in reducing poverty;
- Environment - which includes the flora, fauna and landscape as well as the natural and cultural heritage and involves considering the human interactions and impacts on the biosphere, both positive and negative;
- Population - demographic trends, migration and resettlement, changes in natural resources and land management and quality of life;
- Health - which includes communicable diseases, non-communicable diseases, malnutrition, injuries, psychosocial disorders and well-being;
- Gender - which includes gender inequalities or differences especially with regard to division of labour (paid and unpaid work), income-generating activities, access to and control over productive factors, and involvement in societal organization; and
- Public Participation - which ensures actively involving the project stakeholders, particularly those who stand to gain or to lose from a project.

3.7.3 The ESAP gives the steps to be undertaken when undertaking an ESIA including the generic terms of reference of an ESIA; typical contents of an ESIA and the minimum contents of an Environmental and Social Management Plan (ESMP). It defines ESIA as an Instrument whose purpose is to identify and assess the potential environmental and social impacts of a proposed project, evaluate alternatives, and design appropriate mitigation/enhancement, monitoring, consultative and institutional strengthening measures. The objective of EASP is to improve decision-making and project results in order to ensure that Bank-financed projects plans and programs are environmentally and socially sustainable as well as in line with Bank's policies and guidelines. The ESAP divides projects into four categories:-

- Category 1: projects are those that are likely to have the most severe environmental and social impacts and require a full ESIA.
- Category 2 projects are likely to have detrimental and site-specific environmental and social impacts that can be minimised by the application of mitigation measures included in an ESMP.

- Category 3 shall not induce any adverse environmental and social impacts and do not need further action.
- Category 4 projects involve investment of Bank's funds through Financial Intermediaries (FIs) in subprojects that may result in adverse environmental or social impacts. Specific requirements for this type of project include an assessment of FI capacities to handle environmental and social considerations.

3.7.4 Under the ESAP, the Borrower is responsible for integrating environmental and social considerations sponsored projects according to the Bank's requirements.

3.7.5 For Category 2 projects such as the proposed project, where there may be small scale resettlement of persons, the Bank requires that the Borrower consult with potentially affected stakeholders early in the project cycle. The Borrower is also required to conduct meaningful consultations with relevant stakeholders, including potential beneficiaries, affected groups, Civil Society Organisations (CSOs) and local authorities, about the project's environmental and social aspects and take their views into account. These consultations shall take place according to the country's legal requirements.

3.7.6 The Borrower shall also give public notification and make the ESIA report available at a public place readily accessible to project stakeholders as soon as the document is ready. This shall be undertaken by NEMA.

3.8 Japan International Cooperation Agency (JICA) Environmental Guidelines

3.8.1 JICA Guidelines for Environmental and Social Considerations integrate the Japan Bank for International Cooperation (JBIC) Guidelines for the Confirmation of Environmental and Social Considerations (2002) and the JICA Guidelines for Environmental and Social Considerations (2004).

3.8.2 JICA classifies projects into four categories:

- Category A: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society.
- Category B: Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific, few if any are irreversible, and in most cases, normal mitigation measures can be designed more readily.
- Category C: Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.
- Category FI: Proposed projects are classified as Category FI if JICA's funding of projects is provided to a FI or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution.

3.8.3 For JICA, impacts to be assessed include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilisation of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the

development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.

3.8.4 In principle, project proponents should consult with local stakeholders through means that induce broad public participation to a reasonable extent, in order to take into consideration the environmental and social factors in a way that is most suitable to local situations, and in order to reach an appropriate consensus.

3.8.5 People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner. Prior compensation, at full replacement cost, must be provided as much as possible.

3.9 Other Development Targets

3.9.1 The **Millennium Development Goals** (**MDGs**) are eight international development goals that all 192 United Nations member states international organisations have agreed to achieve by 2015. They include eradicating extreme poverty, reducing child mortality rates, fighting disease and epidemics, such as HIV/AIDS, and developing a global partnership for development.

3.9.2 The proposed projects are in line with the MDGs in terms of poverty eradication, through creation of employment and improving livelihoods through provision of energy and may also make some contribution towards reducing diseases such as bronchitis which is related to a high dependence on firewood as source of energy.

3.9.3 **Kenya Vision 2030** is an economic development plan by the Kenyan Government to develop different economic zones in various parts of the country. The plan aims to produce annual economic growth rates of 10%. Currently, Kenya has a GDP growth of 4.9% (2007). The Vision calls for a series of five-year plans, with the first one being from 2008 to 2012. The first plan calls for investments in six key sectors; tourism, agriculture, manufacturing, trade, information technology and financial services.

3.9.4 The Government is committed to continued institutional reforms in the energy sector, including a strong regulatory framework, encouraging more private generators of power, and separating generation from distribution. New sources of energy will be found through exploitation of geothermal power, coal, renewable energy sources, and connecting Kenya to energy surplus countries in the region.

SECTION 4

NATURE OF THE PROJECT

4 NATURE OF THE PROJECT

4.1 Overview

4.1.1 KPLC has identified the need for major reinforcement of the Nairobi transmission network. A number of different options were considered as part of the feasibility studies. The recommended option includes the following projects:

- New 400/220 kV substations at Suswa and Isinya;
- New 220/66 kV substations at Ngong, Thika Road, and Athi River, and
- New Suswa-Isinya 400 kV transmission line (100 km).

4.1.2 ESIA reports have already been prepared for Athi River and Isinya substations and these substations have therefore been excluded from assessment within this ESIA report.

4.2 Proposed Transmission Line Route

4.2.1 The proposed 100 km 400 kV Suswa – Isinya transmission line will run from a few kilometers outside Suswa town, parallel to the existing 220 kV Olkaria-Nairobi North line for approximately 23 km (see the route is represented in Appendix C). It will then cross the Ewaso Kedong valley and the Kiambu escarpment to Ngong (passing close to the Ngong wind turbines); and from Corner Baridi pass by Kipeto onto Isinya. From Suswa to Corner Baridi, the OHTL will run across savannah and shrub vegetation, through areas which are sparsely populated and mainly used for grazing. After Corner Baridi, the line will traverse some settlement areas especially between Athi River and Isinya. The line routing has attempted as far as possible to avoid human settlement. The Suswa-Isinya line has been Geo Referenced as per Table 4.1.

Table 4.1: Geographical Position System Coordinates for Suswa- Isinya Line

No	Geo-Reference in Universal Traverse Mercator (UTM)	Location
Take-Off	0205527 9883308	
AP 1	0220781 9876192	Suswa
AP 2	0221072 9876022	
AP 3	0224405 9873460	Suswa (10 Km from Suswa Substation/Separates from Nairobi North 220 kV Line)
AP 4	0227563 9864006	Kiambu Escarpment
AP 5	0229603 9852248	Kimuka
AP 6	0236760 9839984	Corner Baridi
AP 7	0240054 9833862	Corner Baridi
AP 8	0243682 9819452	Olchoro River/Kisaju
AP 9	0255749 9805600	Isinya Substation

NB: AP: Angle Point

4.2.2 A short spur line of 3.2 km will run from the Suswa-Isinya transmission line to the Ngong substation. The spur connects into the transmission line between AP4 and AP5 (the exact coordinates of the spur are as yet to be confirmed) and runs through a sparsely populated area and does not affect any buildings.

4.3 Proposed Substation Sites

4.3.1 The proposed Suswa 400/220 kV substation is to be located near Suswa town, on a 100 acre plot. The site is located off the Mai Mahiu – Ngong asphalted road. The site is near the local slaughter house and the current land use is for grazing of livestock. The Geo-reference for this site is shown in Table 4.1 above.

4.3.2 The proposed 220/66 kV Ngong substation is to be located just behind the wind turbines near the Savannah Restaurant and campsite at the foot of Ngong Hills. It is 30 acres in size and is located about 10 km from Ngong town on the Ngong-Ewuaso road, about 1 km from Kimuka centre. The Geo-reference for the site is as follows: Ngong s/stn: N (9851137), E (234047).

4.3.3 The proposed 220/66 kV Thika Road Substation will be located opposite Kenyatta University within Gicheha Farm which is currently used for growing crops. The land has few shrubs or trees. The proposed area of land take is 30 acres. The Geo-reference for the site is as follows: Thika Rd S/stn: N (9869944), E (271357).

SECTION 5

PROJECT ACTIVITIES

5 PROJECT ACTIVITIES

5.1 Introduction

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

5.2 Pre-construction/Project Design

5.2.1 As part of the pre-construction stage, KPLC has commissioned PB to conduct a feasibility study aimed at producing a long-term strategy for development of Kenyan power transmission system, with a focus on the Nairobi Metropolitan area. The study covers the planning period up to 2030 and includes technical and economic analysis. A conceptual design has been developed and will be taken forward for detailed design and implementation including the projects described in the previous section. This ESIA report forms part of the feasibility study.

5.2.2 KPLC/KETRACO are currently applying for various permits and licenses including procurement of land for the associated substations. The procurement of the various goods and services and contracting of the construction firm and other consultants will begin after the completion of the EIA process.

5.3 Construction

5.3.1 The construction of the **transmissions line** will require the creation of some temporary access roads to the transmission construction sites. The construction of the transmission towers themselves will require some localised vegetation clearance. Materials arising from the excavation for the tower foundations (soil, rock etc.) would either be spread in appropriate areas surrounding the line or removed to another site as agreed. The foundations will be in filled with cement supplied via ready-mix-cement trucks or alternatively mixed on site. Following tower erection, conductor stringing, which may involve the use of a mobile crane, will occur and may result in the need for some tree cutting along the Right of Way (RoW).

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

5.4 Operation

5.4.1 Once constructed, the **transmission line** will require minimal maintenance. Yearly visual inspection of the OHTL towers and conductors is expected. After a period of many years, the entire system would need a detailed survey and overhaul. There may be a requirement for occasional visits to remove tree or branches where these start to grow too close to the OHTL. Access rights may need to be retained to allow for maintenance works in the future.

5.4.2 The **substations** will require periodic maintenance of the transformer equipment and of the site infrastructure (buildings, roadways etc) resulting in the generation of industrial waste

including hazardous wastes such as used transformer oil. The day-to-day operation of substations will generate domestic waste and sewage and will require the supply of water and energy to the site.

5.5 Decommissioning

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

SECTION 6

PROJECT ALTERNATIVES

6 PROJECT ALTERNATIVES

6.1 Introduction

6.1.1 This section identifies the alternatives to the proposed projects which have been considered as part of the feasibility study.

6.1.2 It also demonstrates how the selected transmission line route and substation sites have been chosen such that involuntary resettlement (including involuntary acquisition of land) and impact on livelihood of people living along the transmission line routes have been avoided or minimised and how environmental impacts have been minimised.

6.1.3 The use of alternatives materials, processes and technologies is also discussed.

6.2 Scheme Alternatives

'No Scheme' Alternative

6.2.1 Currently, Kenya's national access to electricity is estimated at 18%. The Government of Kenya, as part of the 2030 Vision, aims to raise access to electricity to 20% by end of 2010 and to 40% by 2020. In addition, development projects emerging from Vision 2030 will increase demand on Kenya's energy supply.

6.2.2 Currently, Kenya's energy costs are higher than those of her neighbours. Kenya must, therefore, generate more energy at a lower cost and increase efficiency in energy transmission, distribution and consumption.

6.2.3 The proposed projects will contribute towards these aims and thus a 'no scheme' alternative is not considered to be a viable option.

'With Scheme' Alternative

6.2.4 KPLC commissioned PB to conduct a study aimed at determining the future transmission system requirements for the Nairobi metropolitan area. The studies included:

- an assessment of the existing transmission system throughout Kenya and the sub-transmission system in the Nairobi region;
- options and associated costs for development of the Nairobi transmission system;
- reference to the findings of an interim environmental and social impact assessment associated with the proposed projects;
- a financial and economic justification for the proposed investment;
- recommendations for expansion and reinforcement of the Nairobi transmission network; and
- a conceptual design for the recommended scheme.

6.2.5 The development of the Nairobi transmission network was considered in two broad stages:

- development up to 2015 (short/medium-term); and
- development beyond 2015 (long-term).

6.2.6 The short/medium term development was further split into first and second stage projects, with the first stage projects, identified in Section 4, being the subject of this ESIA.

6.2.7 A conceptual design was developed for the preferred option which recommends the staged development of new transmission line and substation sites. The preferred option identifies the need for the projects identified in Section 4 to be undertaken initially, with further developments to follow.

6.2.8 Some modifications to plant on existing substation sites has also been identified within the feasibility report however these have not been assessed within this ESIA report as the impacts of these modifications are not of a scale considered necessary for EIA.

6.2.9 Similarly, the upgrade at a later date of the Suswa – Isinya transmission line from 220kV to 400kV has not been assessed but rather the higher voltage has been assumed for the purpose of the ESIA.

6.3 Line Routing and Substation Siting Alternatives

6.3.1 In proposing the above concept, consideration was given to social and environmental impacts of the projects. Early on it was identified that a number of the transmission lines proposed in the early scheme concept (as presented in Figure 1.1, Section 1 of this report) could be avoided. The number of transmission lines was thus limited to those that are technically required whilst complying with KPLC/KETRACO's planning criteria.

6.3.2 The concept developed largely avoids built up areas, thus minimising the need for land acquisition and resettlement. The Suswa – Isinya line route itself has been chosen to avoid settlements and their associated infrastructure as well as tourist areas. The proposed route avoids hills and ridges thus minimising visual impact. New substation sites have been located to avoid areas of dense settlement and where impacts on local people e.g. from loss of farmland or grazing land are minimal.

6.4 Alternative Materials, Processes and Technologies

6.4.1 Due to Nairobi's high altitude, corona and radio interference noise levels were found to be the deciding factor for conductor size and bundling arrangements. For altitudes above 1600m, the voltage gradient surrounding single Canary conductors will exceed the recommended level of 18kV/cm and will result in corona and radio interference noise levels above recommended values. As much of the proposed line route includes sections which reach or exceed 1600m (the altitude around Ngong reaches 2000m), PB has recommended the use of twin Canary and triple Canary conductors on 220 kV and 400 kV lines respectively.

6.4.2 Double circuit towers have been recommended to minimise line corridor width requirements and therefore the associated land take and disturbance to people and wildlife.

6.4.3 The proposed transmission line route follows the existing Olkaria-Nairobi North line route for a distance of 23 km from Suswa thus reducing the visual impact by siting the transmission line in an area where there is already a degree of visual impact and where residents have already been sensitised to such development.

6.4.4 The Danube tower design (as employed on the Mombasa-Nairobi line) will result in a lower profile, and therefore reduced visual impact, without significantly affecting the cost. The feasibility study recommends that a choice between Danube and standard vertical formation towers should be made during the detailed design stage, on a case-by-case basis.

6.4.5 Due to the hilly terrain over part of the route, some particularly long spans (>600m) may be required. This factor will be considered in arriving at a suitable tower arrangement during the detailed design stage. Again, consideration will be given to the use of the Danube tower design to reduce the tower height and minimise visual intrusion.

SECTION 7

BASELINE

7 BASELINE

7.1 Introduction

7.1.1 The baseline description has been based both on desk review, field observations and consultations within the proposed project areas.

7.1.2 The baseline has been split down into a description of the socio-economic and cultural, physical and biological environments for the proposed transmission line route and each of the substation sites.

7.2 400kV Suswa-Isinya Transmission Line and Associated Suswa 400/220 kV Substation

Social Economic and Cultural Environment

7.2.1 **Administrative Boundaries**: The proposed Suswa substation is located a few kilometres from Suswa township, off the Mai Mahiu-Narok Highway, to the north of the base of the Suswa crater. The substation falls within Ewaso sub-Location, North Keekonyoike Location, of Kajiado North District, Kajiado County.

7.2.2 The proposed 100 km Suswa – Isinya 400 kV transmission line also falls within the Kajiado North (former Ngong and Magadi divisions of old Kajiado District) and Isinya Districts (former Isinya division of Kajiado District) as presented in Figure 7.1.

7.2.3 **Population**: The area immediately around the substation is sparsely populated, with the Suswa township and general area having a population of only about 3,500 to 4,000 persons. The populations likely to be affected by the transmission line route are mainly located in the Kajiado North and Isinya Districts. The areas and populations of these districts are presented in Table 7.1 below.

Table 7.1: Population of Project Area

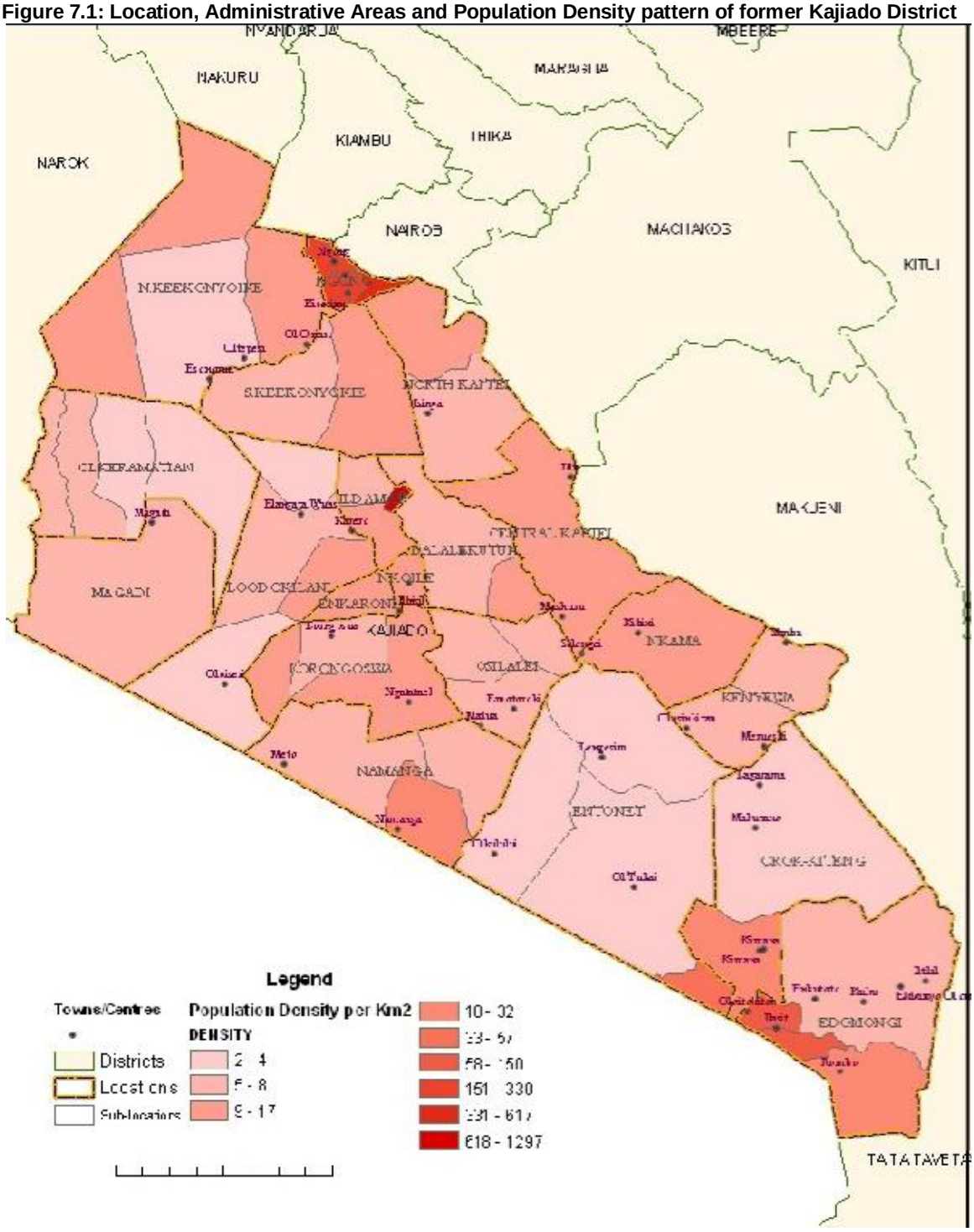
District	Area (sq. km)	Population (1999)	Estimated Population (2010)
Kajiado North	6,338.4	193,081	299,849
Isinya	2,238	67,140	104,266
Total	**8,576.4**	**464,883**	**703,964**

Source: Adopted from District Development Plan 2005-2010

7.2.4 The current estimated population growth rate is 4.5 percent per annum and life expectancy at birth is 43 years. While the population is predominantly Maasai, the District is also occupied by non-Maasai groups such as the Kikuyu, Kamba, Luo and Somali especially near the urban centres of Ngong, Kiserian, Ongata Rongai and Isinya. A significant portion of the District's population increase can be attributed to the influx of the non-Maasai groups and only about half or even less is due to natural growth among the Maasai themselves.

7.2.5 Land adjudication and sub-division of group ranches has led to individual land tenure that has contributed to land sales to other people and opened the area to farming communities from other parts of the country. The land which is of medium and high agricultural potential areas has been sold on and thus pushed the local pastoralists to drier parts of the District. The rapid human population growth has also led to competition with wildlife over resources in the District.

Figure 7.1: Location, Administrative Areas and Population Density pattern of former Kajiado District



7.2.6 **Socio-economic activities**: There are five main categories of livelihood in the project area as shown in Table 7.2 below:

Table 7.2: Livelihood Activities in Project Area

Livelihood Zone	% Population
Pastoral – all species	47
Formal Employment/Casual waged Labour/Business	32
Mixed cropping: Maize/beans/Tomatoes	12
Leasing Pastoral	5
Agro-Pastoral	4

7.2.7 Most income from the two districts is generated from agriculture (including livestock production) and from waged employment as shown in Table 7.3 below:

Table 7.3: Socio-Economic Indicators (2000)

Average Households size (no. of people)	4.2
Absolute Poverty (Rural & Urban)	28%
Income from Agriculture	44%
Income from Rural Self employment	10.6%
Wage employment	45.3%
Urban self-employment	6%
Number of unemployed	20%

Source: Adopted from District Development Plan 2005-2010

7.2.8 Pastoralism is still a major economic activity from Suswa to Kimuka. Land in these areas is basically used for grazing of animals, which supports major livelihood systems in the area. The main types of animals kept in these areas are cattle, sheep and goats, while donkeys are used as a means of transport. In the environs of the proposed Suswa substation, pastoralism is the main economic activity. A slaughter house is located next to the proposed site. Land holdings in this area are fairly large with farmers owning up to 1,000 acres of land, and those with smaller holdings owning on average 30 acres.

7.2.9 Being semi arid, most of the catchment experiences insufficient rainfall, leading to overgrazing and utilisation of available vegetation. The resultant exposure of most of the surface induces flash floods and sediment transport downstream towards the lower plains.

7.2.10 Agro-pastoralism, agro-forestry and horticulture are practiced around Kimuka, Kisaju and Isinya where land is being subdivided into small farmlands and residential plots. There are two flower farms, one in Kimuka and one in Corner Baridi, although these are some distance from the proposed wayleave.

7.2.11 **Poverty**: The Maasai community perceives a poor person as one who has no livestock, no children, no source of income and no land.

7.2.12 The major cause of poverty in the project area is illiteracy and the high rate of school dropout, as parents find they are unable to meet education costs. Other causes include frequent droughts that wipe out large herds of domestic livestock, HIV/AIDs, poor road infrastructure, acute water shortages and pressure on land. In areas close to Nairobi, poverty is particularly aggravated by pressure on land and HIV/AIDs.

7.2.13 The poor are vulnerable to nutrition related illnesses and respiratory infections due to poor shelter and from use of biomass in confined areas. Young girls are often forced into early marriages and denied access to education.

7.2.14 Poverty also leads to impacts on the environment caused by harvesting wood for selling as firewood and charcoal as well as the over-exploitation of water resources.

7.2.15 **Education**: There are several schools near the proposed Suswa sub-station location; Suswa Primary School, Mt. Suswa Kicharu, Victory Academy, Soira Maasai Girls Rescue Centre and Olaimutia Primary. All of these lie outside the wayleave and will not be directly impacted.

7.2.16 In the larger old Kajiado District, the student population is 117,440 in primary schools and 41,107 in secondary schools showing low transition from primary to secondary education. There are 198 primary schools scattered over this vast District and resulting in long travel distances between schools. The teacher to pupil ratio is 1:41. The number of secondary schools is estimated to be about 60.

7.2.17 **Health**: In Kajiado District, there are two district hospitals, 19 health centres, 40 dispensaries, 26 private health institutions and the average distance to a health facility is 10 kms. Most of the health facilities are based near the town centres of Suswa, Ewuaso, Ngong, Kipeto and Isinya. The most prevalent diseases are malaria, respiratory infections, diarrhoea, skin diseases and eye infections. The doctor/patient ratio is 1:66,412. Life expectancy level in the District is 43 years, which is below the national average.

Physical Environment

7.2.18 **Climate**: Overall, Kenya has been divided into seven agro-climatic zones using a moisture index (Sombroek et al, 1982). The index used is annual rainfall expressed as a percentage of potential evaporation (Eo). Areas with an index of greater than 50% have a high potential for cropping, and are designated zones I, II and III. The semi-humid to arid regions (zones IV, V, VI and VII) have indexes of less than 50% and mean annual rainfall of less than 1100 mm (see Table 7.4 below).

Table 7.4: Agro-ecological Zones of Kenya

Zone	Classification	Moisture index (%)	Annual rainfall (mm)
I	Humid	>80	>1800
II	Sub-humid	60 - 80	1500 - 1800
III	Semi-humid	50 - 60	1100 - 1500
IV	Semi-humid to semi-arid	40-50	600-1100
V	Semi-arid	25-50	450-900
VI	Arid	15-25	300-550
VII	Very arid	<15	150-350

7.2.19 The proposed Suswa substation is located within arid and semi arid land with an annual rainfall of approximately 750 mm. The transmission line, on the other hand, passes through several climatic zones. The majority of the transmission line is located within zones V and VI; with only small sections being in zones IV and III.

7.2.20 The project area has a bimodal rainfall pattern. The short rains fall between October and December and the long rains between March and May. Annual rainfall in the District is strongly influenced by altitude. Larger amounts of rain are usually received at raised

grounds of Ngong Hills and Ngurumani Escarpment. Ngong receives an average of 1250mm of rainfall per annum while the lowest area of Magadi records 500mm per year.

7.2.21 Temperatures in the project area also vary with altitude and season. Mean annual rainfall ranges from 300 to 800 mm.

7.2.22 The 'Maasai' pastoral districts are in medium-potential areas (mainly zones IV and V). However, some parts, like Ngong, are in Agro-economic Zones (AEZ) II and III which are high potential areas for agriculture. The larger Kajiado District can basically be divided into:

Table 7.5: Agro-ecological Zones in Old Kajiado District

Zone (AEZ)	Percentage	Remarks
II - III	8 %	Ngong Hills area
IV	34%	Oloitoktok
V	55%	Isinya area
VI	3%	Magadi

7.2.23 **Vegetation:** The typical vegetation in the project area is open grassland, bushed grassland, wood and bush land. Open grasslands predominate in the Athi-Kapiti Plains. At the Suswa substation, the vegetation is mainly open grassland, with a few pockets of Acacia shrubs.

7.2.24 There are three main types of bush and woodland along the transmission line route:

- Tarconanthus types on shallow soils, mainly between Ewuaso and Kimuka;
- Semi-deciduous bushland with Combretum, Grewia, Acacia, Rhus and Premna species on hill slopes in wetter areas near Kimuka, Ngong and Isinya (zone IV); and
- Acacia-Commiphora bush and woodland in the Central Hills where shallow soils overlie basement complex parent material.

7.2.25 Using agro-ecological zones, the vegetation can be described as follows:

7.2.26 Ecological Zone III: Mwaura (2005) indicates that the vegetation in this zone is the dry semi-deciduous type that varies from dry lowland forest and bush land. In drier areas such as Ongata Rongai, Kiserian, Ngong and Ololua, the vegetation is composed of quite a number of Acacias including the flat-topped *Acacia Abyssinica*, umbrella thorn (*A. tortilis*), *A. hockii* and the yellow-barked Acacia (*A. xanthophloea*). Other dominant trees in Zone III include *Euphorbia obavalifolia, Cordia africana, Strychnos henningsii, Diospyros abyssinica, Albizia schimperiana, Ochna holstii; Chionanthus battiscombe, Teclea spp.* as well as *Calodendrum capense and Zanthoxylum usambarense*.

7.2.27 Ecological Zones IV: Mwaura (2005) indicates that the vegetation within zone IV includes dry woodland, bush land and grassland commonly referred to as savannah. The whistling thorn (*Acacia drepanolobium*) and the larger *Acacia gerrardii* is also found in few places. Other Acacias include *Acacia senegal* and *Acacia seyal*. In areas where the soils are predominantly vertisols, the grass community is dominated by Cynodon, Sporobolus, Andropogon and Setaria while the star grass (*Themeda triandra*) and Zebra grass (*Hyparrhenia spp*.) are common in areas of latosolic soils.

7.2.28 Ecological Zones V and VI: The predominant species in most parts of zones V and VI are Acacia mellifera, A. tortilis, A. nubica, A. ancistroclada, A. nilotica, Commiphora riparia, C. africana and Balanites aegyptiaca.

7.2.29 **Land Use:** The Maasai are a pastoral people with livestock forming the basis of their economic livelihood, the focus of social relations, and a critical element of ethnic self-definition. With most of the area being arid and semi arid, ranching and livestock production form the dominant land-use. Rain fed agricultural potential however exists in the higher altitude areas that receive higher rainfall. This is mainly after Kimuka, heading towards Ngong, Kipeto and Isinya.

7.2.30 There are no hospitals or schools within 1 km of the proposed transmission line route or substation site. Several residences will be directly affected by the wayleave for the line route, otherwise residences are located well outside from the wayleave and generally at least 0.5km away.

7.2.31 There is also a variety of wildlife in the project area particularly as the line route moves towards the vicinity of Nairobi National Park, and tourism is also on the rise.

7.2.32 **Soils and Geology**: The larger (old) Kajiado has been divided into four ecological zones ecozones: the Rift Valley, the upland Athi Kapiti Plains, the Central Hills, and the Amboseli Plains (Republic of Kenya, 1982). The project area starts in the Rift Valley (Suswa) and moves into the Athi Kapiti Plains. Some small sections fall in the Central Hills near Isinya as seen in Figure 7.2 and as described below.

7.2.33 The Rift Valley: The Rift Valley runs from north to south and is generally 50- 60 km wide. The geology is predominantly quaternary volcanics. The floor of the Valley is step-faulted, and comprises a series of horsts running north and south with flat bottomlands between them. The numerous rocky scarps and slopes have shallow, reddish-brown, stony clay-loams. The lower lying areas have deeper and more varied soils, including alluvial deposits. The broken and rocky terrain restricts access to much of this ecozone.

7.2.34 The Athi-Kapiti Plains: The upland Athi-Kapiti Plains are mainly open, rolling land. The Plains drain towards the Athi River basin in the east. Geologically, they derive from volcanics but there is a band of tertiary sediments running south-west to north-east across the centre of the plains. The soils are mostly deep black Vertisols.

7.2.35 The Central Hills: At the south-eastern edge of the Athi-Kapiti Plains the land falls away more steeply to the east. Numerous gneiss and limestone hills protrude from the slope, the largest, on the southern boundary, rising to 2800 m. Soils are red, sandy and often shallow. In the eastern part of the zone, the land is much dissected and divided by water courses that drain into the north-easterly flowing Kiboko River, a tributary of the Athi River.

7.2.36 **Water Quality and Hydrology:** There are few permanent natural sources of surface water in Kajiado District. The main ones are the Uaso Nyiro River in the Rift Valley, two streams in the northern part of the Athi-Kapiti Plains and the Kiboko River which drains much of the Central Hills.

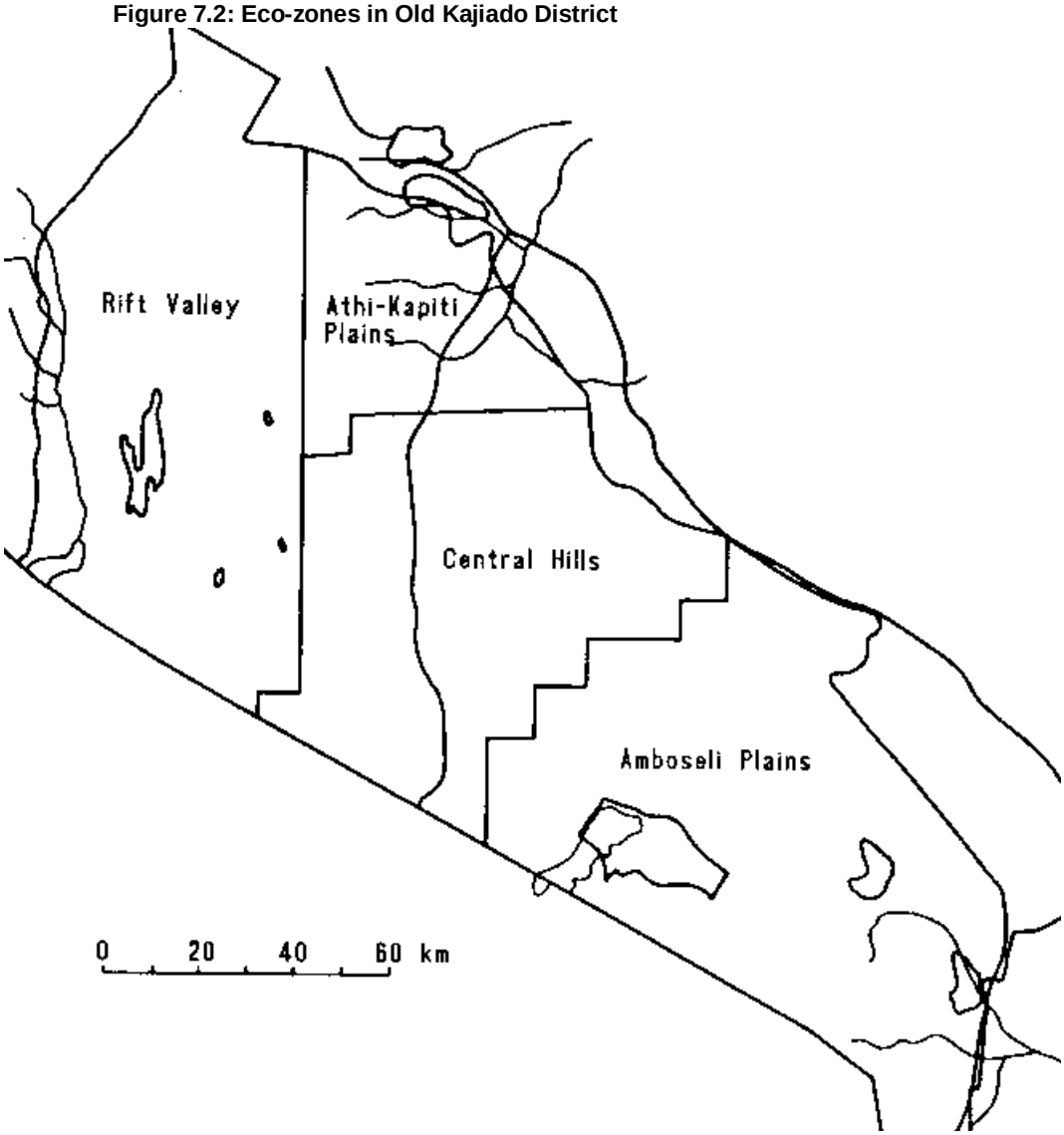
7.2.37 This lack of permanent sources of surface water has led to the construction of several small dams and the drilling of a large number of boreholes. Most of the boreholes in the Rift Valley are in the eastern half of the Valley; the Uaso Nyiro River provides water to the western side of the Valley. In the Athi-Kapiti ecozone, most boreholes are clustered at the northern end where general development has been greatest. In the Central Hills, the greatest density of boreholes is close to the Narobi- Magadi Soda railway, again where development is furthest advanced.

7.2.38 **Landscape and Visual Amenity**: The landscape of the project area is mostly flat as it falls within the Kapiti Plains. There are however some hills, namely the Kiambu Escarpment and also the Ngong Hills.

7.2.39 The Suswa substation is located within 2.5km of the base of the Suswa crater. This is a local attraction, with tourists climbing the crater to obtain views and also exploring caves present within the interior of the crater.

7.2.40 **Archaeology and Cultural Heritage**: There are no World Heritage Sites or areas of cultural importance that would be impacted by the proposed projects nor are any archeologically sensitive areas affected.

Figure 7.2: Eco-zones in Old Kajiado District



7.2.41 **Traffic and Transport Infrastructure**: The project area is well served by a network of all-weather roads. A railway line runs from Nairobi to Magadi Soda. In addition, numerous roads that are passable in the dry season penetrate the interior of the District. This network effectively links the urban and trading centres in the District and public transport is quite readily available.

7.2.42 **Waste Management**: Waste management provision is generally lacking. Domestic solid wastes are generally handled in individual homesteads and burnt or buried in small earth fills to rot. There are a few commercial waste collectors in Ngong and Kiserian who dispose their waste in the Ngong Dump site or in the Nairobi City Waste Dump.

7.2.43 There are no sewerage works in the project area. Most homesteads use pit latrines, while sub-urban areas nearer Nairobi use septic tanks.

7.2.44 **Noise and Vibration**: Noise measurements taken during the field visits (see Appendix D) indicated that the ambient noise levels were low as there are generally no significant noise emissions in the project area. Some noise is however emitted by aircraft and from the existing transmission lines.

7.2.45 **Air Quality**: There are no issues with respect to air quality in the project area since there are no significant air pollution sources such as roads and industry.

7.2.46 **Aviation and communication**: The Ngong/Kiserian area forms part of the landing path to the Jomo Kenya International Airport and Wilson Airport. There are several telecommunication base stations near the transmission line and the Suswa substation.

Biological Environment

7.2.47 **Wildlife, habitats and migratory birds**: The project area does not contain any natural habitats considered to be either critical or fragile. The project area does not have any wetlands or forested areas and there are no migratory bird routes.

7.2.48 The study area is endowed with a variety of wildlife species including elephant, wildebeest, buffalo, common zebra, giraffe, warthog, gerenuk, impala, Grant's gazelle and Thompson's gazelle and Coke's Hartebeest. Carnivores include lion, hyena, wild dog, cheetah, leopard, bat-eared fox. Some of these animals, especially the lion, are endangered especially as a result of human-wildlife conflicts.

7.2.49 The project area has also a variety of birdlife which include ostrich, kori, bustard and the secretary bird.

7.3 220/66 kV Ngong Substation and 3.2 Km Spur to Suswa-Isinya transmission line

Social Economic and Cultural Environment

7.3.1 **Administrative Boundaries**: The proposed Ngong substation location is off the Ngong-Kimuka - Ewuaso Road, in Kimuka sub-location, Intashat Location, Kajiado North District in Kajiado County. Ngong means knuckles in Maasai and the name comes from the four hill peaks of the ridge, which stands alone rising from the plain around Nairobi. Kimuka (Kimuga in Maasai) means the place of many trees. The spur line connecting to the Suswa-Isinya line is also in the Kimuka area and is located in a sparsely populated area.

7.3.2 **Population**: The project area is located within an area of low population density and there are few persons living in the immediate vicinity of the proposed substation site. The site is within 3 km of the residential area of Kibiko which is one of the suburbs of Nairobi near the Ngong Hills. The population of Ngong is about 60,000 persons.

7.3.3 The current estimated population growth rate in the District is 4.5% per annum and life expectancy at birth is 43 years. While the population is predominantly Maasai, the area around Ngong is mainly cosmopolitan and is also occupied by non-Maasai groups such as the Kikuyu, Kamba, Luo and Somali.

7.3.4 Land adjudication and sub-division of group ranches has led to individual land tenure that has contributed to land sales to other people and opened the area to farming communities from other parts of the country. The proximity to Nairobi has also attracted high migration to the area. The land, which comprises of medium and high agricultural potential areas has

been sold on and thus pushed the local pastoralists to drier parts of the District. The rapid human population growth has also led to competition with wildlife over resources in the District.

7.3.5 **Socio-economic activities**: Ngong and its environs is a well developed outlying residential area for many of Nairobi's workers. The area and its environs have Nairobians as their main residents who prefer the area due to its quiet and serene environment.

7.3.6 In addition to keeping cattle, the main economic activities in the project area relate to real estate development, schools and restaurant services. There are some small scale farming activities such as poultry keeping as one of the better known poultry farmers, Mogoku, also has a branch in Kerarapon. Tourism activities such as picnicking and camping are also on the increase due to the proximity of the area with the Ngong Forest.

7.3.7 **Poverty**: The Ngong area is a middle-income suburb of Nairobi with most persons commuting daily to the city. There are however still a substantial number of Maasai, mainly in the periphery of Ngong. Due to ongoing construction and infrastructural developments in the area, instances of poverty are relatively low.

7.3.8 **Education**: The Kimuka Primary School is located within 1 km of the proposed Ngong substation site. There are several other schools within a few kilometers including the Kibiko Secondary and Kibiko Primary schools. The schools in the area, especially Kimuka Primary, receive volunteer teachers from Europe and America. There are several schools in the nearby Ngong town and its environs, and many more others in the Karen, Kiserian and Ongata Rongai areas, which also hosts six universities.

7.3.9 **Health**: In Kajiado District, there are two district hospitals, 19 health centres, 40 dispensaries, 26 private health institutions and the average distance to a health facility for local residents is 10 km. The Ngong district hospital is about 9 km from the proposed substation site, while there are several other health facilities in the Ngong area. The most prevalent diseases are malaria, respiratory infections, diarrhoea, skin diseases and eye infections. The doctor/patient ratio is 1:66,412. Life expectancy level in the District is 43 years, which is below the national average.

Physical Environment

7.3.10 **Climate**: The altitude of Ngong is about 1961 m above sea level with the hill peaks rising to approximately 2460 m. above sea level. The area enjoys an equatorial as opposed to a tropical climate, with temperatures being fairly comfortable both during the day and at night.

7.3.11 The altitude however makes for some colder mornings and evenings, especially in the June/July season when the temperature can drop to 10°C. The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day.

7.3.12 The area has a bimodal rainfall pattern with long rains from March to May and short rains in the October to December period. Larger amounts of rain are usually received at raised grounds of the Ngong Hills with Ngong itself receiving an average of 1250 mm per annum. Ngong falls within Agro-ecological zone II which is sub-humid.

7.3.13 The proposed substation site and spur line are on the lee ward side of the Ngong Hills and, though very near Ngong, has much less rainfall, about 1,000 mm per annum, and effectively falls under zone IV.

7.3.14 **Vegetation**: Vegetation in the immediate area of the proposed substation site is mainly composed of close Acacia trees, mixed with Tarconanthus bushes and some grass and undergrowth type vegetation. The spur line falls within similar vegetation to that of the substation.

7.3.15 **Land Use**: The project area is predominantly used for cattle herding. However, it is expected that the residential Kibiku area will soon expand out towards the site. The neighbouring land is already being sub-divided and it is expected that it will become residential within a few years time. Horticulture, indoor dairy farming, and poultry keeping are also practiced in the area.

7.3.16 There are no hospitals or schools within 1 km of the proposed Ngong substation site or spur. Several residences are located within 0.5 km of the proposed substation site boundary.

7.3.17 **Soils and Geology**: Soils in the project area are mainly composed of the red volcanic and black vertisols.

7.3.18 **Landscape and Visual Amenity**: The topography of the project area is mostly flat. There are however some hills, namely the Kiambu escarpment and the Ngong Hills. The proposed substation site will be visible from the Ngong – Ewuaso Road. It will also be visible from the Ngong Hills (near the wind turbines). The spur line will also be visible from the Ngong Hills.

7.3.19 **Archaeology and Cultural Heritage**: There are no World Heritage Sites or areas of cultural importance that would be impacted by the proposed substation siting or spur, nor are there any archeologically sensitive areas.

7.3.20 **Traffic and Transport Infrastructure:** The proposed substation site is well served by an all-weather road which links Ngong town to Ewuaso via Kimuka. The road is earmarked for asphalting. The road currently experiences a low level of traffic flow although this will gradually increase as residential areas develop and the road is improved. The spur line however will require some temporary roads during construction and for ongoing maintenance access.

7.3.21 **Waste Management**: Waste management provision in the project area is generally lacking. Solid wastes are generally handled in individual homesteads and burnt or in small earth fills to rot. There are few commercial waste collectors in Ngong and Kiserian who dispose their waste in the Ngong City Waste Dump.

7.3.22 There are no sewerage works in the project area. Most homesteads use pit latrines, while sub-urban areas nearer Nairobi use septic tanks.

7.3.23 **Noise and Vibration**: Noise measurements taken during the field visits (see Appendix D) indicated that the ambient noise levels were low as there are generally no significant noise emissions in the project area. Some noise is however emitted by aircraft and from the existing transmission lines.

7.3.24 **Air Quality**: There are no issues with respect to air quality in the project area since there are no significant air pollution sources such as roads and industry.

7.3.25 **Aviation and Communication**: The Ngong/Kiserian area forms part of the landing path to the Jomo Kenya International Airport and also Wilson Airport. There are also several telecommunication base stations near the transmission lines and the substations.

Biological Environment

7.3.26 **Wildlife, habitats and migratory birds**: The project area does not contain any natural habitats considered to be either critical or fragile. The project area does not have any wetlands, forested areas and there are no bird migratory routes. There are few wildlife species in the area; the most common are giraffe, baboons, hyrax and birds like the African Sterling.

7.4 Thika Road 220/66 kV Sub-station

Socio-Economic Environment

7.4.1 **Administrative location**: The proposed Thika Road substation site is located along Thika Road Super Highway, opposite Kenyatta University in Gicheha Farm. Administratively the project is located within Thika District, and in Ruiru Division.

7.4.2 **Population**: As of the 1999 Population and Housing Census, the District had a population of 432,554. At the start of the plan period (2008) the District population stands at 464,846 and is projected to reach 479,962 persons at end of plan period (2012). The ratio of males to females is approximated at 1:1. The District population distribution and densities per divisions is as illustrated in the Table 7.11 below.

Table 7.11 District population distribution and densities per Division

Division	Area(Km^2)	1999		2008		2010		2012	
		Pop.	Density	Pop.	Density	Pop.	Density	Pop.	Density
Gatanga	251.1	103,048	410	110,741	441	112,527	448	114,342	455
Githurai	174.2	58,992	339	63,396	364	64,419	370	65,458	376
Kakuzi	481.2	71,622	149	76,969	160	78,210	163	79,472	165
Ruiru	352.4	91,718	260	98,565	280	100,155	284	101,770	289
Thika Municipality	220.2	107,174	487	115,175	523	117,033	531	118,920	540
Total	**1479.1**	**432,554**	**290**	**464,846**	**314**	**472,344**	**200**	**479,962**	**324**

7.4.3 **Socio-economic activities**: The agriculture and rural development sector contributes significantly to the District both in terms of income and employment. In the agriculture sub-sector, 47,268 households are engaged and derive their source of livelihood directly from farming of both cash and food crops. The sub-sector is a source of direct or indirect employment to 189,072 people comprising 63,024 males and 126,048 females. The main cash crops are coffee, tea, pineapples and macadamia while the main food crops are maize, beans, Irish-potatoes and pigeon peas. Average farm sizes are 1.6 ha

7.4.4 Most of the farming in the District is rainfall fed except for the large scale pineapple farming by multi-nationals and the coffee estates. Besides crop farming, livestock farming is undertaken in the District. The main Livestock are dairy cattle, dairy goats, meat goats, poultry and bee keeping. Milk production stands at over 45.27 million litres, earning farmers in excess of KShs. 1.086 billion. Poultry earnings are KShs. 716.45 million and honey fetches KShs. 9.63 million. The total turnover from co-operatives stood at KShs. 186.95 million with a total membership of 72,564 during the plan period.

7.4.5 Tourism, trade and industry sub-sectors are also a major source of employment and market outlets for agricultural products in the District. There are a total of 31 agro-based industries, 16 chemical and 15 engineering industries. The District has an enterprising community engaged in small, medium and large scale business. At the beginning of the plan period,

there were 53 trading centres comprising 2,500 retail and 335 whole sale traders respectively. These translate to over 15,000 direct and over 30,000 indirect jobs.

7.4.6 **Poverty:** Absolute poverty in the district is 36% with urban poor comprising 39% of the population compared to the 36% rural poor. The food poor account for 1.5% of the population. Waged employment provides 38% of income, followed by rural self-employment (25%), urban self-employed (21%) and agriculture (16%).

Physical Environment

7.4.7 **Climate:** The annual average rainfall varies from an average maximum of 250 mm and - 1020 mm pa which is well distributed within all areas. Rainfall is however very unreliable and tends to vary from year to year. The temperature varies with altitude, with mean monthly temperature ranging from 18 degrees centigrade in the coldest months to 30 degrees centigrade in the hottest months.

7.4.8 **Topography:** The District has a diverse topography, ranging from 1200m to 1800m above sea level. This has to a large extent affected the climatic conditions and economic activities of the District. The higher areas to the west, although characterized by deeply dissected topography with numerous slopes prone to landslides, form water catchments areas and watersheds of the rivers which flow from the Aberdare ranges to the West and towards South East joining River Tana, finally forming part of Tana and Athi River Drainage systems. The Eastern parts of the District are lowlands covering Ruiru, Thika Municipality and Kakuzi Divisions.

7.4.9 **Soils:** The soil type is of rich red loam in the upper parts of the District, while in the lower areas, near seasonal streams, there is black cotton soil. The area has a good ground cover with grass which results in a low soil erosion potential.

7.4.10 **Land-use:** The main land-use is agriculture including horticulture. Main crops grown include coffee, tea and dairy. Land is also used for residential and educational purposes.

7.4.11 There are no hospitals, schools or dwellings within 1km of the proposed substation site.

7.4.12 **Water Resources:** The District has numerous seasonal streams and rivers including the Chania and Thika rivers. These are an important source of piped water. The District has a high potential for underground water with many boreholes scattered in places like Ruiru Division, Ithanga, Kakuzi, and Gatuanyaga areas.

7.4.13 **Infrastructure**: The District has a total of 1339.4 km. of classified road and 123.7 km. of earth road. Traversing the District is a 51 km. railway line which boosts connection and the transportation of goods to markets in Nairobi and overseas. Electricity coverage in the District is still low; the Rural Electrification Programme is to be intensified to increase the anticipated coverage to 30% by year 2012.

Biological Environment

7.4.14 Generally, the natural environment of this area is still intact and there has been little or no human interference. Various types of habitat are represented including wetlands, forest and riverine habitats. None of these are protected environments however. Prominent tree cover species in the area are *Prunus Africana, Lantana Camara, Papyrus, Grevillea robusta, acacia* trees and shrubs.

7.4.15 The project area does not contain any natural habitats considered to be either critical or fragile. The area has little fauna. There are a few species of birds, wild dogs, and wild rabbits. The community around this area domesticates cattle, goats, sheep and donkeys.

SECTION 8

CONSULTATION AND PARTICIPATION

8 CONSULTATION AND PUBLIC PARTICIPATION

8.1 Introduction

8.1.1 The following section describes the public consultation events held to discuss the proposed projects and the transmission line route and substation sites with those who live in the environs of the project areas.

8.1.2 The aim of consultation is to ensure that stakeholder interests are identified during the ESIA study and that stakeholder views, and in particular those of PAPs, are taken into account at the project planning stage. Stakeholders' views are also important in shaping the development of the ESMP.

8.1.3 The main findings and feedback from these events is summarised within this section while copies of the lists of attendees at the various consultations are provided in Appendix B of this report.

8.1.4 This section also summarises consultation undertaken with other governmental and non-governmental organisations including KWS, KFS, KCAA and District Authority representatives.

8.2 Public Consultation and Participation

8.2.1 Community members were mobilised through the provincial administration (local chiefs). The public consultations took the form of public meetings (barazas), which brought together representatives from the larger community including PAPs, local leaders such as chiefs and assistant chiefs. Other people present in the consultations were officers from KETRACO and the consultants Kamfor.

8.2.2 Following prayers, introductions and preliminary remarks by the respective chiefs, participants were then taken through details of the proposed projects. They were then informed of the reasons why the meeting was important and the need for them to raise any issues that in their opinion were important for the success of the projects. Participants were encouraged to be open and to feel free in expressing their opinion. It was emphasised that KETRACO was keen to listen to the opinions of community members so as to incorporate them in the project plan.

8.2.3 This introduction was followed by a presentation from KETRACO. This presentation took the participants through the process of registration of way leaves, associated compensation, and other compensation relating to structures, trees and other vegetation. The payments process with respect to the different types of compensation and people who benefit from the compensation was also explained.

8.2.4 Finally, participants were given an opportunity to ask questions and highlight other issues of concern to them. Many environmental and socio-economic issues were raised which form the basis of this section of the report.

8.2.5 The issues common to all the sites is first presented followed by any issues specific to the respective sites where meetings were held.

8.3 Common issues

8.3.1 **Knowledge of project proponent**: It was clear that community members were not aware of the different agencies dealing with power and the roles they play. The most commonly

known agency is KPLC which has been operational for many years and is a body which interacts with the general public more frequently than others given its role in power distribution for commercial and domestic use. Other agencies, such as KETRACO, are largely unknown. This finding was significant given that in respect of the proposed project, the community will interact more with KETRACO which will be responsible for erecting the power pylons and constructing the substations. KETRACO will also be in charge of operation of the line and substations as well as their eventual decommissioning. This, therefore, calls for more awareness creation on the different agencies and their respective roles.

8.3.2 **Access to electricity**: All the people consulted where optimistic that they would be able to be connected to power for domestic use once the projects are complete. This will however not be realised given that proposed project is purely associated with transmission and not distribution. There was a general lack of understanding of power distribution processes both for commercial and domestic purposes. It is felt that this will need to be clearly explained to community members so as to address any misconceptions and over expectations. KPLC / KETRACO are expected to take a lead role in this.

8.3.3 **Compensation**: Compensation for affected property topped the list of issues most commonly raised by community members. Generally the communities were not aware of how compensation would be paid to affected persons. This will need to be clearly and systematically explained by KETRACO as the lead agency in this project.

8.3.4 **Other project benefits**: Community members at all the sites visited were curious to know what other benefits would accrue to the community, especially to those not directly affected by the project. Specifically, they were interested in knowing if the projects will have any short-term and long term employment opportunities for the locals. They also wanted to know whether there were any plans to support community projects as part of the power company's corporate social responsibility. Besides any such benefits, they also wanted to know what negative effects the projects would result in. They were for instance concerned about the potential for accidents caused by defects of malfunctioning of the power transmission line.

8.3.5 **Size of way leave and access to land**: Community members were concerned about the amount of land required for the way-leave and what that meant for their land. A number thought that once the affected land is eased to KETRACO, no other activity would be allowed within the way leave. Such misconceptions will need to be cleared prior to commencement of the project such that they are aware exactly which activities area and are not allowed in the wayleave.

8.3.6 **Low literacy rates**: In all the sites visited, community members were quick to note that literacy rates among the community were low which they felt makes the people generally prone to exploitation. They cautioned one another against rushing into decisions and the need for a common community approach to be adopted.

8.3.7 **Local language**: All the public consultation meetings benefited from translations into the local language to enable each and everyone to understand the deliberations. Community members were also asked to speak in their native language if they felt more comfortable expressing themselves in this way.

8.3.8 **Role of the provincial administration and local leaders:** The office of the chief still plays a key role at all the sites visited and remains authoritative and respected. Chiefs will be crucial in mobilising community support and in passing information to community members. The office is indeed the entry point to the community.

8.4 Key issues raised in line route and substation site consultations

Proposed Suswa-Isinya 400KV Transmission Line Route

8.4.1 This transmission line would pass through land occupied mainly by the Maasai community, whose main occupation is pastoralism. Most of them own large tracks of land running from tens to hundreds of acres. All land is individually registered.

8.4.2 Consultations with community members revealed that this initiative was a totally new concept to most of them and there was need for close consultation between them and the project proponents so that the communities fully understand the projects.

8.4.3 The community members noted that there were cases of absentee land owners who bought land but do not live in the area. Those affected by the project would need to be identified and informed. Most of these land owners could easily be identified and contacted through the people that sold the land to them.

8.4.4 There were many cases of people that have inherited land from their fathers but had never registered the titles in their names. This was noted to be an important issue, especially when seeking compensation for a way leave since the payment can only be made to the person registered as the owner in the land title. In some cases, the persons registered in the title may be dead and the rights to the land left to their sons. When asked why they had not finalised the succession of such land, community members noted that they had not seen any reason to do this. Others said that they had started but had not completed the process. However, there are those who noted that they avoid registering the land in individual title deeds to avoid the arbitrary sale of ancestral land to outsiders.

8.4.5 A few cases of lost or damaged titles were also reported as well as instances where land had been sold but titles were yet to be issued to the new owners.

8.4.6 Access to water was a main issue for most community members. It was for instance difficult to meet with community members in the morning when most of them are busy sourcing water for livestock and domestic use. This challenge will significantly influence the timings for any future meetings and sensitisation sessions.

8.4.7 It was noted that the transmission line was likely to pass over a community dam (Chamnes Lake). The title to this dam is held in trust by the Ol Kejuado County Council. The community members cautioned that paying the compensation for this land to the county council would be against the wishes of the community and a recipe for conflict. Community members therefore called for a mutual agreement between them and the power company on how to handle compensation in relation to this land. They were, for instance, open to the money being used to finance a community project such as improvement of the dam.

8.4.8 Towards Suswa, the transmission line will run parallel to the existing line meaning that a number of the PAPs already have power lines across their land. Others not affected by the existing transmission line will be affected by the new transmission line. It was initially considered that this area would have only limited challenges by virtue of there being an existing power line. It was generally expected that having gone through a similar process, community members would have a thorough understanding and positive outlook on the project. However, it is now considered that the area will require special attention as discussed below.

8.4.9 Local community members (Suswa and Ewuaso Kedong), and particularly those on whose land the current transmission line is located, reported that although the previous public consultation process had started well with a similar public meeting, they had not clearly

understood the compensation process. As such, some considered that they had not been fully compensated and had thus sought for more money from KPLC. The misunderstanding arose because there are different categories of groups who are compensated for wayleaves - land owners, and land users. These groups are paid different rates with land owners being compensated for their land while land users are compensated for vegetation only.

8.4.10 It was also noted that at the time of the establishment of the existing transmission line, the area from Suswa to Ewuaso Kedong was a ranch, and was only subdivided years later. Since compensation is made to those with Land Title Deeds, the new claimants included those who came after subdivision of land, and the project was already established.

8.4.11 Community members however indicated that they were not opposed to the development, as it is for the national good, in as long as there is transparency and openness in the compensation process. The members thanked KETRACO's team for explaining the compensation process to be followed as per their policy.

Proposed Suswa 400/220KV Sub-station Site

8.4.12 The Suswa substation would not expected to have any other major issues. It is understood that the land has already been acquired by the project proponent.

8.4.13 The Suswa substation would be located within a few kilometers of a more densely populated area due to its proximity to the Suswa town. Community members will thus need to be sensitised on the risks that substation sites can pose to them and their livestock.

8.4.14 Community members were optimistic that the new substation would enable them access electricity. These expectations will need to be responded to. Other issues raised were the opportunity for employment as watch guards on the substation once completed.

Proposed Ngong 220/66KV Substation Site

8.4.15 This substation would be constructed on private land. Land acquisition and compensation should therefore be straight forward and will only require consent from the registered owner. Although a transmission line already passes near the substation site (parallel to the Ngong-Kimuka road) community members were optimistic that the presence of the substation could improve electricity access of community members for domestic and commercial use.

Proposed Thika Road 220/66KV Substation Site

8.4.16 This substation would be built on land that is currently being used for agricultural purposes. The land is privately owned and all that is required in consent from the owner and agreement on the compensation. The substation is unlikely to affect many people, although in the longer term the community anticipates that it will improve electricity supply and reduce incidences of disruption in supply.

8.5 Summary of Recommendations from Initial Public Consultations

8.5.1 The following recommendations are suggested that should assist the project to roll out smoothly with support from community members.

- A sensitisation curriculum covering all information relevant to community members should be prepared. This should include clear explanation of the compensation framework and entitlement in order to prevent any future misunderstandings. Consequently sensitisation forums should take place in public barazas and on community radio stations.

- The project should forge and always ensure close contacts and collaboration with the respective local administrators, mainly locational chiefs. They will play a key role in community mobilisation, sensitisation and coordination of community activities in their respective areas of jurisdiction.
- The contact person from KPLC/KETRACO who the community members will be liaising with should be agreed on and the information widely shared with the affected communities.
- Once the project is ready to roll out, community level committees will need to be established. This will facilitate all activities relating to community members. Membership to this committee should be by nomination or election by respective communities, but in all cases the committees should be strongly representative of the affected communities.
- To ensure that all community members benefit from the project interventions, KPLC and KETRACO should consider supporting community projects in the areas affected by the project as part of their corporate social responsibility. This will spread the benefits beyond the PAPs who are deemed to benefit from compensation.
- Community sensitisation and consultation meetings should, whenever possible, be held in the afternoons. This seems to be a better meeting time for communities made up largely of pastoralists, who must walk long distances in search of water in the morning hours.

8.6 Key Stakeholder Consultation

8.6.1 Below is a summary of the main outcomes from consultation with other governmental and non-governmental key stakeholders.

Kenya Wildlife Service (KWS)

8.6.2 KWS confirmed that they had a Memorandum of Understanding (MoU) with KPLC for the power lines to pass through the National Park. The transmission lines are to be underground (for the Nairobi-Mombasa Line).

8.6.3 KWS confirmed that the proposed transmission line route does not pass through any bird migratory paths.

Kenya Forest Service (KFS)

8.6.4 KFS confirmed that the line does not pass through any forests under the Nairobi Conservancy. They do however have an interest in the projects if these require trees to be cut down.

8.6.5 The consultative meeting confirmed that there was no large-scale cutting down of trees but some would need to be cut down.

Kenya Civil Aviation Authority (KCAA)

8.6.6 KCAA's main object is to plan, develop, manage, regulate and operate a safe, economical, and efficient civil aviation system in Kenya.

8.6.7 KCAA has a master plan and common flight paths for landing and take-off at the airports. They have no clear safeguarded zones. However, the Kenya Civil Aviation Act (2002 – Cap 394) has a provision for having safeguard/restricted zones. The Act states that the Minister

responsible may give guidelines on the prohibiting or regulating in the vicinity of any aerodrome the emission or causing of smoke, soot, ash, grit, dust and any other substance whatever which obscures or may obscure visibility; and also on the classification and use of airspace and the control and use of air routes.

8.6.8 The Civil Aviation Act also provides for the control of building in restricted areas and control of structures on or near aerodromes. The Minister may, where he considers it to be necessary in the interests of the safety of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any building or structure above a height specified.

8.6.9 The Director-General may also, in the interests of safety or efficiency of air navigation order for the removal of any structure, tree or natural growth or formation on or in the vicinity of an aerodrome; or reduction in height of any such obstruction.

8.6.10 KCAA confirmed that the proposed Suswa Isinya transmission line is located away from their facilities.

District Authority Stakeholders

8.6.11 Meetings were held with the following representatives from the Local Authority:

District Environment Officer

8.6.12 Those at the meeting were informed of the proposed projects and of the planned consultative meetings. Their main request was that the ESIA process be consultative.

District Environment Committee (Kajiado)

8.6.13 Queries were raised as to whether, where the transmission line would pass through existing small town centres, or where such centres are proposed in the future, they would get power in the future. It was however clarified in the meeting that the line routing was mainly planned to have minimal displacement of persons and did not follow town centres existing or planned.

8.6.14 Other members wanted to know whether local communities would benefit from electricity connections once the transmission line and substation sites were operational.

District Development (including Social Development) Officer

8.6.15 Attendees at the meeting requested that there should be proper consultations and adequate compensation. They also requested that those compensated should be the real land owners (rather than people who might take advantage of the process). They were willing to be involved in the compensation exercises as they knew the local groups and persons likely to be involved.

SECTION 9

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

9 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

9.1 Introduction

9.1.1 This section identifies the potential social and environmental impacts of the proposed projects in terms of the nature, magnitude, extent and location, timing and duration of the anticipated impacts. These impacts may relate to the project design stage, construction stage or the project operation and decommissioning stage.

9.1.2 Based on impact prediction methods, and the results of public consultations, both beneficial and adverse environmental impacts have been identified. Suitable mitigation measures are discussed in Section 10. These are then coasted and responsibilities for their implementation assigned as appropriate within the Environmental and Social Management Plan (ESMP) presented in Section 12.

9.2 Impacts on the Social Economic and Cultural Environment

Potential Negative Socio-economic Impacts – Pre-Construction Phase

Local Displacement of Persons

9.2.1 No involuntary resettlement of persons arising from the proposed projects has so far been identified. The transmission line routing avoids almost all buildings (save two). In these instances, the buildings will need to be demolished but can be re-erected in another part of the same properties. This will create some displacement but within the same land. The PAPs will be compensated for these buildings.

Restriction of land use and land rights

9.2.2 Easement of the land where the transmission line passes (the way leave) will result in long term changes in the manner in which that particular piece of land can be used. For example, it will not be possible to put up structures or plant trees on this land. This will limit the choices that land owners have on the use and rights to their land.

Land ownership patterns

9.2.3 The proposed projects are likely to lead to changes in local land holding patterns as a result of the requirement that land must be fully and legally registered for any compensation to take place. As identified during the consultation process, siblings have avoided registering their family land into individual titles so as to discourage the sale of land to ‘outsiders’. If such parcels of land are affected and siblings are forced to finalise succession, then land ownership patterns are likely to change significantly.

Potential Positive Socio-economic Impacts - Construction Phase

Employment creation

9.2.4 The proposed projects will provide short term, local employment opportunities during the construction phase for community members in terms of site clearance, excavation, loading and offloading of materials and deliveries and as drivers for the mobile site workforce. Other short term opportunities are likely to arise from the provision of security services where temporary camps or stores are erected and from opportunities to provide goods and services to construction workers e.g. food kiosks and other shops.

Increased economic activity

9.2.5 There will be a short term increase in economic activity around the project areas. The construction labour force will require food and other small items that are supplied by the retail shop outlets. These are opportunities that local community members can take advantage of.

9.2.6 Short term, indirect economic gains are likely to result from the purchase of construction materials where these are locally or regionally available e.g. cement, glass, metal and bricks for the construction of the transmission line and substation sites.

9.2.7 Other gains will result from taxes levied on those employed in the construction works and from local and national businesses employed in delivering the project e.g. consultants and construction companies.

Improved road infrastructure

9.2.8 The proposed projects will require roads to be installed or upgraded to allow for the movement of machinery and for the delivery of materials. The roads that would be installed/improved to serve the projects could also be of long term benefit to the community e.g. in the transportation of goods.

Gender Issues

9.2.9 Women as well as men will benefit from the short term, local employment opportunities that will be created during the construction phase of the proposed projects. It is anticipated that there will be income generating activities for women in catering/restaurants for workers on the construction sites and from the selling of local products to construction camp workers.

Capacity Building

9.2.10 The effective undertaking of the projects will require capacity building and awareness campaigns. Health, safety and environmental training and awareness will be extended to workers both during the construction and operational phases of the projects (including site labourers, both skilled and unskilled, site management and maintenance teams) and to project affected persons (PAPs), local residents, pastoralists, and others whose activities could be affected by the proposed projects.

Socio Cultural Impacts

9.2.11 A possible positive socio-cultural impact of the proposed projects is that they will reinforce the authority of community elders and local leadership when the various committees are formed to facilitate the rolling out of the projects. Nomination to these committees will follow existing community structures which depend on the opinion of community leaders.

Potential Negative Socio-economic Impacts - Construction Phase

Health and Safety

9.2.12 Construction operations can pose hazards to people living or working near to the construction sites as well as those employed on them. Excavations can pose a particular threat to children and livestock as can construction traffic and stockpiled materials. Local people, including those employed on the site, may not be aware of construction hazards. Children may be inadvertently recruited to work on construction sites.

9.2.13 Construction worker camps can also give rise to health risks associated with poor waste disposal practices and sanitation as well as prostitution.

Potential Positive Socio-Economic Impacts – Operational Phase

Improved Electrical Capacity in the National Grid and Reliability of Supply and Reduced Reliance of Fossil Fuels

9.2.14 The proposed projects will improve the electrical capacity of the national grid around Nairobi itself and the country as a whole. With the additional substations and power transmission line, KPLC will be able to increase electrical power reliability and power supply capacity. This additional capacity will help meet the increasing electrical power demand and reduce losses and the frequency of power outages.

9.2.15 This is likely to provide a means of long term, regional and national economic empowerment since KPLC will be able to supply electrical power more reliably to businesses which in turn will be able to improve their efficiency and productivity. There are also likely to be benefits to educational establishments, hospitals and agriculture etc. as a result of the increased electrical power reliability and capacity.

9.2.16 The project will have long term local and regional benefits as it will result in less reliance on wood for energy, as electricity becomes available to more households. Additionally, the transmission line will carry electricity generated by a range of renewable energy technologies including geothermal energy, hydro and wind power. This will reduce reliance on fossil fuels for electrical generation thus introducing local, regional and national benefits with respect to security of electrical supply and global benefits with respect to reduced carbon emissions and contribution to global warming.

Employment creation

9.2.17 During the operational phase, longer term jobs opportunities will be created in terms of site security and the manning of substation sites and maintenance of substations and the transmission line itself although a number of these positions are likely to require more skilled workers.

9.2.18 Periodic vegetation clearance from the way-leave should provide occasional opportunities for the use of local unskilled labour.

9.3 Impacts on the Physical Environment

Potential Negative Impacts on the Physical Environment - Construction Phase

Impacts on Vegetation

9.3.1 The transmission line will mainly pass through scrubland and savannah grasslands used for ranching and grazing purposes. The predominant vegetation species are *Acacia Tortillas, and Acacia Senegal*. There are a few *Eucalyptus Sapp, Gravellier Robusta,* which have been planted on farm especially around Kimuka, Corner Baridi and Kisaju areas. Most of the land is open, and with low trees and bushes.

9.3.2 Whilst the impact on taller woody vegetation is likely to last for the operational phase of the project, the impact on grasses and herbs is mostly transient. Tree and bush clearance will be limited as most trees/shrubs within the way leave are less than 12 feet in height, the maximum allowed.

9.3.3 The transmission line will result in some loss of natural and planted vegetation, especially during the erection of the towers. Vegetation will also be damaged/destroyed by moving machinery and trees cut to make way for the transmission line. Vegetation is a valuable resource in an area where the main economic activity is livestock rearing. This will however be a temporary impact since vegetation will be allowed to re-grow once the transmission line is established.

Impacts on Land Use

9.3.4 The proposed routes of the transmission line and siting of the substations has ensured as far as possible that the line has a minimum of impact on crop land, commercial forests, and flower farms. There will be a small, permanent loss of some croplands due to the presence of the tower pads. This is considered quite insignificant when compared with the total area of cultivated land in the project areas.

9.3.5 The farmer's seasonal agricultural activities may be temporarily disrupted during the construction activities for the transmission line and crops may also be affected temporarily. Following establishment of the transmission line, the way-leave will still be available to pastoralists for grazing and for growing crops such as maize and millet.

9.3.6 The proposed Suswa and Isinya substation sites are located in areas which are currently open grasslands, on land that has been set aside for the substations and already belongs to KPLC, and, which is not subject to growing crops or for grazing. The Thika Road substation site is however still used for growing crops. Areas of the site could however be returned to this usage once the substation site has been established.

Impact on Soils

9.3.7 Soil erosion can be an issue during construction activities, especially in areas with thin soil coverage and during prolonged dry and windy periods. Erosion can result from activities such as vegetation clearance, excavation and topsoil storage as well as vehicle movements.

9.3.8 Excavation and vegetation clearance will be limited in extent (for pylons and building foundations) and vegetation clearance along the RoW will be limited only to the taller shrubs and trees. Traffic and transport associated with the proposed projects will adhere to existing paved roads or follow specified routes as these are established. Thus, no significant adverse impacts on soils are expected.

Impacts on Drainage, Surface Waters and Water Resources

9.3.9 Construction works can have both short-term and long-term impacts on water resources. Earthworks can release suspended particles into watercourses, which can have temporary detrimental effects on water organisms. Spillages of fuel and transformer oils can cause contamination of the ground and water resources.

9.3.10 Hard standing, such as that associated with tower pads and maintenance roads etc. can have effects on the hydrological functioning of wetlands or water resources. Due to the line routing and substation siting avoiding such areas and minimal land take being required for buildings and hard standing, no such effects are likely.

9.3.11 The study has identified that the OHTL passes approximately 200 m east of a dam in Kimuka. In Corner Baridi area, the OHTL passes within 100 m of an animal-watering pan and also crosses the Olchoro River at Angle Point 8 (Geo-Reference 37M 0243682 9819452). The transmission line construction and operation will not however affect access to or use of these resources.

9.3.12 Process water will be required for the mixing of cement for the tower and substation foundations, drinking water and water for sanitation for worker camps. The water will be delivered using bowsers and will be sourced from nearby water sources where available with the agreement of the local community.

Visual Impacts

9.3.13 Some level of adverse visual impact will arise during the construction of the proposed projects, in particular during the construction of the substation sites. The construction works will be visible from local roads and by those residing nearby or pastoralists using land within close proximity of these sites. For the proposed Suswa and Ngong substation sites, there will be views from the Suswa Crater and from the Ngong Hills respectively which are both enjoyed for leisure usage by locals and tourists. These construction visual impacts will however be short term in nature.

Impacts on Archaeology and Cultural Heritage

9.3.14 The proposed projects will not pass through or be sited close to any known World Heritage or archaeological sites. The potential for chance finds remains and should not however be overlooked during the construction phase.

9.3.15 The proposed projects are not located within any United Nations (UN) Classified Indigenous Peoples Land.

Impacts on Traffic and Road Infrastructure

9.3.16 Traffic movements associated with site staff, delivery of materials and the removal of waste during the construction phase of the proposed projects are likely to be minimal. There may be occasional requirements for the movement of abnormal loads on local roads which may result in a need for temporary diversions at worse or a slowing of traffic and some limited congestion.

Impacts from Solid and Liquid Wastes

9.3.17 The proposed projects will generate waste during construction including off specification materials (e.g. cement), empty cable drums, empty oil drums, wood from crates and plastic, paper and domestic waste from construction sites and worker camps. This could result in

an increase in pressure on local landfill facilities as well as the potential for unauthorised disposal and littering if not properly managed.

9.3.18 It will be necessary to dispose of effluent collected from worker camps. It is anticipated that pit latrines will be dug to dispose of this effluent including that from sanitation facilities which can transmit diseases such as Cholera and Typhoid. There is the potential for water resources, such as groundwater boreholes, to become contaminated as a result and consideration will need to be given in the planning stages regarding the proximity of disposal sites to settlements and to the water resources they rely on, which may be some distance from settlements.

Noise and Vibration

9.3.19 Field visits to the project areas revealed largely quiet and peaceful environments with some noise emanating from aircraft as well as from existing OHTLs.

9.3.20 During the construction phase, noise will emanate from moving vehicles, excavators, generators, power tools (e.g. for vegetation clearing), and compressors. This will be a temporary effect largely confined to the construction period although there could also be occasional noise from traffic associated with the maintenance of the OHTLs and substation sites.

9.3.21 Permissible/acceptable human noise levels can be temporarily exceeded due to the operation of plant and equipment in the working zone of the OHTL route or on substation sites. This can have impacts on the construction workforce in terms of hearing impairment and cause nuisance to local residents and can be a particular issue close to particularly sensitive receptors such as schools and hospitals. There are no such sensitive receptors within 1km of the proposed transmission line or substation locations. There are however dwellings within 0.5 km of the Ngong substation site boundary although these would also be unlikely to experience noise levels above the ambient at this distance and in any case, construction works would generally be restricted to normal working hours e.g. 08.00 to 18.00.

9.3.22 Vibration can also be an issue is there is a requirement for blasting e.g. during the excavation for pylon footings close to residential and other sensitive receptors. However there are lower impact alternatives to blasting which could be applied should blasting be unacceptable at any particular location.

Air Quality

9.3.23 Air pollution may arise during the construction phase as a result of dust and emissions from construction vehicles, plant and equipment. Dust may be generated by excavation and earth moving operations. It is unlikely under most weather conditions that dust generated on construction sites would cause a nuisance at residential receptor sites given their distance from the works. Exhaust emissions may occur as a result of poor maintenance of plant and equipment or over revving of engines. Temporary roads and haulage routes will be located away from residential development and croplands as far as possible. All of the above potential impacts can however be minimised via the implementation of a construction environmental management plan.

Off-site resource impacts

9.3.24 Adverse environmental impacts may arise as a result of the sourcing of construction materials such as wood from forests or sand from river beds if this is not conducted in a sustainable manner. The project will also result in an increased demand for construction

materials and may impact upon the availability of such materials for other projects being undertaken at the same time.

Potential Negative Impacts on the Physical Environment - Operational Phase

Impacts on Vegetation

9.3.25 Shrub clearance works and tree felling/lopping will need to be continued periodically throughout operation to maintain transmission line clearance and access to the RoW. Tree and bush clearance will be limited as most trees/shrubs within the way leave are less than 12 feet in height.

Visual Impacts

9.3.26 The proposed transmission line project will traverse Suswa to Kiambu mountain ranges, run beside the Ngong Hills and then through open, rolling plains to Isinya. The pylons will be visible to local residents and pastoralists and tourists due to the open views since the project area is only vegetated by savannah grassland with low shrubs and small trees.

9.3.27 Although it is not feasible to fully mitigate the impact of OHTLs for safety reasons (e.g. camouflage), the effects have been minimised in the design of the project by routing the lines through areas which are less populated, away from major roads and tourists routes. The transmission line will be routed avoiding hills and ridges wherever possible to minimise visual impacts.

9.3.28 The proposed transmission line route follows the existing Olkaria-Nairobi North line route for a distance of 23 km from Suswa thus reducing the visual impact by siting the transmission line in an area where there is already a degree of visual impact and where residents have already been sensitised to such development.

9.3.29 The Danube tower design (as employed on the Mombasa-Nairobi line) will result in a lower profile, and therefore reduced visual impact, without significantly affecting the cost. The feasibility study recommends that a choice between Danube and standard vertical formation towers should be made during the detailed design stage.

9.3.30 The visual impact of the proposed projects is an effect at a socio-cultural level in terms of aesthetics. From the perspective of the tourist seeking pristine natural environments, infrastructure reminding them of an industrialised society can mar their experience of an area. However, from the perspective of rural populations, it may be seen as a sign of development and of change for the better or simply accepted as being part of the infrastructure required to facilitate their everyday lives.

Impacts on Traffic and Road Infrastructure

9.3.31 During the operational phase, few additional journeys are expected resulting in no significant increase in traffic in the area of the proposed projects.

Impacts from Solid and Liquid Wastes

9.3.32 The operation of the substation sites will generate wastes including transformer oils, waste materials from maintaining the sites and domestic waste including paper and food waste. All waste will be collected on a regular basis for disposal to authorised sites and is not expected to be of a sufficient quantity to increase in pressure on local landfill facilities.

9.3.33 Liquid effluent from on-site sanitation facilities will be either disposed of to soak-aways or will be collected into septic tanks with will be emptied on a regular basis and tankered off site for disposal at an authorised site.

9.3.34 No significant impacts associated with liquid or solid waste disposal during operation are anticipated.

Noise and Vibration

9.3.35 During operation, a low buzzing or humming noise can emanate from OHTLs and substations which can cause some alarm to those not familiar with their operational and safety aspects. This will however be minimised via the use of established overhead power line technologies.

9.3.36 KPLC will install anti-vibrating devices over the entire OHTL length to damp vibration caused by the conductors exposed to the dynamic load of wind. Therefore vibration impacts during the operation of the OHTL are expected to be minimal and are not considered further.

Air Quality

9.3.37 No air quality impacts are expected during the operation of either the substations sites or the transmission line.

Electric and Magnetic Fields

9.3.38 Electric overhead lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. The strength of both electric and magnetic fields is a function of the voltage, distance from the conductors to the ground and the lateral distance from the line to the receptor. Many studies published during the last decade on occupational exposure to Electro-Magnetic Fields (EMF) have exhibited a number of inconsistencies and no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields are a threat to human health.

9.3.39 EMF decrease very rapidly with distance from source and there should be no potential health risks for people living outside the proposed 64 m wide way leave corridor for the 400 kV line and 50m corridor for the 220 kV lines.

Ozone and Corona

9.3.40 Corona or electrical discharges into the air are produced around high voltage power lines which are sometimes visible on a humid night or during rainfall and can produce noise and ozone. Ozone concentrations around power lines are considered to have only very localised impacts and have no health consequences.

9.3.41 The feasibility study has identified suitable technologies to minimise corona, particularly at higher altitudes relevant to the proposed projects.

Impacts on Aviation and Communication

9.3.42 Aircraft navigation and communication facilities can be affected by transmission line projects. Although the proposed transmission line is situated along entry points for aircrafts heading to land in Jomo Kenyatta International and Wilson Airport, the, aircraft are flying above the height of Ngong Hills, and at a much greater altitude than the estimated tower height (35 m). The maximum height of the lines and the routing of the line will be in accordance with the requirement of the KCAA.

9.3.43 No impact on radio and television signals is expected as a result of the transmission line or substation sites. The line will be designed specifically to minimise radio and television interference levels and the buffer zone created by the way-leave provides a further safeguard against such effects.

9.4 Impacts on the Biological Environment

Potential Negative Impacts on the Biological Environment - Operational Phase

Impacts on Wildlife, Habitats and Migratory Birds

9.4.1 Bird strikes and mortality are of most concern in areas attracting high densities of birds, such as migratory species, and large birds such as waterfowl. This is likely to be an issue only during the operation of the OHTL. It has been identified however during the collection of the baseline data that the OHTL does not intersect any major bird migration routes.

9.4.2 Birds nesting in the towers pose a danger both to themselves and to the safe operation of the power line. Large nests eventually fill with droppings that can reach the conductors and cause electric shocks or burns to birds. These will need to be regularly removed as part of routine maintenance. Previous studies suggest that climbing animals, such as baboons, learn to keep away from conductors.

9.4.3 The impact of a transmission line on other fauna is limited as the area is sparsely populated with impalas and zebras.

9.4.4 The way-leave and substation sites would be cleared manually of vegetation and as such the use of herbicides is not envisaged. The cleared way-leave creates a specific biotope in areas with denser vegetation. This biotope is similar to a natural meadow, although much longer in extent, that acts as an open grazing area for herbivores, and hence as a hunting ground for carnivores.

9.4.5 Thus, no significant impacts on wildlife, habitats and migratory birds are anticipated.

9.5 Potential Negative Impacts - Decommissioning Phase

9.5.1 Potential negative impacts during the decommissioning phase could include spillages of transformer oils to the ground and groundwater as plant is decommissioned.

9.5.2 Solid wastes, e.g. brick/concrete rubble from substation site demolition and metals/cables from towers dismantling can become an eyesore if not taken off site either for re-use or recycling.

9.5.3 Invasive flora species could colonise former substation sites and the way-leave on decommissioning following removal of structures, buildings and hardcover.

9.5.4 Local residents could be subject to noise and air impacts during demolition. This is of particular relevance to the area around the Ngong site which, although currently sparsely populated at present, is likely to be more populated as residential development spreads out from the Nairobi area in the future.

SECTION 10

MITIGATION AND ENHANCEMENT MEASURES

10 MITIGATION AND ENHANCEMENT MEASURES

10.1 Introduction

10.1.1 This section identifies the mitigation measures for the anticipated negative impacts as well as enhancement measures for beneficial impacts where these are likely to occur. Each of these measures (to be implemented at either the pre-construction, construction, operational or decommissioning stage) are listed and then costed as appropriate in Section 12 of this report (the Environmental and Social Management Plan) and responsibilities for their implementation assigned.

10.2 Socio-Economic and Cultural Environment

Mitigation and Enhancement of Socio-economic Impacts – Pre-Construction Phase

Displacement and Relocation of Project Affected Parties

10.2.1 It is not anticipated at present that there will be a requirement for involuntary resettlement and there will be no need for the proponent to undertake a Resettlement Action Plan (RAP). A few buildings (two) have been identified as being on the line route and will be displaced within the owners premises who will be adequately compensated by the proponent.

10.2.2 The proponent will compensate any PAPs with regard to loss of land and crops. Compensation will be undertaken as per the rates prescribed by Ministry of Lands and Ministry of Agriculture.

Public Sensitisation

10.2.3 Public sensitisation will need to continue throughout the detailed design of the line route and project implementation stages. In line with the findings from the consultation, this should be organised with the involvement of local chiefs and administrators. A point of contact within KPLC/KETRACO should be assigned to liaise with community members and community level committees should be established to represent the affected communities.

10.2.4 Sensitisation forums should be held to address the issues raised during the public consultation: expectations regarding the proposed projects' ability to deliver electricity at a local level; compensation calculations and entitlement (this should be undertaken in consultation with local administration and other government bodies such as the Ministry of Lands); health and safety in the vicinity of the worksites; allowable activities within the way-leave; employment opportunities for local people and the findings of this ESIA report. This will help reduce conflicts with local communities as the projects are rolled out.

Corporate Responsibility

10.2.5 To ensure that all community members benefit from the project interventions, KPLC and KETRACO should consider supporting community projects in the areas affected by the project as part of their corporate social responsibility.

10.2.6 Baseline studies have identified a number of areas where support might be provided such as in upgrading school infrastructure or providing boreholes to communities that have no ready access to water. It is recommended that communities are invited during the ongoing consultation process to suggest schemes that would benefit them as a whole.

Mitigation and Enhancement of Socio-economic Impacts –Construction

Employment of Local Labour/Gender Issues

10.2.7 The use of local labour should be maximised during the construction of the projects (e.g. as security and site workers and in vegetation control etc) and training provided so as to provide capacity building.

10.2.8 As an enhancement measure, it is recommenced that equal employment opportunities are given to women within the project skills requirements and that the procurement of local products and services is maximised.

10.2.9 These recommendations should be included as a requirement of the contract to be prepared by KPLC/KETRACO for the letting of the construction works relating to the proposed projects

Health and Safety and the Prevention of Accidents

10.2.10 Substation construction sites will be fenced off prior to the commencement of construction activities in order to prevent accidents involving wildlife or local inhabitants. Excavation for foundations will be closed up as soon as practicable to prevent people or animals falling into the excavations. The local community, and in particular children, will be sensitised to the dangers of construction sites prior to and during the works. Appropriate signage in the local language will be erected. Stockpiled materials will be secured within the site compound. No children will be employed in the undertaking of the site works.

10.2.11 Adequate first aid facilities will be provided at all sites where construction activities are being undertaken including on mobile sites.

10.2.12 All construction workers will be given appropriate health and safety training and required to wear protective clothing (helmets, gloves and safety boots) during construction and operation, including maintenance. Other risks such as falls from height will be mitigated through the wearing of harnesses while undertaking tower erection and testing the structure for integrity. Hoisting equipment will be properly rated and maintained. Anti climb devises and danger warning plates in the local language will be fitted to all towers prior to their operation.

10.2.13 KPLC/KETRACO supervisory staff will be provided with health, safety and environmental training which will include specific training with respect to the content and implementation of the ESMP presented in Section 12 of this report. In addition, Contractors will be required to prepare their own Health, Safety and Environmental Management Plan based on the ESMP. Both KPLC/KETRACO and their Contractors will need to demonstrate their implementation of the ESMP through annual audit.

10.2.14 Health hazards can occur in construction sites due to lack of proper sanitary facilities and also from prostitution. Construction workers will be provided with appropriate sanitary facilities and informed of associated risks from HIV/AIDs. Other measures to be applied will include counselling and HIV/AIDs testing, and provision of condom dispensers for construction staff.

10.2.15 Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points in the local language. Construction vehicles shall not exceed maximum speed limit of 40km per hour in residential areas.

10.2.16 Live wire-work will be conducted by trained workers with strict safety standards and equipment.

10.2.17 Vegetation thinning will be undertaken within the RoW in order to minimise the risk of fire during the construction (and operational stages).

Mitigation and Enhancement of Socio-economic Impacts –Operation

Employment of Local Labour/Gender Issues

10.2.18 The use of local labour should be maximised during the operational phase of the projects (e.g. in providing security, undertaking vegetation control etc) and training provided so as to provide capacity building.

10.2.19 As an enhancement measure, it is recommenced that equal employment opportunities are given to women within the project skills requirements and that the procurement of local products and services is maximised.

10.3 Physical Environment

Mitigation of Impacts on the Physical Environment - Construction Phase

Land Use

10.3.1 The impact on crops will be reduced either by undertaking the construction works after the crops harvest or by compensating for all damaged crops. Farmers will be compensated for any disruption to or loss of crops and land arising from the construction. Awareness campaigns will be undertaken to ensure that farmers are aware that the way-leave can be used for grazing and arable crop farming but not for tree planting.

Soils

10.3.2 Soils excavated for pylon foundations will be used for backfilling excavations and will not be left exposed to wind or water for long periods.

10.3.3 Construction traffic will follow defined temporary access routes to be established as part of the works so as to avoid damaging the soil structure in the wider area. The contractor will minimise and avoid as far as possible tracking over steep terrains during the transportation of construction materials or during way-leave clearance. Repairs to access roads will be undertaken to maintain the surfacing and prevent soil erosion.

10.3.4 Degraded areas will be re-planted with local species endemic to the area to improve ground cover.

Drainage, Surface Waters and Water Resources

10.3.5 During construction, existing water flow regimes in rivers, streams and other natural or man-made irrigation channels will be maintained and/or re-established where they are disrupted by the works. Where an OHTL route crosses a river, the crossing will be designed such that the required clearances as prescribed in the Environmental Management and Co-ordination (Water Quality) Regulations 2006 and Water Act 2002 are maintained.

10.3.6 All vessels (drums, containers, IBCs etc.) containing oil, fuel and other hazardous chemicals shall be stored away from watercourses and bunded in order to contain spillages. Site

workers will be trained in clearing up spillages and spillage kits including suitable PPE will be available in storage areas.

10.3.7 All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.

10.3.8 Effluents containing soil, cement or oil will not be allowed to flow into any water drainage or water courses. Water from washing out of equipment will also not be discharged into water courses or road drains. Temporary stockpiles shall be located away from drainage and surface run off shall be directed away from stockpiles to prevent erosion.

10.3.9 Abstraction of both surface and groundwater for the construction works will only occur with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

10.3.10 Wastewater from sanitation on the worker camps will be collected in mobile containers and discharged into pit latrines which will be decommissioned on completion. It will be necessary to locate such disposal sites such that the effluent does not contaminate water resources such as boreholes used by the local community.

10.3.11 The discharge of any effluents will be carefully managed with agreement of NEMA with regard to the detailed methods of disposal. Standard good working practices should ensure that any impacts due to the quality of water discharging from the project are insignificant.

Visual Impact

10.3.12 In addition to the mitigation already incorporated into the design of the line route, awareness raising through public consultation should also help to lessen adverse reaction to the OHTL. Suggestions from the consultation regarding the line routing and substation siting will be taken into consideration in the final choice of design and routing.

10.3.13 Temporary access roads will be ripped and rehabilitated after the completion of the construction phase where these would not serve either the ongoing maintenance of the OHTL or the local community. Depots, worker camps and buildings erected during construction will be removed and the area restored to its original condition in order to avoid deterioration into shanty-areas unless an alternative usage is foreseen and is agreed with the local administration.

10.3.14 During construction of the substation sites, existing vegetation around the perimeter of the site should be maintained to minimise views into the site. Following construction, natural vegetation should be restored in non operational areas of the site and/or additional landscape planting with local indigenous species used to improve views into the site.

Archaeology and cultural heritage

10.3.15 Discovery of ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works will be immediately reported to the Proponent/Engineer so that the appropriate authorities can be expeditiously contacted and measures implemented to protect historical or archaeological resources.

10.3.16 Graves will generally be avoided but those which may be affected by the proposed project will be compensated. This will include expenses related to the relocation including for ceremonies and labour in connection with exhumation and reburial.

Traffic and Transport

10.3.17 The transport of heavy and abnormal loads will be undertaken out of normal working hours whenever possible. The locating of access roads and design of detours shall be undertaken in consultation with the local community.

Liquid and Solid Wastes

10.3.18 Waste facilities will be provided in depots and construction workers camps. Solid wastes arising from construction such as metals, papers, plastics, will be disposed of at approved sites in line with applicable government waste management regulations. Construction waste will be removed and reused or disposed off on a regular basis. No waste will be left on any site at the end of the works. Waste generation will be minimised as far as possible and waste materials reused or recycled as far as possible.

Noise

10.3.19 Noise emitted during the construction phase will be minimised through use of noise reduction technologies such as silencers/mufflers and provision of hearing protection devices for workers. Additional noise abatement measures may need to be implemented e.g. close to residential and sensitive wildlife areas, including careful selection and use of plant and hours of working.

10.3.20 Noise impacts associated with the construction process would be minimised through the implementation of a construction environmental management plan.

Air Pollution

10.3.21 Normal dust mitigation measures e.g. covering stockpiles of dusty materials and damping down, will be adopted during the construction phase. Speed limits will be put in place to minimise the generation of dust on access roads particularly near residential areas, crops or grazing sites.

10.3.22 Emissions from vehicles, plant and equipment will be minimised through regular maintenance. Vehicle idling and over revving will be discouraged and all plant will be turned off when not in use.

10.3.23 Air Quality impacts associated with the construction process would be minimised through the implementation of a construction environmental management plan.

Aviation

10.3.24 The transmission line will be located sufficiently far from main airports to not affect normal operations. Visual markers will be placed on line as an indication for light aircraft flying at lower altitudes than larger commercial aircraft. The transmission line will meet the requirements of the KCAA.

Materials Usage

10.3.25 Local materials will be used as far as possible to avoid importation of foreign material and long distance transportation. Materials, e.g. wood and sand, will be responsibly sourced and it's provenance known.

10.3.26 Appropriate licenses/permits shall be obtained from relevant authorities to operate quarries or borrow pits. Such sites will not be located in the vicinity of settlement areas, cultural sites,

wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value.

Mitigation of Impacts on the Physical Environment - Operational Phase

Drainage, Surface Waters and Water Resources

10.3.27 All vessels (drums, containers, IBCs etc.) containing transformer oil, fuel and other hazardous chemicals shall be stored away from watercourses and bunded in order to contain spillages. Site operatives will be trained in clearing up spillages and spillage kits including suitable PPE will be available in storage areas.

10.3.28 Abstraction of both surface and groundwater for the operational substation sites will only occur with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

10.3.29 Sewage generated by the operational substation sites will be collected into septic tanks that would be emptied periodically into tankers and disposed of off-site by suitably licensed contractors or facilities would be connected to mains sewerage where available.

Liquid and Solid Wastes

10.3.30 Solid and liquid wastes arising from the operation of the substation sites will be disposed of regularly at approved sites in line with applicable government waste management regulations.

10.4 Biological Environment

Mitigation of Impacts on the Biological Environment - Construction Phase

Flora and Fauna Loss of Biodiversity and Impact on Habitats

10.4.1 In order to mitigate impacts on flora, the proponent will ensure that there is minimum clearing of vegetation and that re-vegetation of disturbed areas occurs following construction. Areas requiring clearance either for the OHTL, substations or worker camps will be clearly marked out prior to clearance works. There will be no clearing of riparian zones and there will be a selective removal of tall growing trees. Clearing will be undertaken manually, 'slash and burn' and mechanical methods (e.g. the use as bulldozers) will not be employed.

10.4.2 Construction workers will be discouraged from engaging in the exploitation of natural resources such as hunting and collection of forest products such as wood.

10.4.3 While the proposed project does not fall within any bird migration routes, the proponent will conduct monitoring of bird collisions or electrocutions along the transmission line, and where evident in any significant numbers, will put wire-marking reflectors in place.

10.4.4 The proponent will ensure that food is not disposed of along the transmission line or at substation sites. Feeding wild animals can contribute to behavioural change, which may encourage them to raid homes for food.

10.4.5 On completion of the construction works, the transmission line way-leave will be allowed to re-vegetate with indigenous species. Invasive species will be prevented from colonising.

10.5 Proposed Mitigation – Decommissioning Phase

10.5.1 Temporary access roads used during the operational phase will be ripped and rehabilitated where these would not serve the local community. Depots, and buildings on substation sites will be removed and the areas restored to its original condition in order to avoid deterioration into shanty-areas unless an alternative usage is foreseen and is agreed with the local administration.

10.5.2 Septic tanks will be emptied and removed from substation sites. No waste will be left on any site at the end of the decommissioning works. Waste materials will be reused or recycled as far as possible.

10.5.3 Any adverse impacts from decommissioning, including noise and air quality impacts on local residents and the potential for contamination will be minimised via the implementation of an environmental management plan.

10.5.4 Buildings and hardcover on substation sites will be removed unless alternative uses can be found for them in agreement with the local administration. The sites will be levelled and allowed to re-vegetate with indigenous species. Invasive flora species will be prevented from colonising

10.5.5 Cement foundations for towers will be removed down to a specified depth followed by site levelling and revegetation. Invasive flora species will be prevented from colonising.

SECTION 11

BUDGET

11 BUDGET

11.1 Introduction

11.1.1 The total land acquisition and compensation cost for proposed projects is estimated at **Kshs** 0.56 billion (Kenya Shillings) as broken down below. The construction of the proposed lines and substations identified below will cost approximately **Kshs** 10 billion.

11.2 Transmission Line Land Acquisition and Compensation Cost Estimate

Transmission Line	Distance	Wayleave	Area	Hectare equivalent	Acre equivalent	Cost per acre (1)	% compensation rate (3)	Total Costs
	km	km	kms^2	(ha)	(acre)	Kshs		Kshs
Suswa-Isinya 400 kV transmission line	100	0.064	6.4	640	1580.8			
Part A of line (Suswa - Kimuka area_					600	300,000	0.25	45,000,000
Part B of line (Kimuka, corner Baridi, Kisaju)					500	400,000	0.30	60,000,000
Part C - areas near Ngong and Isinya					480.8	500,000	0.40	96,160,000
Buildings					1	2,000,000(2)	1.00	2,000,000
3.2 Km spur line to Ngong Sub-station	3.2	0.064	0.2	20.5	50.6	400,000	0.25	5,058,560
Total transmission line								**208,218,560**

11.3 Substation Land Acquisition Cost Estimate

Substations	Area	Cost/Acre	Total
	(acres)	Kshs	Kshs
400/220 kV substation at Suswa	100	250,000	25,000,000
220/66 kV substations at Ngong	30	1,000,000	30,000,000
New 220/66 kV substations at Thika Road	30	10,000,000	300,000,000
Total Substation Sites			**355,000,000**

Notes:

(1) The cost per acre ìs an estimate based on current land value of the area.

(2) This is based upon the approximate value of houses observed along the line routing. The replacement cost of structures needs to be carried out by a licensed valuer, appointed by KPLC/KETRACO.

(3) The percentage compensation is dependent on land owners holding. Compensation is paid up to a maximum of 50% for those with little land as while they would still retain use of the holding once the line is constructed, they may not be able to build within the way-leave. Where affected persons have large land holding, the percentage compensation is reduced.

SECTION 12

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

12 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

12.1 Introduction

12.1.1 This Environmental and Social Management Plan (ESMP) provides a logical framework within which the negative environmental and social impacts identified during the ESIA study can be mitigated and any beneficial environment effects can be enhanced.

12.1.2 Monitoring and management practices as well as monetary compensation are considered and cost estimates included as applicable. Responsibilities and time frames for the implementation of the various aspects of the ESMP will be identified.

12.1.3 The ESMP will be provided to prospective bidders for the construction contracts to ensure that environmental mitigation costs are factored into their costings. The Contractor(s) will also be required to prepare a separate and specific ESMP for their works in order to control construction impacts and ensure compliance with applicable environmental and health and safety legislation and standards.

12.1.4 KPLC/KETRACO will ultimately be responsible for ensuring that the ESMP is implemented on site via reviewing the Contractor's ESMP and ensuring its implementation on site via audits.

12.2 Environmental and Social Management Plan

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
Pre-construction						
Community Consultation	Awareness raising / Sensitisation / Capacity Building	-Inform all communities along the transmission line route and adjacent to substation sites of the schedule of implementation and project activities -Obtain feedback and take into consideration in design of OHTL routing and substation siting. -Inform PAPs of the compensation framework and their entitlement to compensation. -Disseminate ESIA findings	KETRACO/KPLC	Periodically, prior to construction	-No. and minutes of consultative meetings held - No. of complaints from the local community	500,000
Land Acquisition	Land take – both individual and communal Temporary lack of access to land during construction works	-Adequate compensation to communities to ensure communities are not left worse off as a result of erection of transmission line -Ensure that period of inaccessibility to land is as short as possible	KETRACO/KPLC	Prior to construction	-Records of compensation paid	208 million for transmission line 355 million for sub-stations
Health, Safety and Environmental Awareness and Training	Reduction of accidents and incidents	-Health, Safety and Environmental training of PLC/KETRACO Supervisory Staff and Contractors site management staff including training on the ESMP and its implementation	KETRACO/KPLC	Prior to and periodically throughout construction	-No. of staff trained and type of training attended -Accident statistics - Annual audit of implementation	100,000
Public Awareness Creation	Capacity Building / Sensitisation	-Public Occupational and Health and Safety Awareness Training Workshops, -Use of child labour prohibited	KETRACO/KPLC	Prior to and periodically throughout construction	-Accident statistics -No of trained community members and type of training attended -No of incidences of child labour recorded	1 million
Work site survey and pegging	Incorrect alignment	-Ensure line alignment as per established route plans	KETRACO/KPLC	Prior to construction	-No additional land take	10 million

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
Construction						
Employment of Local Labour	Socio-economic, Capacity building	-Maximise local employment (including of women) on construction works as well as worker camps (suggested this is a contractual requirement to hire a percentage of local workforce including women)	KETRACO/KPLC	Throughout construction	-local workers employed as a % of total workforce - % women employed as % of total workforce	Nil additional cost
Site Clearance	Impact terrestrial flora and fauna	-Mark out areas for clearance and use manual method of clearance -Undertake selective clearance by removing tall woody species leaving saplings, for quick regeneration of vegetation along the wayleave -Prevent colonization by invasive species-	Contractor	Construction	-No. and type of trees cut down -Area of land (acres) cleared	Contractor Cost
	Impact on water bodies and aquatic flora and fauna	-Minimise clearance and disruption to riparian vegetation and habitat	Contractor	Construction	-Area of land cleared -Type and area of riparian vegetation cleared -Incidences of siltation of water bodies from construction activities -Water quality of water bodies near construction sites	Nil additional cost
Site access roads	Soil erosion, Air quality, Water quality, Health and Safety	--Avoid steep terrain during the transportation of construction materials by using alternative routes or use light vehicles where appropriate -Prevent surface water run-off over disturbed earth draining to water bodies by redirecting flow -Pave permanent access roads to prevent erosion -Erect traffic warning signs in the local language -Set and enforce speed limits for	Contractor	Daily inspection,	- Water Quality - Accident statistics	Nil additional cost

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
		construction traffic using access roads.				
	Archaeology	-Implement of chance finds procedure	Contractor	As finds of potential archaeological significance are unearthed	-Items of archaeological significance disturbed or destroyed	Nil additional cost
Selection and use of Construction Plant and Equipment	Air pollution (dust, fuel emissions), Occupational health and safety, Nuisance to local community	-Control speed of construction vehicles -Prohibit idling and over revving of vehicles -Water should be sprayed during the construction phase on dusty excavated areas -Regular maintenance of plant and equipment.	Contractor	Daily inspection	-Visible particulate matter in the air - Increase in upper respiratory tract ailments - Worker need for use of PPE -Complaints from the local community members regarding noise and dust	Nil additional cost
Storage and Dispensing of Construction Materials	Health and Safety Land quality, Water quality	-Provision of bunded, lockable storage areas -Suitably trained personnel only to dispense and work with hazardous material - Provision of suitable PPE -Immediately clean up spillages - Keep health and safety data sheets to hand	Contractor	Daily inspection	-Type and number of storage provided -Incidences of land Contamination -Water Quality -Accident statistics	Contractor Cost
Construction works associated with pylon and substation foundations	Health and Safety	- Temporarily or permanently cordon off work sites to prevent public accessing work areas -Soils extracted for the excavation of towers to be used for backfilling and should not be left exposed to wind or water for long periods -Supply and use of PPE including safety shoes/boots, gloves for mixing cement, dust protection during dry and dusty conditions or when working with hazardous materials - Close excavations for pylon foundations as soon as possible and/or provide guarding	Contractor	Daily Inspection	-No and type of PPE/RPE purchased -No. of workers wearing appropriate PPE/RPE -Accident statistics	Contractor Cost

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
Construction works associated with pylon erection and conductor stringing	Health and Safety	-Workers should always wear PPE and carry first aid kits -Enhanced security measures when working near wild animals -Workers working at height to be suitably trained and provided with appropriate PPE including harnesses-	Contractor	Daily inspection	- No and type of PPE/RPE purchased - No. of workers wearing appropriate PPE -Accident statistics	Contractor Cost
Establishment of worker camps and depots	Solid Wastes,	-All solid wastes from work sites the camps such as metal, papers, food should be collected centrally, removed regularly and disposed of to designated waste disposal sites-	Contractor	Daily inspection	-Presence of solid wastes left on site, fly tipping and littering - Waste related prosecutions -Contamination of water bodies/ -No. of instances of disease	Contractor Cost
	Liquid Wastes	-All camps will have sanitary facilities for its workers including proper pit latrines located away from water bodies and groundwater supplies (wells)	Contractor	At commencement of works	-No. of sanitary facilities available -Incidences of ground or surface water contamination -No. of instances of water borne disease	Contractor Cost
	Health Risks	-Awareness campaigns on HIV/AIDs among workers.	Contractor	At commencement of works and periodically as new workers arrive	-Accident statistics	Contractor Cost
Commissioning of Power line	Avifauna mortalities	-Undertake wire marking to alert birds to the presence of power line. -Build raptors platforms on top of pylons for roosting and nesting	KETRACO/KPLC	Prior to final commissioning of OHTL as appropriate	-Bird mortalities	Up to 6 million
	Aircraft accidents	-Install visual markers as an indication for light aircraft-	KETRACO/KPLC	Prior to final commissioning of OHTL as appropriate	-Aircraft related accidents or near misses	Nil additional cost – part of basic design requirement

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
	Electrocution (community, climbing fauna)	-All pylons should be fitted with anti climb devices and danger warning signs	KETRACO/KPLC	Prior to final commissioning of OHTL as appropriate	-Accident statistics -Fauna mortalities	1.5 million
Closure of Worker Camps and Depots	Solid and Liquid Waste, Landscape and Visual	-Remove all construction plant and equipment -Remove all solid and liquid wastes -Remove all temporary buildings -Remove all temporary access roads	Contractor	On completion of Construction Works	-Return of site to its quasi original state	Contractor Cost
Revegetation	Fauna and flora, Soil Erosion	-Re-plant degraded areas with local species common in the area to complement natural vegetation degeneration to improve ground cover	KETRACO/KPLC	As construction of sections of line route are completed.	-No. and type of trees/shrubs planted	Up to 500,000
Operation						
Employment of Local Labour	Socio-economic, Capacity building	-Maximise local employment on transmission line maintenance and at substation sites.	KETRACO	Throughout operation	-% local workers employed as a % of total workforce	Nil additional cost
Maintenance of Power line	Electrocution of workers	-All staff involved in Live-wire works should have protective clothing	KETRACO	Project Period	-Accident statistics	Operational cost
	Risks of Fire	-Use of fire as a management tool will not be permitted. - Wayleave will be maintained clear of tall trees - Overhead line will be periodically maintained	KETRACO	Project Period	-Accident statistics	Operational cost
	Accidents from snake bites or wild animals	-Workers should always wear protective gear, carry first aid kits, enhance security measures	KETRACO	Project period	-Accident statistics	Operational cost
Storage and dispensing of Operational and Maintenance Materials	Health and Safety Land quality, Water quality	-Provision of bunded, lockable storage areas -Suitably trained personnel only to dispense and work with hazardous material -Provision of suitable PPE -Immediately clean up spillages	KETRACO	Daily inspection	-No. and type of storage provided Incidences of land Contamination -Water Quality -Accident statistics	Nil additional cost (part of construction cost)

Project Activities	Potential impact	Mitigation and Enhancement Measures	Responsibility	Frequency	Verifiable Indicators	Estimated Costs (Ksh)
Maintenance of Wayleave	Impact flora and fauna Fire	-Mark out areas for clearance and use manual method of clearance; -Undertake selective clearance by removing tall woody species leaving samplings, for quick regeneration of vegetation along the way-leave -Prevent colonization by invasive species	KETRACO	Throughout operation	-Land areas cleared (acres) - Type of vegetation cleared - No. of instances of invasive species	Operational cost
Generation Operational and Maintenance Wastes	Solid Wastes,	-All solid wastes from the substation sites should be collected centrally, removed regularly and disposed of to designated waste disposal sites-	KETRACO	Daily inspection	-Presence of solid wastes left on site, fly tipping and littering - Waste related prosecutions	Operational cost
	Liquid Wastes	-All substation sites will have sanitary facilities for its workers including septic tanks located away from water bodies and groundwater supplies (wells)	KETRACO	Periodic emptying throughout project	-Contamination of water bodies - Instances of water borne disease	120,000
Decommissioning						
Pylons including transmission line	Waste, Landscape and visual, Flora and fauna	-All pylons and transmission line/conductors removed from site and sold as scrap metals or recycled, -Removal of cement foundations down to specified depth to allow for reforestation - Site levelling and revegetation	KETRACO	End of project	-Value from re-sale - Return of land to its quasi original state	0.5 billion
Buildings	Waste, Landscape and visual	-Buildings to be demolished where reuse not appropriate Re use materials where appropriate -Remove all plant and equipment -Remove all solid and liquid wastes - Remove all access roads; -Revegetate sites	KETRACO	End of Project	- Value from re-sale, -Return of land to it's quasi original state	100,000
Revegetation	Fauna and flora, Soil Erosion	-Re-plant degraded areas with local species common in the area to complement natural vegetation degeneration to improve ground cover	KETRACO	As decommissioning of sections of line route are completed.	-No. and type of flora planted	Up to 500,000

SECTION 13

CONCLUSION

13 CONCLUSION

13.1.1 The proposed projects, comprising an electricity transmission line and substations, are considered to be in line with the development and socio-economic needs of Kenya as a whole. They fulfil in part, the Economic Recovery Action Plan, 2003 and Vision 2030 and the Millennium Development Goals. The proposed projects will facilitate transmission of electricity generated by a range of renewable energy technologies including geothermal energy, hydro and wind power therefore reducing reliance on fossil fuels. Indeed, the projects have many positive socio-economic impacts both locally, regionally, nationally and globally.

13.1.2 In view of positive and negative impacts identified, as well as public consultation conducted in the project areas, it is unlikely that the proposed projects will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the projects such that the overall benefits from the projects will greatly outweigh the few adverse impacts.

13.1.3 The main social issues for the projects will revolve around the displacement and relocation of people along the transmission line corridor and acquisition of way leave. The proponent will compensate the PAPs with respect to adverse impacts associated with displacement and disturbance.

APPENDIX A

PHOTO GALLERY

Plate 1: Proposed site of Suswa Substation

Plate 2: Consultation in Kimuka

Plates 3 & 4: Consultation in Kisaju

Plate 5: Proposed Site for Thika Road Substation

Plate 6: Consultation in Corner Baridi

 Plate 7: Typical vegetation along the Suswa – Isinya Line	 Plate 8: Project Affected Persons in Suswa

APPENDIX B

PUBLIC CONSULTATION ATTENDEES LIST

CONSULTATION AND REPLUBLIC PARTICIPATION FOR ISINYA-SUSWA ELECTRICITY TRANSMISSION LINE (400Kv) REGISTRATION FORM
MEETING HELD AT KIMUKA
DATE 4th October 2010

NO.	NAME	LOCATION	CONTACT	COMMENT
1.	Daniel s. Sakuda	Intashart	0721 346034	The meeting was v. good
2.	Tipsol Parsitau	Intashart	0726 975066	Meeting a success
3.	Thomas k. Letowoon	Intashart	0725 369923	The meeting was nice
4.	Daniel Sasine	Intashart	0722 961384	Very informative interraction
5.	Puta Ole Nkoitiko		0715 137359	
6.	Moina Ole Torora		0727-617548	Just nice
7.	Ole Mpeti	Oloshoibor		
8.	James Koilel	Ntashat	0724 711673	“
9.	Julius Mkuyoto	Ntashat	0717 211468	“
10.	Samson Lekuka	Intashat	0722423236	“
11.	John	mpale	0720 055704	“
.				

CONSULTATION AND PUBLIC PARTICIPATION FOR ISINYA-SUSWA ELECTRICITY TRANSMISSION LINE (400Kv) registration form
MEETING HELD AT INKIITO PRIMARY SCHOOL ON 5/10/10

NO.	NAME	LOCATION	CONTACT	COMMENT
1.	David Teekah	Inkuto(chief)	0724491734	
2.	Jackson Konchela	Kisaju(chief)	0721525427	
3.	Noah Gusu	Inkuto		
4.	Joseph Sambu			
5.	Lanlei Sokorte			
6.	Jackson Sankaire			
7.	Joseph Sekento			
8.	Ole Tingisha			
9.	Solomon Shapara			
10.	Kanae Ngusur			
11.	Moses monirei			
12.	Jeremiah Nkukuu			
13.	Joel Puree			
14.	Justus Teete			
15.	Jeremiah Ntenkese			
16.	John Monirei			
17.	Joel Sankaire			
18.	Wilson Teeli			
19.	Joseph Koila			
20.	K. Sankaile			
21.	Joyce Soyantet			
22.	Dais Sokorte			
23.	Mrs. motonto			
24.	Mrs. Korio			
25.	Eliza Leshinka			
26.	Josephine David			
27.	Esther Senkaire			
28.	Mrs. monirei			
29.	Mrs. Ngunyaa			
30.	Mrs. Tingisha			
31.	Mrs. Murkuku			
32.	Mrs. Sambu			

CONSULTATION AND PUBLIC PARTICIPAYION FOR ISINYA-SUSWA ELECTRICITY TRANSMISSION LINE (400Kv) REGISTRATION FORM MEETING HELD AT KISAJU PRIMARY SCHOOL ON 5/10/10

NO.	NAME	LOCATION	CONTACT	COMMENT
1.	Jackson konchellar	kisaju		
2.	Benson Munyiri			Village elder
3.	Joseoh Kananiet	kisaju		
4.	John Kusoi			
5.	Daniel sekento			
6.	Kaluudu monorei			
7.	Jrari Saduu			
8.	Ayiaki supeyo			
9.	Ole koisaba			
10.	Tupet sisoo			
11.	Jackson Ralia Kulenyi			
12.	Moses Rimpaso Kilenyi			
13.	Reluta sumug			
14.	Serpepi mpishi			
15.	Moses munyiri			
16.	Daniel kuria			
17.	Panli morika			
18.	Paul karariet			
19.	Emmanuel syeyo			

CONSULTATION AND PUBLIC PARTICIPATION FOR ISINYA-SUSWA ELECTRICITY TRANSMISSION LINE (400Kv) REGISTRATION FORM
MEETING HELD AT EWASO
DATE 7th October 2010

NO.	NAME	LOCATION	CONTACT/ID	SIGNATURE	COMMENT
1.	Daniel kitasi Toris	Ewaso			
2.	Risho ole Tuukuo				
3.	Maina Charles				
4.	Lona Tinina				
5.	Permuat Pulei				
6.	Kipino Sitei			KJP/EWUASO	Not paid
7.	Muruampei muntolol		ID:6852941	1969/CDR 12059	Not paid
8.	Losika masiodo		ID:8343859	KID/EWUASO	CPR DATES
				KEDONG/1973	31/7/2008
				CDR NO.12065	Current letter
					6/5/2010
9.	Moriaso Kindi				
10.	Kooki Kindi				
11.	Shokoret Taini				
12.	Kuya Kituki				
13.	Kipoipoi Sholoi				
14.	Aleiti Kasi				
15.	Koikai Masiodo				
16.	Sipoi kindi				
17.	Ciamito Kisamey				
18.	Lankisa merumu				
19.	Lenkina merumu				
20.	Santito Satabau				
21.	Moiyale murkuku				
22.	Lengutut Lesiri				
23.	Oseru kindi				
24.	Ntete maisiodo				
25.	Kashoi kilelu				
26.	Yiatum masiodo				
27.	Sitei masiodo				
28.	Qibo kindi				
29.	Rishan masiodo				
30.	Kipule masiodo				
31.	Losika masiodo				

32.	Kaano kindi				
33.	Keruro lekuti				
34.	Ole kirau				
35.	Muruampei montolol				
36.	Paana murtolol				
37.	Samson Nkipai				
38.	Munt Kenya Peride				
39.	Ndilai				
40.	Rishoi Tuukuo				

CONSULTATION PUBLIC PARTICIPSTION FOR ISINYA-SUSWA ELECTRICITY TRANSMISSION LINE (400Kv) REGISTRATION FORM MEETING HELD AT IL MASIN PRIMARY SCHOOL DATE 13th 0ctober 2010

NO.	NAME	LOCATION	CONTACT/ID	SIGNATURE	COMMENT
1.	Chief Ibrahim	Njomo/olchoro/onyori	0723335573		A good beginning
2.	John Kerter		0722301720		Good work
3.	Parsoip Kimeri				Good work
4.	Wilson Murkuku		0710856751		Good work
5.	Paul Katira		0724781973		Good work
6.	J.p Nchipai		0722474861		Good work
7.	Julius Nipalicu		0721627220		Good work
8.	Daniel Parkinyowe		0752264116		Excellent
9.	Joseph Mapengo		0722356738		Good
10.	Simon Markuvi		0738157136		Good
11.	Samuel ole minisia		0722907051		
12	Solomon Ngiroiya				Good
13.	Wilson mpty		0734666290		Provided clearly to community members
14.	Mapinko		0723492140		Great things
15.	Z. N. Gicheha		0738222108		Greatful work
16.	Amos muhuri		0735847654		Good thing
17.	Malano Esho		0726521992		Good
18.	Moses Lekishon		0710528115		Good

APPENDIX C

PROPOSED SUSWA-ISINYA TRANSMISSION LINE ROUTE AND SUBSTATION SITES

APPENDIX D

NOISE READINGS FROM FIELD VISITS

Noise Readings taken during Field Visits (October 2010)

Area	Location	Max Noise readings (dB)	Date of reading
Suswa	37M 221487 9872924	42	7th October 2009
Ewaso	37M 0221072 9876022	40	7th October 2009
Kimuka	37M 232598 9849811	42	4th October 2009
Ngong	37M 234188 9850430	44	4th October 2009
Corner Baridi	37M 238803 9838058	42	4th October 2009
Isinya	37M 258485 9803574	48	5th October 2009
Athi River- Kenani	37M 280855 9860427	52	9th October 2009
Thika Substation	37M 271499 9872273	48	11th October 2009

The readings were not weighted