MINISTRY OF ENERGY

REPUBLIC OF KENYA

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED RABAI-MALINDI-GARSEN 220 KV & GARSEN – LAMU 132 KV TRANSMISSION LINES AND ASSOCIATED SUBSTATIONS

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Activity: Environmental and social impact assessment for the proposed Rabai-Malindi-Garsen 220KV & Garsen-Lamu 132KV transmission lines and associated substations.

Report Title: Environmental and Social Impact Assessment Study Report: The proposed Rabai-Malindi-Garsen 220KV & Garsen-Lamu 132KV transmission lines and associated substations

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This Environmental and Social Impact Assessment report is being submitted in accordance with the terms and conditions of Contract in respect of provision of consultancy services for the Environmental and Social Impact Assessment Report on the proposed Rabai-Malidi-Garsen 220KV and Garsen – Lamu 132 KV transmission lines and associated substations). It has been carried out in full observance of the EIA regulations (Kenya Gazette Notice No. 56 of 13 June 2003) in compliance with the Environmental Management and Coordination Act, 1999.

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LIST OF ABBREVIATIONS

ASAL	Arid and Semi-Arid Lands
CBO	Community Based Organisation
CSR	Corporate Social Responsibility
DDP	District Development Plan
DEO	District Environment Officer
EMCA	Environmental Management and Coordination Act, 1999
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
KETRACO	Kenya Electricity Transmission Company
Km	Kilometres
Km^2	Square Kilometres
KPLC	Kenya Power and Lighting Company
Masl	Metres above sea level
m	Meters
M	Million
mm	millimeters
NEMA	National Environment Management Authority
RAP	Resettlement Action Plan
REP	Rural Electrification Project

EXECUTIVE SUMMARY

Introduction

The Study to electrify Tana River, Lamu and Malindi Districts was completed in 1995 by Fitchner. The Study established that a 132 kV line was required in between Kilifi and Garsen and further recommended that it would be necessary to upgrade the 132 kV line by the year 2010 as well as upgrade the envisaged 112 Km 33 kV line between Garsen and Lamu to 132kV. This Project was not implemented as proposed then and it is envisaged that it will now be implemented by the year 2010.

The components of the project include:

i. 96 km of a 220 kV single circuit line from Rabai to Malindi and a 220kV bay at Rabai and 220/ 33kV substation at Malindi;
ii. 116 km of a 220kV single circuit line from Malindi to Garsen and a 220/132/33 kV substation at Garsen and;
iii. 108 km of 132 kV line to Lamu and 132/33 kV substation at Lamu.

The lines will be owned by the Government of Kenya through The Kenya Electricity Transmission Company (KETRACO) and will be Operated and Maintained by the Kenya Power and Lighting Company (KPLC).

The Kenya Government policy on all new projects requires that an Environmental Impact Assessment (EIA) study be carried out at the project planning stages to ensure that significant impacts on the environment are taken into consideration. Electrical infrastructure, including electrical transmission lines, are some of the projects listed under the second schedule of the Environmental Management and Coordination Act (1999) that should undergo an EIA.

Norken International Limited has therefore been contracted by the Ministry of Energy to conduct an environmental and social impact assessment (ESIA) study and resettlement action plan (RAP) for the proposed transmission line, as per the terms of reference that were developed for this study. The objective of this assignment is to ensure that the potentially adverse environmental and social impacts can be minimized and the positive impacts enhanced.

The study was carried out at desk level and also through a detailed and structured field study. The process included: collection of baseline data to describe the status of the project site before project implementation commences; data analysis and evaluation; public participation to identify the concerns of persons likely to be affected by the project; and preparation of an EIA study report encompassing the details specified in the Environmental Regulations (2003).

Summary of Findings

A number of positive and negative anticipated impacts to the environmental and social wellbeing have been identified thus far. The route of the proposed transmission line

crosses two major rivers: the Tana and Athi Rivers (Galana Sabaki) and as such, potentially significant impacts include the construction of corridors crossing aquatic habitats that may disrupt these watercourses and wetlands; and removal of riparian vegetation. It is important to note that sediment and erosion from construction activities and storm water runoff may increase turbidity of surface watercourses. The proposed route also passes through important forests (lowland rainforests) especially the Witu forest which is a lowland rain forest. The major impacts on occupational health and safety and public health relate to EMF radiation.

Many within the local communities felt that proposed project would indirectly bring in development to the areas mainly in the form of skilled and unskilled labour opportunities. They felt that there would also be opportunities for small business (especially for women and youth supplying goods and services to the project staff). There was hope that the project proponent would have some corporate social responsibility (CSR) actions that would invest in development projects in the areas such as schools, water, health centres, roads and cottage/*juakali* business capital.

Generally the local communities were in favour of the proposed project but those within the proposed transmission line felt that if they had to be moved or their land taken away they should be fully compensated To that end, a resettlement action plan (RAP) has been prepared as part of this study and submitted to the Proponent.

Although there is indisputable justification of the proposed transmission lines and associated sub-stations, there are significant environmental and social issues associated with the construction and operation of the proposed project. In this regard, a comprehensive mitigation and monitoring plan has been developed in order to provide a detailed environmental management plan that will guide the entire project cycle (construction through to decommissioning) and is provided below:

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Soil Erosion	Construction	Control the earthworks and contain excavated soils on site, Soil removal process not to deposit residuals in the drains, Efficiency of erosion control measures, Landscaping to create contours towards the drainage systems,	Supervising Foreman and Contractor	Continuous throughout construction phase	Silt loading in the drainage systems during rains Part of the soil and surface water drainage, pavings and landscaping. No Costs Estimate
	Occupation	Compact loose soils and apply binding materials.	Ministry of Energy	Continuous activity	
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Air Pollution (dust, emissions and particulate matter)	Construction	Maintain construction machinery in working order at all times Control speed of construction vehicles around the site Keep the loose soils and dry materials at the construction site moist at all times, Delivery vehicles with dry materials be covered, Sensitise construction workers on aerial emissions.	Supervising Foreman and Contractor	Continuous throughout the construction phase	Complaints from the neighbours, Physical appearance in the immediate air space, Depositions on surfaces (buildings, plants and stationary vehicles) Dust mask @ Ksh
	Occupation	No burning materials (plastics, papers or fabrics) on site,	Ministry of Energy	Continuous	100
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Noise and vibration	Construction	Sensitise the workforce and truck drivers on issues equipment maintenance, Supervise construction traffic, Maintain plant and equipment,	Supervising Foreman and Contractor	A continuous observance throughout the construction Spot checks of noise	Complaints from the neighbours, Audible noise levels at the nearest home not to exceed 50

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
		Undertake construction only during the daytime for peace of the neighbours, Workers to wear ear plugs/muffs as part of the personal protective gear.		levels every month	Decibels, Sound proofing material approx. KSh 600 per kilogram
	Occupation	No workshops and noise intensive activities shall be operated at the site, Consider the possibility of investing in silences to reduce quantity of noise produced Create a barrier wall beyond the perimeter of the high level noise are and the community	Ministry of Energy	Continuous	Maintenance: internal cost
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	No complaints from the residents
Contamination of Ground and Surface Water : oil spills, silt, leachate from solid wastes, suspended matter, infiltration into water supply pipes, sewage	Construction	Proper storage, handling and disposal of oil and oil wastes from machinery, Discourage servicing of machinery and vehicles on site	Supervising Foreman and Contractor	Continuous through the construction period	Nature of surface runoff from the site No cost estimates (Part of the earthworks and landscaping)
	Occupation	Avoid unnecessary wastage and spillage of water, Sewer pipes not to discharge into drainage systems,	Ministry of Energy	Continuous monitoring	Nature of surface runoff from the site No specific cost estimates (part of the sanitary and plumbing installations)
Waste Management, Sanitation and Hygiene	Construction	Special attention on the site sanitary facilities, Construction concrete debris be	The Architect Contractor,	Wastes expected throughout the construction phase	Compatibility of the waste types with the recipient physical and

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
		disposed off safely preferably re-used on road graveling, Earth excavate be dumped on pre-identified and approved land fill sites, Other inert materials (wood, steel bars, nails, papers, glass, etc. be recycled off site OR dumped in dumping sites approved by the City Council, Plan materials (logs and branches) may be used offsite for building or firewood while leaves and lesser be dumped in approved dumping sites, Provide segregated waste holding units on every floor as temporary storage bins,	Supervising Foreman		social environment. Value of the wastes types to the generation points and the recycling agents. Temporary latrine approx. Ksh 10,000
	Occupation	Solid waste holding bins (segregated into different compartments), Engage approved refuse handling agents for the various waste types emanating from the building, Carry out an annual waste audit to determine quantities and characterization of wastes and hence mode of disposal, Identify hazardous wastes for specialized disposal.	Care Taker or Property Manager	Facilities and mechanisms to be in place upon commissioning	
	Decommissioning	Ensure safe disposal of the waste generated during the decommissioning process, Everything be done in accordance to the decommissioning audit.	Proponent	> 50 years	No cost estimates
Road Safety	Construction and Occupation stages	Enforce speed limits for construction vehicles during construction,	Contractor	Initiate action upon commissioning of	Number of reported cases,

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
		Design a separate vehicle entry different from the common entrance with the residents, Streamline traffic flow into and out of the premises, Initiate changes in traffic flow in the micro-area upon commissioning, Install appropriate cautionary signage for motorists entering the premises.		works and a transition onto operation of the building	Complaints from the residents, Inconveniences from visiting motorists. No cost estimates
Loss of Vegetative Cover	Construction and Occupation	Rehabilitate sites used for construction	Contractor	To be accomplished within the commissioning period	Vegetation cover on all open spaces.
Inappropriate disposal of waste	Construction and operations	Proper design and construction of on-site treatment and disposal systems – septic tanks, VIP toilets. Trash processing to be managed with proper on-site incinerator for burnable trash; system of triple rinse, puncture and return-to-supplier for chemical containers; fenced off trash bit for organic wastes	Design and Supervising Engineer & Contractors. Ministry of Energy in operation phase	Continuous throughout the construction & operations phases	Observations on trash & operational status of sewerage treatment & disposal systems.
	Construction and operations	Contamination of water sources by oils, fuels and vehicle chemicals can be mitigated through proper design and construction of on-site treatment and disposal systems – spent-oil, used parts, tyres to be collected & off-site disposal, proper fuel depot;	Design and Supervising Engineer & Contractors. Ministry of Energy in operation phase	Continuous throughout the construction & operations phases	Observations on trash & operational status of vehicle garages and parking areas.

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Waste Generation	Construction and operations	- Identification (through consultation) of suitable landfill sites; and - Disposal of solid waste and building debris in an appropriate manner - Ensure best practice with regard to waste disposal	Ministry of Energy Contractor	Continuous during construction and operations	Disposal of waste by a licensed waste handler Internal cost
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Risks of leaks or spills	Construction	Regular maintenance of site equipment Investigate the possibility of catalytic convertors Safety procedures for fuel storage and re-fuelling Dispose of oil residues carefully		Throughout construction	Spot checks by the proponent Internal cost
Risk of Fire	Construction and Operation	Provision of fire safety system that includes training, fire fighting equipment; Regular maintenance of machinery, vehicles and equipment; and No burning activities to be allowed close to or within the site.	Contractor Ministry of Energy	Throughout construction and operations	Internal cost Internal cost Spot checks by Proponent

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Exposure to physical hazards	Construction and Operation	Ensure all equipment is inspected prior to use	Ministry of Energy Contractor	Continuous	Internal cost
Trips and Falls hazards	Construction and operation	Provide fall protection measures to all workers on site	Contractor Ministry of Energy (OHS Officer)	Continuous	Incidences and accidents record book Internal cost
Risk of traffic accidents	Construction	Ensure appropriate road safety signage Ensure all drivers adhere to the traffic laws and requirements Erection of bumps where human and vehicular traffic have high interaction opportunities	Ministry of Energy	Continuous	Internal cost
Spread of HIV/AIDS	Construction	Review activities of Dam construction to integrate with HIV/AIDS campaigns Develop appropriate training and awareness materials for IEC on HIV/AIDS Identify other players (CBOs, NGOs etc) on HIV/AIDS for enhanced collaboration Integrate monitoring of HIV/AIDS proactive activities	Ministry of Energy Ministry of Health NGOs CBOs	Continuous	Internal cost as part of CSR policy

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Impact on access roads		Traffic to abide by speed limits and local by-laws Movement of heavy construction traffic to be planned appropriately	Contractor	Continuous	Internal Cost
Impact of camp sites on the environment		Exhaust and rehabilitate one material site before opening another section Exhausted quarries and borrow puts be isolated, protected and rehabilitated Ensure controlled spoil dumping	Contractor	Continuous	Internal Cost
Exposure to high electromagnetic fields and high current carrying wires	Operation	Ensure controlled access to the electricity power lines Enforce way leave requirements for power lines	Ministry of Energy Ministry of Energy KLPC	Continuous	Minimal
Compensation and relocation of project affected persons	Operation	Make the respective land acquisition and easements contracts with each land owner prior to the start of the project	Ministry of Energy	Continuous	Use Government compensation rates
Cultural diffusion	Operation	Facilitate promotion of cultural preservation	Ministry of Energy	Continuous	Minimal - as part of CSR Policy
Impact of power transmission lines on migratory fauna	Construction	Selection of right of way that avoids sensitive habitats Use of common corridors to minimise impacts on undisturbed areas	Ministry of Energy Contractor	Continuous	Visit to the site by an ecologist immediately prior to construction to confirm the presence of migratory species

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Terrestrial habitat alteration and disruption	Construction	Installation of transmission lines above existing vegetation Re-vegetation of disturbed areas with native plant species Removal of invasive plant species during routine vegetation maintenance	Contractor	Continuous	Minimal
Impact on public health as a result of EMF radiation	Operation	Evaluate potential exposure to the public against the ICNIRP reference levels	Proponent	Continuous	Internal – as part of annual environmental audit
Avian and bat collisions/electrocutions	Operation	Cover energised parts and hardware Install visibility enhancement objects Maintain a 1.5 m spacing between energised components and grounded hardware	Proponent	Continuous	Minimal
RoW maintenance	Operation	Schedule maintenance to avoid breeding and nesting seasons Avoid clearing in riparian areas Avoid use of machinery in the vicinity of watercourses Observe manufacturer machinery and equipment guidelines	Proponent	Continuous	Minimal

Recommendations

The benefits related with this project, mainly the security of energy supply in the Country, supersede the negative impacts and hence the justification for the transmission line and associated infrastructure. Rigorous implementation of the Environmental Management Plan (EMP) will facilitate the mitigation or prevention of potentially adverse environmental impacts.

Diligence on the part of the contractor and proper supervision by the project proponent will be crucial for ensuring success of the EMP and for ensuring that the recommended measures are implemented throughout the design, construction and operational phases to avert any negative impacts.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place and the importance of this Dam, the development of this project is considered strategic and beneficial and should therefore be allowed to proceed.

A summary of the recommendations for the prevention and mitigation of potentially adverse environmental and socio-economic impacts are stated below:

(i) Ensure the sentiments expressed by the community under this report are integrated in the implemented plan of the project, especially where aspects of social interest are concerned;
(ii) Institute effective communication, education and awareness towards the project beneficiaries for enhanced acceptability and social harmony;
(iii) Ensure proper design and construction methods in relation to borrow pits, roads and excavations during construction;
(iv) The Proponent should rehabilitate all sites that are may be used for construction activities such as camps, sites for storage materials and any paths, tracks that may be established during the construction phase;
(v) The Proponent should ensure the selection of right of way that avoids sensitive habitats;
(vi) Use of common corridors to minimize impacts on undisturbed areas;
(vii) Minimal clearing and disruption to riparian vegetation;
(viii) No uncontrolled burning to be carried out;
(ix) Regular maintenance of site equipment and machinery to detect and control leaks;
(x) The transmission lines should be installed above existing vegetation to avoid land clearing;
(xi) Any disturbed areas should be re-vegetated with native plant species;
(xii) Movement of heavy construction traffic should be planned appropriately;
(xiii) Provide PPE for workers and safety warnings for the public during construction;
(xiv) Ensure strict access controls to the electricity power lines once operational;
(xv) Enforce way leave requirements for the power lines;
(xvi) Only allow trained and certified workers to install, maintain and repair electrical equipment;
(xvii) Ensure that structures are tested for integrity prior to commencing work;

(xviii) Evaluate potential exposure to the public against the reference levels developed by ICNIRP;

(xix) The Proponent should make the respective land acquisition and easements contacts with reach land owner before the project can start; and

(xx) Consultations should be held with regulatory air traffic authorities prior to installation.

CHAPTER 1: INTRODUCTION

1.1 Background

The Study to electrify Tana River, Lamu and Malindi districts was completed in 1995 by Fitchner. The Study concluded then that a 132 kV line was required between Kilifi and Garsen. The Study further recommended that it would be necessary to upgrade the 132 kV line by the year 2010 and also upgrade the envisaged 112 Km 33 kV line between Garsen and Lamu to 132kV.

This Project was not implemented as proposed then and it is envisaged that it will now be implemented by the year 2010. Increased power requirements are now envisaged due to the proposed Lamu Port; the proposed sugar factories and other industries to support the vast agriculture production in the Tana Delta and electricity to support tourist hotels in the region.

The Ministry of Energy now intends to commission development of this project and as the Kenya Government Policy on all new projects requires that an environmental impact assessment (EIA) be carried out at the project planning stages Norken (I) Ltd has therefore been contracted by the Ministry of Energy to conduct the environmental and social impact assessment (ESIA), as per the TOR that were developed (Annex 1). The objective of this assignment is to ensure that the potentially adverse environmental and social impacts can be minimized and the positive impacts enhanced.

1.2 The Proponent

The Proponent goes by the name of the Ministry of Energy and the registered office and contact addresses of the Proponent are:

Nyayo House
Kenyatta Avenue
P.O. Box 30582-00100,
Nairobi, Kenya.

1.3 Project Objectives

The proposed project seeks to meet the following objectives:

(i) Cater for the envisaged increased power requirement due the proposed Lamu port, the proposed sugar factories in the area as well as other industries;
(ii) Support the vast agricultural production in the Tana River Delta and electricity to support tourist hotels in the region;
(iii) Reduce transmission loses by replacing the existing 33KV lines with a 220KV between Kilifi and Malindi; and
(iv) Replace the existing expensive diesel generators at the load centres of Garsen, Lamu as well as other load centres in Lamu and Tana District.

1.4 Project Justification

The project area suffers from the lack of a sufficient and reliable electricity supply and this problem has a variety of aspects:

i. An overwhelming part of the project area is not supplied with electricity at all. This means that electricity is not used for purposes for which it is generally expected to be available and would be used in the case of an adequate power supply. This has significant impacts on small-scale industrial and commercial sector as electricity powered equipment cannot be used, resulting in reduced productivity in these sectors;
ii. In the social sector the lack of electricity leads to a poor quality of public services (e.g., emergency cases in health facilities cannot be treated adequately during night time) and an under-utilization of these services (e.g., no evening classes in schools). For households the unavailability of power is inconvenient in general, and also deprives them of the possibility of carrying out productive activities. It has also been noted that only a very small part of the business community can afford their own generation facilities to offset the lack of grid supply;
iii. The isolated distribution network of Lamu suffers from a lack of generation capacity meaning that not all consumers connected can be supplied with the required quantity of electricity. It is important to note that the present systems allow only limited connections of additional consumers so that a number of would be consumers cannot be connected to the isolated network; and
iv. The power supply in Malindi, which is only part of the project area supplied directly from the interconnected grid, is insufficient and unreliable. Power supply is quite often interrupted and consumers also suffer from voltage fluctuations. It is also not sufficient to satisfy the demand of Malindi/Gede up to the year 2010.

This project has therefore been recognized as a rural electrification project (REP) and is intended to satisfy the demand of electrical power and energy in Malindi, Garsen, Witu, Mpeketoni, Mokowe, and Lamu respectively. The proposed project will replace many other privately operated small diesel power stations which are extremely expensive to run.

1.5 Project Alternatives

The consideration of alternatives is one of the more proactive sides of environmental assessment. This process serves to enhance the project design through an examination of

the potential options instead of only focusing on the more defensive task of reducing adverse impacts of a single design. This calls for the comparison of feasible alternatives for the proposed project site, technology, and/or operational alternatives.

The proposed route was selected after a review of 1:50000 topographical maps of the transmission line routes, and major distribution and proposed locations of substations, site visits and discussions with various stakeholders to form a basic idea of the land use activities prevailing in the project areas along the transmission and distribution routes.

Under the *No Action Alternative*, the transmission line and substations at Malindi, Garsen, and Lamu would not be constructed. The resultant socio-economic benefits that would be created by the proposed development would be foregone and the anticipated impacts resulting from construction, and operation of the development, such as the development of new industries and job opportunities, would not occur.

The original line route proposed (Annex IV) had to be changed because of the impact it would have posed to the environment by traversing environmentally sensitive areas as well as built up and highly settled market centers. The impact on the environment has therefore been minimized as a result of rerouting the original route. After the review of proposed line route and the first field visit the EIA team established there was a need to consider as an option an alternative route which will pose fewer impacts in terms land acquisition and resettlement (Annex V).

To that end, the proposed route considered within this report avoids the settlements and highly populated areas found mainly along the Mombasa to Kilifi Road and also avoids Arabuko Sokoke forest, which is one of the last remnant indigenous forest in Kenya. The adoption of this route requires that the proposed 220/33kV sub station at Malindi be located approximately 15km from the outskirts of Malindi town. In the proposed route, the section near Witu town will also be re-routed and pass along the outskirts of the town as the original route cut right through the Town Centre, and would have resulted in the demolition of various buildings. It was also established that locating a sub-station on Lamu Island would pose a lot of challenges during the construction phase, especially in terms of ferrying the construction material to the island. Therefore, an alternative substation location was selected on the mainland near the town of Hindu.

Mitigation measures, including best construction management practices, have been recommended in sections 6 and 7 of this report, and when diligently implemented will help to protect the physical, ecological and socio-economic environment of the project area. The Proponent will undertake to incorporate all necessary measures to ensure adverse impacts are mitigated to the maximum extent practicable during construction, operation and decommissioning of the proposed development.

1.6 Study Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the EIA regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site and the

surrounding areas, public consultation (which included discussions with local administration and the community), photography, as well as discussions with the Proponent.

The key activities undertaken during the assessment were as follows:

i. Consultations with the Proponent and regarding the proposed project details, the site planning and implementation plan;
ii. Thorough physical inspections of the proposed site, photography, and interviews with the local community;
iii. Evaluation of the activities around the site and the environmental setting of the wider area through physical observations as well as from existing information in literature;
iv. Review of available documentation; and
v. Reporting, review and submissions.

Below is a typical outline of the basic EIA steps that were followed during this assessment:

Step 1: Environmental Screening

This is the first stage when the proposed project was evaluated guided by EMCA, 1999. In screening we try to confirm whether or not a particular project falls within a category that requires an EIA prior to commencement. Electrical infrastructure, including transmission lines, is listed under schedule 2 of EMCA, 1999 among projects requiring an EIA.

In addition, other considerations during the screening process included physical site location, environmental sensitivity of the areas surrounding the proposed site, nature of community and social activities in the area.

Step 2: Environmental Scoping

Scoping, a result of a preliminary physical assessment of the site and its surroundings, helps to narrow down to the most critical environmental and social issues requiring attention for detailed evaluation.

The Scoping process involved discussions with the Proponent at the proposal stage, review of available documents and implementation plans, and a rapid assessment of the site and the surrounding areas. Consultations were also carried out during which time the communities were interviewed to capture their opinion regarding the proposed project. The scoping exercise concluded with a development of the Terms of Reference (TOR) for the assignment which were submitted to the National Environment Management Authority (NEMA) for approval.

Step 3: Desk Study

Documentation review is a continuous exercise that involves a review of available documents on the project, including approved plans/designs, project plans and designs, environmental legislation and regulations, etc. The review provided an understanding of the terms of reference, environmental and social status, demographic trends, land use practices, development strategies and plans as well as the policy and legal documents.

Step 4: Field Assessment

With the background obtained from preliminary visits, discussions and documentation, the proposed project site was comprehensively evaluated and the administration and community interviewed. The proposed development was evaluated with a view to establish the physical environment status, social and economic trends. The field assessment was also designed to establish potential positive and negative impacts through interviews, discussions and physical observation.

Step 5: Baseline Conditions

Physical inspections and observations constitute the exercise for collecting baseline information.

Step 6: Consultations

The involvement of the public and the relevant authorities is an integral part of the Environmental Impact Assessment because public input helps to ensure that important social issues are not overlooked. To that end, the team held structured and comprehensive consultations with Interested and Affected Parties (IAPs) likely to be affected by the project in order to:

i. Understand their perceived view of the project; and
ii. Assess the extent to which their views needed to be taken into account specifically with regard to the implementation of the project.

To that end, the followings steps were carried out:

1) A detailed desk study to establish and describe the environmental and socio-economic conditions within Kaloleni, Kilifi, Malindi, Garsen and Lamu Districts. This secondary information was obtained from District Development Plans and Poverty Reduction Strategy Papers. Most of these plans were for the years 2002-2008 but in some cases only documents from earlier years were available (e.g. from Tana River District). For the new districts such as Kaloleni and Garsen information from the parental district documents apply;
2) Focus group discussions (FGDs) were conducted with men, women and the youth, the composition of the groups were determined after consultation with the local Chiefs and Assistant Chiefs of the areas;
3) Key Informant Interviews and Semi-Structured Interviews were conducted with the District Officers (DOs), Chiefs, Assistant Chiefs, Councilors and Village Elders;
4) Open-ended questionnaires were administered to obtain views about the proposed project and its perceived impacts from households along the proposed transmission line. The households were picked at random within a kilometer from the proposed way leave and also on whose homestead the 40 metre way leave would pass. For those households which were on the proposed transmission line and not reachable to be interviewed, the Chiefs and Assistant Chiefs gave the team an estimated number of households, names and the villages;
5) Public *Barazas* which were organized by the DOs and Chiefs; and
6) Transect walks were also done to confirm the information from the discussions and observations were made on physical and environmental conditions.

A check list of the information to collect from each category of the persons to be interviewed guided the collection of data throughout the field exercise. The data was analyzed manually, both at the field work stage as it was collected and at the end of the

field work (Annex VI is the set of socio-economic data collection tools used for the field exercise).

Step 7: Reporting

Compilation of this report has been undertaken by the Team Leader (Lead EIA Expert) and the assisting Environmental Expert. In addition to documentation of the anticipated impacts and appropriate mitigation measures, an Environmental Management and Monitoring Plan has also been established.

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1.7 Scope of the Study

This environmental and social impact assessment (ESIA) study has been designed in accordance with the terms of reference to address the following issues:

i. To identify and assess all potential environmental and social impacts of the proposed project;

ii. To identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;

iii. To verify compliance with the environmental regulation and industry standards;

iv. To identify problems (non-conformity) and recommend measures to improve the existing management system;

v. To assess compliance with Company's corporate environmental policy requirements;

vi. To prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Coordination Act (1999) and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

CHAPTER 2: PROJECT CONCEPTUAL DESIGN

2.1 Project Description

The Fitchner Study to electrify Tana River, Lamu and Malindi Districts proposed that that a 132 kV line was required between Kilifi and Garsen. The Study further recommended that it would be necessary to upgrade the 132 kV line by the year 2010 and also upgrade the envisaged 112 Km 33 kV line between Garsen and Lamu to 132kV. Initially, the project was intended to serve Malindi, Garsen, Lamu, Hola, Bura and Garissa and was spilt into the following two phases:

i. Rabai-Malindi-Garsen 220kV transmission line, Garsen – Lamu 132 kV transmission line, associated substation and bay; and
ii. Garsen – Garissa 132 kV transmission line and associates sub-stations.

However, the components of the project that are the focus of this ESIA study include:

i. 96 km of a 220 kV single circuit line from Rabai to Malindi and a 220kV bay at Rabai and 220/ 33kV substation at Malindi;
ii. 116 km of a 220kV single circuit line from Malindi to Garsen and a 220/132/33 kV substation at Garsen and;
iii. 108 km of 132 kV line to Lamu and 132/33 kV substation at Lamu.

These lines will be owned by the Government of Kenya through the Kenya Electricity Transmission Company (KETRACO) and will be operated and maintained by the Kenya Power and Lighting Company (KPLC).

2.2 Proposed Substations

2.2.1 Rabai Outgoing Bay

At the existing Rabai 220kV substation, the proponent intends to establish one 220kV bay to control the 220 kV transmission line to the proposed Malindi 220/33kV substation.

2.2.2 Malindi Substation

The Proponent intends to establish a new 23MVA 220/33kV substation at Malindi, which will include a 220kV switchyard and one 220/33kV 23 MVA power transformer and one set of 22kV Metal-Clad Type Metal_enclosed Switchgear. The Proponent will also establish one 220kV bay to control the Malindi – Garsen 220kV transmission line.

2.2.3 Garsen Substation

The Proponent will establish a new 220/132/33kV substation at Garsen equipped with one 220/132/33kV 40 MVA power transformer and one set of 33kV Metal-Clad Type Metal-Ecnclosed Switchgear. Two 132kV bays will be established to control the Garsen – Lamu and the Garsen-Garissa 132 kV transmission lines.

2.2.4 Lamu Substation

The Proponent intends to establish a new 132/33kV substation at Lamu which will include a 132kV switchyard and one 132/33kV 7.5MVA power transformer and one set of 33kV Metal-Clad Type Metal-Enclosed Switchgear.

Further details with regard to the project conceptual design are appended in Annex III (Proposed System Conditions).

2.3 Proposed Transmission Line Route

The following sections list the coordinates that the proposed transmission line follows and provide a sectional description. *Photos of the proposed route are provided in Annex II and detailed maps in Annex V.*

2.3.1 Rabai to Garsen

Table 1: Proposed coordinates from Rabai –-Garsen

Point	Northing	Easting
Rabai sub station	**9,565,552**	**562,144**
A1	9,570,970	559,109
A2	9,575,800	556,755
A3	9,581,300	554,400
A4	9,583,500	552,500
A5	9,588,300	550,300
A6	9,591,200	548,300
A7	9,593,900	548,500
A8	9,596,800	550,000
A9	9,599,400	551,400
A10	9,603,100	553,300
A11	9,606,800	555,150
A12	9,609,000	556,800
A13	9,611,500	559,060
A14	9,615,058	562,024
A15	9,619,643	564,926
A16	9,623,582	567,469
A17	9,628,656	571,887
A18	9,635,486	574,228
A19	9,640,159	575,928
A20	9,644,552	580,454
A21	9,649,248	595,176
A22	9,646,374	603,224
A23	9,645,366	605,343
Malindi-Garsen section		
Malindi sub station	9,645,435	608,683
B1	9,649,550	611,185
B2	9,654,588	611,761
B3	9,658,600	612,300
B4	9,661,450	617,350
B5	9,664,200	622,150
B6	9,666,500	626,000
B7	9,669,100	626,180
B8	9,672,500	625,800
B9	9,675,400	625,700
B10	9,678,500	626,300
B11	9,680,900	626,070
B12	9,684,239	626,439
B13	9,712,108	626,054
B14	9,720,396	623,974
B15	9,742,300	624,037

B16	9,744,700	622,132
Garsen sub station	**9,746,037**	**622,055**

From Rabai substation the proposed line takes a North East direction crossing Kayonida river near Boyani parallel to an existing 220kv transmission line from Kamburu to Rabai. The line parts with the existing 220kv approximately 5km from Mariakani town passing through Munyenzeni to Bongo. From Bongo it takes North-Easterly direction following the road through Bamba Town to Kwa Dadu Centre. The topography from Rabai to Bamba Centre is relatively flat with scattered rock outcrops in some areas, sandy soil, scattered settlements with coconuts as the main crops. From Bamba to Kwa Dadu the terrain is gently rolling with scattered trees and thick bushes (woodlands), sandy loam soils with little or no settlements visible. The area is accessible through various tracks and roads up to Kwa Dadu.

The proposed transmission line thereafter takes an easterly direction along the road passing half a kilometer from Kirashini centre and turning South East slightly before reaching Kakoneni centre passing through Jilore and thereafter turning east to the Malindi substation. From Kwa Dadu to Malindi substation the topography is relatively flat with red loamy soil, scattered farmland with mangoes and few people. The Malindi substation is located along Malindi-Ganda-Bamba road which is well maintained gravel road by Kenya Wildlife Service as it links Malindi Town with Tsavo East National park through Sara Gate. The site falls in a land belonging to Kakuyuni secondary and some private land with mangoes.

From Malindi substation, the line takes a northern direction crossing undulating hills and subsequently the River Tana at a right angle, thereafter turning North East at Pumwani Centre connecting Malindi-Garsen road approximately 1.5 Km past Gongoni centre. The area from Malindi substation has undulating hills with red loam soils and thick bushes with very few people. The line follows the Malindi-Garsen Road through Fundisa, Marereni and Kitangale to Tulu where the Garsen substation is located. From Marereni to proposed Garsen substation, the area is bushy with thorny trees, sandy soil and a scattered population. The proposed Garsen substation will be located on the left of Malindi-Garsen road, an area with thorn trees and thick bushes that is ideal location for acquiring 50 acres for future expansion.

2.3.2 Garsen to Lamu

Point	**Northing**	**Easting**
Garsen sub station	**9,746,037**	**622,055**
Garsen to Lamu Section		
C1	9,746,200	624,500
C2	9,749,200	629,045
C3	9,749,500	635,536
C4	9,746,500	645,900
C5	9,738,500	651,900
C6	9,736,600	655,800
C7	9,735,148	661,839
C8	9,736,800	669,700
C9	9,737,600	670,500
C10	9,739,700	673,900

C11	9,745,100	687,300
C12	9,751,800	687,800
C13	9,756,600	689,000
Lamu sub station	**9,757,108**	**698,206**

The proposed 132Kv line starts from the proposed Garsen substation following a North-Eastly direction crossing River Tana then Eastwards parallel to Garsen-Lamu road, passing half a kilometer right of Witu town before taking a North-Easterly direction to Mkunumbi. From Mkunumbi, the line follows a northerly direction before crossing Milhoi causeway and turning East at Hindi centre then crossing North West of Mukowe jetty to Lamu Island. From Garsen the area is generally flat with thorny trees and bushes mainly inhabited by pastrolists, with large stretches of doum palms. From Witu centre, the main vegetation type lowland rain forest occurs around Witu area. The main trees are *chlorophora excelsa*, *terminalia kilimsharica*, *tecleopasis glandulosa*, *brachylaena hutchinsii* and *manilkara sansibarensis*. This forest stretches to lowland moist sanvanna which stretches all the way to Lamu. The area also has large numbers of coconut trees and scattered farmland which stretches all the way to Lamu Island. The soil varies from sandy in Garsen to Witu centre to sandy clay from Witu to Mokowe Jetty. Mangrove forest is found in Mokowe near the mainland jetty and the forest extends from Hongwe in the south to a few kilometers south of Kiunga headquarters.

The location of the proposed Lamu substation is in area with sandy soils, plenty of doum palms and sparse population near Hindu town. Accessibility is through Garsen-Lamu road which is in good condition.

2.4 Project Implementation Schedule

The Project comprises of feasibility studies of the Rabai, Malindi, Garsen, Lamu and Garissa power transmission project comprised of reviews of: transmission system; metering system; previous studies and data collection; and the load forecast. Transmission system planning and an economic and financial analysis was also carried out, as well as cost estimates and justification and the establishment of ranking and performance targets. This was followed by the environmental scoping study. Thereafter the design and tender documents will be finalized and the work commence.

2.5 Project Inputs

2.5.1 Land

All construction activities will take place within the existing sites.

2.5.2 Buildings, Sheds, Offices.

The Contractor will construct his temporary buildings, warehouses, storage facilities and spoils near the works during the construction period.

2.5.3 Public and Worker Access

The Contractor will maintain all access to the sites and provide temporary screens, fencing, hoardings, fans, planking footways, as may be necessary for protecting the public and others.

2.5.4 Sanitary Provision

The Contractor will provide and maintain sanitary facilities for labour to the requirements of the Government.

2.5.5 Toilets/Latrines

The Contractor will agree with the civil works supervisor the siting of toilets before construction. They will be constructed of a minimum standard of enclosed walls and roofs of corrugated metal sheeting.

2.5.6 Utilities.

The Contractor will connect the following temporary services at the site:

- **Telephones:** The Contractor will provide a telephone in the site office for the joint use of the Contractor and the engineer;
- **Water Supply:** The Contractor will provide clean, fresh water for the works; and
- **Lighting and power:** The Contractor provides a supply of electricity and all equipment for lighting and power for distributing about the site.

2.5.7 Labour Supply

It is estimated that the total number of people will be 250 and will consist of the Contractor's employees both skilled and unskilled.

2.5.8 Raw Material Handling and Transport

Construction input material will include gravel, rock, cement, sand, ballast, structural steel, reinforced steel, paint, timber, fuel and lubricants. Consumable materials will include lubricants, greases, chemicals, reagents, resins and others. Construction material will be brought into the site using earth moving equipment, dump trucks from stockpile of shell zone material and filter material.

2.6 Project Cost

The estimated cost of the project is **US$ 90,942,872.22** *(Read as US Dollars Ninety Million, Nine Hundred and Forty Two Thousand, Eight Hundred and Seventy Two, Twenty Two Cents)* and summary breakdown of the costs is presented below:

Table 2: Project Cost

Item	Description	Cost (USD)
1	Outgoing Bay of Existing Rabai substation	1,449,752.46
	Engineering and Supervision (12%)	173,970.29
	Contingency (10%)	144,975.25
2	Malindi 220/33 kV substation	6,543,677.34
	Engineering and Supervision (12%)	785,241.28

	Contingency (10%)	654,367.73
3	Garsen 220/132/33 KV substation	8,482,309.89
	Engineering and Supervision (12%)	1,017,877.19
	Contingency (10%)	848,230.99
4	Lamu 132/33 KV Substation	3,203,633.61
	Engineering and Supervision (12%)	384,436.03
	Contingency (10%)	320,363.36
5	**Subtotal Amount 1+2+3+4**	**24,008,835.42**
Section 1	Rabai to Malindi Transmission Line (T/L)	12,561,108.86
	Engineering and Supervision (12%)	1,507,882.46
	Contingency (12%)	15,575,768.79
Section II	Malindi to Garsen Transmission Line	15,207,868.92
	Engineering and Supervision (12%)	1,824,944.27
	Contingency (15%)	2,281,180.34
Section III	Marsh land line from Garsen – Lamu T/L	16,916,124.39
	Engineering and Supervision (15%)	2,527,418.66
	Contingency (20%)	3,383,224.88
Section IV	Normal line from Garsen – Lamu T/L	7,137,601.99
	Engineering and Supervision (12%)	856,512.24
	Contingency (17%)	1,213,892.34
Section V	Subtotal of construction of T/L	51,822,699.16
	Subtotal of engineering and supervision of T/L	6,726,207.63
	Subtotal of contingency	8,385,130.02
Section VI	**Total amount Section I+II+III+IV**	**66,943,036.80**
ITEM	**GRAND TOTAL AMOUNT**	**90,942,872.22**

2.7 Material Sites

All material site identified are on private land and their utilization would be subject to contractual agreements with the land owners. Materials including cement, fuel and metal bars will be sourced from bonafide suppliers in Nairobi and other places.

CHAPTER 3: BASELINE CONDITIONS

3.1 Geographical Location

The proposed development comprises: 96 km of a 220 kV single circuit line from Rabai to Malindi, including a 220kV bay at Rabai and 220/ 33kV substation at Malindi; 116 km of a 220kV single circuit line from Malindi to Garsen and a 220/132/33 kV substation at Garsen; as well as a 108 km 132 kV line to Lamu and 132/33 kV substation at Lamu. The proposed transmission line therefore passes through the Coastal Province of Kenya within the following five Districts: Kilifi, Malindi, Tana River, Tana Delta and Lamu.

3.1.1 Coast Province

The Kenyan Coast Province runs in a south-westerly direction from the Somalian border in the north, at 1° 41'S to 4° 40'S at the border with Tanzania. It lies in the hot tropical region where the weather is influenced by the great monsoon winds of the Indian Ocean.

3.1.2 Kilifi

Kilifi District borders Kwale and Mombasa District to the south, Malindi and Tana River Districts to the north, as well as Taita Taveta District to the west. Kilifi covers an area 4,779.2 Km², which includes the Arabuko Sokoke Forest, approximately 189 Km².

3.1.3 Malindi

Malindi District covers an area of 7,750.5 Km². The District was carved out of the larger Kilifi District. A further division in 2007 created Kinango and Msambweni Districts respectively. Malindi borders Tana River to the north, Kilifi to the south, Tsavo East National Park in Taita Taveta District to the west and the Indian Ocean to the east.

3.1.4 Tana River

The greater Tana River District is in Coast Province and was recently divided into two Districts: Tana River and Tana Delta. Tana River borders Mutomo District to the West, Mwingi District to the Northwest, Garissa and Fafi Districts to the North East, Ijara District to the East, Garbatulla District to the North and Tana Delta District to the South. The district lies between latitudes 000’53” and 200’41’’ South and longitudes 38025’43” and 40010’29” East.

3.1.5 Lamu

The District borders the Indian Ocean to the east, Tana River District to the south west, Ijara District to the north and the Republic of Somalia to the north east. Lamu District lies between latitude 1º 40’S and 2º 30’ and longitude 40º 15’ E and 41º 38E. It covers an area of 6, 814km² and is divided into 7 administrative Divisions.

3.2 Site Ownership and Status

The proposed transmission line passes through a variety of land uses, including densely populated settlements.

3.3 Land Use

3.3.1 Kilifi

Kilifi has diverse Agricultural potential ranging from high to medium and low and the highest potential area spreads from along the coastal uplands and low coastal plains, while medium the potential area stretches along the coastal plain up to the Arabuko Sokoke forest. The lower potential area is mainly found in Bamba Division.

3.3.2 Malindi

Livestock farming and mixed farming is practiced in this District. Mixed farming is the main livelihood of the District although more than half of the District area is under ranching.

3.3.3 Tana River

The District is divided into the following livelihood zones:

- Pastoral, which covers most parts of Garsen, Galore, Bura and Bangale and accounts for 13.7% of total population;
- Marginal mixed farming that is located along the riverline of the Tana River in Wenje, Madogo and parts of Bura, Galore and Bangale Divisions. This land use accounts for 49.4% of the total population; and
- Mixed farming which is located to the south and covers parts of Garsen, Kipini and Tarasaa Divisions and account for 36.9% of total population.

3.3.4 Lamu

The District has a total agricultural land of 5517km². The area available for farming is 600 km² of which 200km² are under cultivation. The District also has 777km² under forest reserves and the main forest types are: the lowland rainforest found in Witu; low and dry forest found in Lungi and Boni areas; and the mangrove found in swamps along the coastal line.

3.4 Physical Environment

The sub-sections below provide brief descriptions of the environmental features in each of the Districts within which the proposed transmission line passes:

3.4.1 Physiographic and Natural Conditions

Kilifi

Kilifi District has four major topographical features: a narrow belt which forms the coastal plain and varies in width of 3km to 20km, the foot plateau, coastal uplands and the Nyika Plateau. The proposed project line route within the District has a relatively flat relief.

Malindi

The district has four major topographical features which are: the coastal plain, the foot plateau, the coastal range, and the Nyika plateau. There are two major physical features in the district: the Indian Ocean and the Sabaki River.

Tana River

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

Lamu District

Lamu is generally a flat District except for a few places where sand dunes occur and the highest point hardly exceeds 50m above sea level. The District is divided into five terrain types: the Tana delta; the coastal plain; the island plain; Dodori river plain; and the sand dune system. It is composed of a chain of islands.

3.4.2 Geology and Soils

Kilifi

The District soils are underlain by shales of the Jurassic age. The shales are covered by unconsolidated sediments of Pleitocene age, the Magarini Formation. This superficial cover of Magarini Sediments includes alternating layers of silty sand, clayey silt and silty clay that together vary in thickness from a few metres to up to a maximum of 15m. The proposed transmission line area has white sandy soil, arenosols, which are excessively drained to well drained, very deep, reddish yellow to white, loose sand to loamy sand.

Malindi

The soil type within the District is composed of well drained, very deep, yellowish red, very friable, fine sandy loam to fine sandy clay loam.

Tana River

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

Lamu

The principal soil type in the region includes a narrow strip of coastal sands towards the north where it is permeated by narrow bands of brown clay soils. The soil south of Lamu is composed of bialternate bands of loams beyond which the grumosolis are permeated by thick bands of ash and pumice soils.

3.4.3 Climatic Conditions

Climate and weather systems on the Kenyan coast are dominated by the large scale pressure systems of the western Indian Ocean and the two distinct monsoon periods.

Kilifi

The climate of the District is monsoon type of climate. It is hot and dry from January to April while June to August is the coolest period of the year. Rainfall is bimodal with the longest rains usually starting from March/April and continuing until July, while the short rains occur in November and December. Annual precipitation varies from 900-1500mm per annum along the coast to 500-600mm per annum in the hinterland.

Average annual temperatures range from highs of 26.5°C to 34°C to lows of 22.5°C to 24.5°C with an average of 30°C and relative humidity of 60%.Kilifi district can be divided into 5 agro-ecological zones between L3 to L6.

Malindi

The District has a monsoon type of climate with hot and humid conditions all year round. It is hot and dry from January to April while June to August is the coolest period. Average annual temperatures range from 22.3ºC to 26.6ºC in the coastal lowlands, while the hinterland temperatures range from 30ºC to 34ºC. Average temperature ranges from 21ºC in July to 24ºC in August.

The rainfall pattern has two distinct seasons: the long rains which occur between the months of March of June, with 60% reliability; and the short rains which start towards the end of October and last until December or January. The mean annual rainfall is about 1,100mm, with the months of May and June recording the heaviest rains. The month of May has the highest precipitation with a mean monthly rainfall of about 375.44 mm, although these long rains decrease gradually after May.

Tana River

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

Lamu

The district has a bimodal pattern of rainfall with the long rains occurring in April to June and the short rains occurring between November and December. The wettest months are May-June while the driest are January to March and August to October. The district has three rainfall zones: below 540mm (Arid) along northern border; 550mm (semi arid) in middle region covering Amu division and the islands; 850-1100mm (sub humid) covering Witu and Mpeketoni divisions. Temperatures throughout the district are usually high ranging from 23ºC - 30ºC. The hottest months are December to April, while the coolest are May to July.

3.4.4 Biological Diversity

Kilifi and Malindi

The natural vegetation found in the District is mainly grassland, stunted vegetations and mangrove forests growing in the shallow swampy areas along the creeks. The Arabuko Sokoke forest is also found within the district which has suitable varieties of trees.

Tana River
The Tana River basin is characterized by high diversity of habitat types including riverine forests, grasslands, woodlands, bush lands, lakes, open river channels, sand dunes, mangroves and coastal waters among others. This high diversity of habitat types is associated with correspondingly high biological diversity of both flora and fauna.

The Tana basin sustains large numbers of mammals, birds, reptiles, fish, amphibians, insects and galleries of riverine forests. The river floodplains and their associated mosaics of riverine forest patches is particularly important as a habitat for threatened and endangered species like the Tana River Red Columbus, Tana River Crested Mangabey, elephant, fish and plants. The riverine wetlands are also important ecosystem that act as a staging, resting, nesting and feeding ground for resident and migratory water birds.

Lamu
The District is rich in biodiversity and has 777km² under forest reserve. The main forest types are lowland rain forest found Witu, low and dry forest found in Lungi and Boni areas and the mangrove found in swamps along the coastal line. The most utilized forest is the mangrove forest. The indigenous forests on the mainland are: the Witu forest reserve, Lungi forest, Lake Kenyatta Catchment and Boni Forest (although the last three are not gazetted). Wildlife is distributed all over the District with highest concentration being in the conservation areas of Dodori and Boni National reserve. Most of the wildlife species found in the country are represented in the District.

Rare threatened or endangered plant species:
No rare or endangered plant species have been recorded in the project area.

3.5 Social and Economic Issues

As mentioned in the previous sections, the proposed transmission line and associated infrastructure covers a stretch of about 300 kilometers, from Rabai to Hindi, transversing five districts in the coast province of Kenya. The districts are Kaloleni, Kilifi, Malindi, Garsen Delta and Lamu of the 13 districts in Coast Province. These districts are characterized as Semi-Arid Districts mainly with households with low asset levels to provide adequate subsistence needs and with high food vulnerability. Some of the poorest and infrastructure challenged constituencies of Kenya are in these districts. The sub-sections below provide brief descriptions of the social, cultural and economic features observed:

3.5.1 Kilifi District

3.5.1.1 Introduction

Kilifi district is one of the seven districts in Coast Province. The district is divided into seven administrative divisions namely Bahari, Kikambala, Chonyi, Kaloleni, Bamba, Vitengeni and Ganze. The district has 36 locations and 108 sub-locations.

Kilifi district is subdivided into three political constituencies:

- Bahari (comprising Bahari, Chonyi and kikambala divisions);
- Ganze (comprising Ganze, Bamba and Vitengeni divisions); and
- Kaloleni (comprising Kaloleni divisions).

There are three established Local Authorities within the District which include: Kilifi County Council; Mariakani Town Council and Kilifi Town Council. It should also be noted that Kilifi district has been divided into Kilifi and Kaloleni Districts in 2008 but following baseline information is based on the situation within Kilifi District before it was divided into two

3.5.1.2 Economic Activities

The major sources of income within the District include farming (coconut and cashew nuts) as well as horticulture and livestock. Staple foods include maize, cassava and potatoes. The main population densities concentrate along the main road leading from Mombasa to Nairobi and Malindi with a deviation along the road to Kaloleni.

The four development zones are:

- Zone 1: Industrial and Commerce Growth Zone;
- Zone 2: Integrated Growth Zone;
- Zone 3: An Agricultural and Livestock Zone that covers the entire Vitengeni and Ganze Divisions as well as parts of Kaloleni Division. The zone has good rainfall patterns and despite a low population density, there is lack of access to good agricultural land and land ownership issues hamper further rapid development of the area. The proximity to the main Mombasa to Malindi road ensures that agricultural produce can be transported with ease to the potential markets in Mombasa and the tourist hotels along the coast
- Zone 4: This is a Lowland Ranching Zone found mainly within Bamba Division and parts of Kaloleni Division. This zone has low rainfall patterns and a very low population density. The zone has poor natural conditions (i.e. availability of water and other natural factors). Only limited investments have taken place as far as roads and water supply are concerned, hence the area has a poor infrastructure base. The zone is an important livestock production area and this potential needs to be exploited

Note that Zones 3 & 4 are the zones where the proposed transmission line will be passing through.

3.5.1.3 Settlement Patterns

Kilifi district settlement patterns are influenced by the infrastructural network and climate, which determine various agricultural potential zones. High population densities (about 350 persons/km²) are found in Bahari, Kikambala and Kaloleni Divisions along the tarmac roads from Mombasa-Malindi and Mombasa-Nairobi up to Mariakani town. These areas are also well supplied with piped water and electricity. High population clusters are also found in Chonyi division and some parts of Kaloleni division where there are high potentials for agricultural production. Sparsely populated divisions in the district are Ganze, Vitengeni, Bamba and some parts of Kaloleni divisions (between 22-75 persons/km²). These are rangelands and less productive agriculturally.

The 1999 Population and Housing Report indicated that the Kilifi District had a population of 554,305 people comprising 258,507 males and 285,798 females representing 47.5% and 52% of the population respectively. The population was projected to rise to 597,354

people in 2002 and 719,466 people by the end of 2008. The population is generally youthful with 47% being below 15 years of age.

3.5.1.4 Poverty and other Major Development Challenges

Poverty in Kilifi district manifests itself, in the inability by the majority of the people to access basic needs such as food, shelter, clothing, health, water, education, land and good roads due to geographical, economic and social cultural barriers. In 1999 65.35% of the population was food poor and 43.02% hardcore poor (meaning that they could not meet the basic minimum food requirements even after spending all their income on food alone). The highest poverty incidences are found in Zone 3 and 4 where the proposed transmission line is expected to pass through.

Agriculture contributes to 80.6% of the household income in the District. The agriculture and rural development sector employs 142,226 out of the productive labour force of which 80% (113,780 people) are women. They however, do not own nor control the production resources (land, capital), nor post-harvest benefits, neither do they adequately participate in decision making, The result is inequitable resource distribution, which breaks the production reinvestment cycle thus retarding the expected benefits of development

Kilifi district is a high potential area for industrial development, as there exists unexploited local resources. The District Development Committee encourages an integrated approach in planning, budgeting and implementation, however, the majority of the projects are not fully funded and a general observation is that only 20% of the proposals receive funding. The level of funding for the Plan was low though some NGOs, private sector, bilateral and multilateral donors and the community were able to implement some projects. Generally self-help projects particularly in education performed better in terms of targeted achievements as they relied on locally sourced resources.

3.5.1.5 Education and Training

In the area of education, the district had a total of 410 pre-primary schools, 230 primary schools and 30 secondary schools at the close of 1997-2007-plan period. In 1999 the total enrolment in primary schools in the district was 90,036 that is 69% of the age group population of 130,000.The education system showed a tendency of experiencing dropout rate of 8%. The major constraints experienced for school drop out are poverty, ignorance and poor attitude towards education, sheer negligence, and heavy workload for pupils and inadequate facilities

3.5.1.6 Health

About 39% of the population lives more than 5 km from the nearest health facility. For the remaining lot of 61%, 26% access health services through the dispensaries and health facilities. Government health centres and hospital serve only 9% and 8% respectively. This implies that most people in the district rely on lower cadre medical staff for health services provision.

Malaria and pneumonia were the leading morbidity causes in the district in 1999. The prevalence of HIV and AIDS in the district is estimated to be 10% and bed occupancy by affected patients with HIV/AIDS related illnesses in the various institutions is about 50%. Pit latrines coverage remained very low, at 15% in the hinterland and 65% in the coastal

strip and Kaloleni. This explained the high incidences of diarrheal diseases and intestinal worms related diseases.

3.5.1.7 Gender Inequality

Gender disparities in Kilifi district exist in almost all spheres of the social, economic and political life. Gender inequality is among the major causes of poverty in the district and gender issues are deeply rooted in the socio-cultural set up. Plans and designs rarely take into consideration specific needs and interests arising from assigned gender roles and responsibilities.

3.5.1.8 Tourism, Trade and Industry

Women's participation in active economic production is minimal due to the skewed division of labour that sees them having more responsibilities and time demands in both domestic and community activities. Factors exacerbating these disparities in Kilifi district are rooted in various socio-cultural practices such as early/child marriages, traditional practices and ownership/inheritance patterns that increase pressure on scarce natural resources and land especially with relocation of widows and their families.

3.5.2 Malindi District

3.5.2.1 Introduction

Malindi district is one of the seven districts in Coast Province. The district is divided into three divisions namely Malindi, Marafa and Magarini. The district has two constituencies, namely Magarini and Malindi and also two local authorities, namely Malindi Municipal Council and Malindi County Council. Malindi County Council has 11 wards, 3 in Malindi division, 5 in Marafa division and 3 in Magarini division. The wards follow the locational boundaries. Malindi Municipal Council has 12 wards, all in Malindi division. The municipal wards cover Malindi division except 3 locations, which are in the County Council

3.5.2.2 Settlement Patterns

Settlement patterns vary from division to division. Malindi division has the largest number of people as it has all the topographic features (Coastal Plains to Nyika Plateau) and suitable economic factors that encourage human settlement.

In Magarini, high settlement is found in the foot plateau and the Coastal Range areas of Gongoni, Mambrui, Marereni and Magarini. This is because these areas have a fairly good soils and high rainfall for agriculture, good road network (Malindi –Garsen Highway) and employment opportunities in the salt firms. In the hinterland locations of Fundissa, which have Nyika Plateau characteristics, the population densities is lower. Generally, the majority of the people in the division are poor with poverty level increasing towards the hinterland. In Marafa division, settlement patterns tend to be fairly homogeneous since climate and soil conditions are homogenous. Most of the parts of the division are in Nyika region with scattered population with many settlements near River sabaki.

3.5.2.3 Population

The district has witnessed a high population growth rate of 3.9% between over the past decade. Factors attributed to the high population increase range from improved health services which have reduced infant and child mortality rates, reduced cases of mortality

from curable diseases and increase in fertility. Another factor that explains the increase in population has been the in-migration from other districts and countries. Migration from other districts has basically been for the purpose of looking for employment opportunities in the tourism industry. The percentage of population less than 15 years formed about 47% of the total population at the beginning of 2002. The district has a dependency ratio of 100:99 implying that for every 100 persons in the labour force, there are 99 dependants.

3.5.2.4 Health

Malaria, respiratory diseases and skin diseases are the 3 most prevalent diseases. Issues concerning mother and childcare are not adequately addressed in most rural facilities. The district has inadequate health facilities especially in the rural areas and these facilities are also far from the community making them inaccessible. Also as a result of high poverty levels, women are discouraged from visiting the facilities due to fee charges.

3.5.3 Tana River District

3.5.3.1 Introduction

The district is divided into 5 administrative divisions with a total area of 38,782sq. Garsen Division with an area of 15,624 sq.km. is the largest of all the divisions in Tana River District.

Tana River District has also been divided into two districts; namely Garsen Delta and Tana River, but the information is on Tana river before it was divided.

The extensive delta created by River Tana presents great potential for the industrial development of t he district. It is a natural habitat an enormously diverse fauna and flora ideal for the promotion of tourism. It also provides a grazing area during the dry seasons and its waters are used for agriculture, the main crops grown being rice, mangoes, maize, bananas and soya beans. Fishing, forestry and agro-forestry are also supported by the Tana Delta.

The district has a coastline that is characterized by sandy beaches interrupted by the Tana delta where river Tana enters the Indian Ocean. Rainfall is low, bimodal and erratic. The mean annual rainfall ranges between 300mm and 500mm. Generally, the district is hot and dry with an average annual temperature of about 300 centigrade. Along the coast temperatures are hot and humid.

3.5.3.2 Population Size

Tana River District is one of the least populated districts in Kenya with an estimated growth rate of 3.03% per year. In 1989 Garsen Division had the highest population followed by Galole and Bura while Bangale and Madogo had the least.

Garsen and Galole have the highest population size partly due to their larger sizes and potential for agriculture and livestock production as well as their level of urbanization. Garsen and Hola, which are the administrative headquarters for Garsen and Galole, are the main urban and business centres. Their population is therefore higher as a result. The low population size for the other divisions is attributed to small divisional sizes as well as low agricultural and livestock potentials.

Bura Division had the highest densities due to concentration of people in the giant Bura Irrigation and Settlement Scheme. While Madogo and Bangale Divisions had the least population densities due to their perennial aridity, Bura Divisions hosts the district headquarters and thus has high population concentration. The highest concentration of population lives along the River Tana which is the only area where livestock and agricultural activities can be undertaken.

Most of the population lives either in villages or market centres scattered throughout the district. Thus the estimated urban population of the district includes all those people living in a particular service centre and those who are served by the centre. The major market centres namely such as are located along Road Malindi-Lamu road, the chief link between the district and the rest of the country. In terms of their potential for further urban growth, virtually all the market centres in the district have bright prospects. Some of the activities have shifted from Garsen to to Minjila and Isdowe areas at the junction of roads to Lamu.

3.5.3.3 Education Facilities

Enrolment is high in the lower classes and declines progressively in the higher classes of standard six, seven and eight. This is due to high drop out rate of girls due to early marriages and lack of school fees, coupled with the general negative attitude towards education for the girl child among the local community. The primary school participation rate is 43% which shows that most pupils in the primary school going age group are not enrolled in schools. Existing educational facilities are highly under-utilized.

3.5.3.4 Health

Given the vastness of the district the average walking distances to the nearest health facilities is 40km. this shows that the health facilities in the district are inadequate. These are food deficit areas with many cases of malnutrition and diseases. Most of the health centres are highly utilized. This is because the health centres are located at divisional headquarters where population is. Dispensaries are also highly utilized as they serve high population. Dispensaries do not charge user fees that explain their high utilization rates.

User charges have been introduced to health centres and hospitals. The social economic status of the majority of the population is low as well as the literacy levels. The user charges have increased the tendency among the majority of the local population to resort to traditional herbal medicine.

Most health facilities lack the basic equipment such as X-rays and those with the facilities experience operational problems since there is not electric power and have to rely on diesel to run generators that are more expensive to maintain.

Malaria and respiratory diseases are the two top causes of morbidity in the district. Of the respiratory diseases, incidence of TB is particularly high among the pastoralists. Form the statistics on the table, it can be concluded that there is dire need to strengthen control measures for the top ten diseases. To combat this, there is need to improve the health services in the district.

3.5.4 Lamu District

3.5.4.1 Administrative Description

Lamu District is one of the seven districts that make Coast Province. The district has a coastline of 130km and a total area of 6,474.7 km2 out of which 30km2 consists of water mass. The district has two constituencies, namely Lamu West and Lamu East. Lamu West constituency covers Amu, Hindi, Mpeketoni and Witu Divisions, while Lamu East Constituency covers Faza, Kizingitini, and Kiunga Divisions. The district has one local Authority namely Lamu County Council with 23 wards. The district can therefore be divided into two zones, namely the rich agricultural and livestock zone in the mainland (mainly settlement schemes) and the fishing and marine zone (the islands) both with varying economic diversities. The zones are also distinct in terms of ecology, infrastructural network and population distribution.

3.5.4.2 Population and Settlement Patterns

Lamu District's population was 56,783 persons in 1989. Its 1999 population was estimated to increase to 80,177 at an annual growth rate of 3.05%. Population increase has been contributed by high in-migration of people from other parts of the country to settle in newly created settlement schemes within the district.

The rich agricultural and livestock zones are composed of Mpeketoni, Witu and Hindi Divisions are settlement schemes with land parcels ranging between 10 and 15 acres. In these areas, farming is the major economic activity and therefore has a high population concentration. Another area of population high concentration forming a linear type of settlement pattern is found along the Mokowe – Garsen Road. Kiunga and Hindi Divisions with 2 and 4 people per km2 are the least densely populated. This is due to lack of infrastructure, essential services and adequate security. The fishing and marine zone is composed of Amu, Faza, Kizingitini and parts of Kiunga. Communities living in these areas live in villages concentrated along the beaches where fresh water is also available.

Insecurity is a major factor influencing settlement pattern. Amu and Mpeketoni Divisions are highly populated due to adequate security as opposed to divisions such as Witu, Hindi and Kiunga, which have security problems. Areas with security problems are thus sparsely populated and communities live in small villages to provide their own security. The major economic activity in these areas is livestock rearing.

3.5.4.3 Poverty

Poverty in Lamu District is manifested in terms of poor access to health services due to the high cost of medication and inaccessibility of health facilities, which arise from poor roads and the unreliability of sea transport on which majority of the residents rely to access medical attention. Poverty also manifests itself in the inability of the population to obtain clean and safe water due to poor sanitation and water salinity. The district also experiences low food production due to the under-developed agricultural sector, wildlife menace, lack of land security (most Lamu residents are squatters), the high cost of education and inadequately staffed and poorly equipped schools.

Historically Lamu District once flourished with economic endowments and poverty is therefore a new phenomenon. The older generation vouches that Lamu was at one time a giant farming region whose food products were exported to needy areas.

3.5.4.4 Education

In the area of education, the district had a total of 82 pre-primary schools, 65 primary schools and 5 secondary schools at the close of 1997-2007-plan period. In 1999 the total enrolment in primary schools in the district was 17,758 that is about 36% of the population in that age bracket. The education system showed a tendency of experiencing dropout rate of 35% and 55% for boys and girls respectively. The major constraints experienced for school drop out are poverty, ignorance and poor attitude towards education, sheer negligence, and heavy workload for pupils and inadequate facilities.

3.5.4.5 Economic Livelihoods

Fisheries activities are mainly concentrated in the coastal villages in Amu, Faza, Kizingitini and parts of Kiunga. Despite being a major source of income the industry has limited markets for the numerous marine products and also lack reliable storage facilities given the erratic power supply in the area occasioned by constant rationing and interruptions. Fishermen are thus forced to sell their catch at very low prices.

Agriculture is the main source of livelihood for over 43,000 people in the district. Over 7,000 acres are under food crops and 9,000 arcres under cash crops. The main cash crops include cotton, simsim, coconut, cashewnut, bixa, mangoes and bananas. Main food crops are maize, sorghum, millet, cowpeas, pigeon peas and green grams. There are 13 ranches in the district.

Those employed in the urban centers are about 18% of the total population. Most of these persons work in the tourism sector employees or are service providers. There are 41 hotels of which 17 are tourist class. Tourism is based on culture, religious, historical, architectural and natural attractions. There is also commercial and subsistence fishing in the district.

3.5.5 Land Issues in Coast Province

The history of the coastal area is unique and this has implications on the different ownership categories in the Coast Province. Historically, the ten-mile coastal strip was once a possession of the Sultan of Zanzibar, and was leased to the British when the East African Protectorate was established; it was bought by the British and became part of independent Kenya in 1963. the ten-mile coastal strip became part of un-alienated government land, under the government lands act. According to official government statistics, approximately 70% of un-alienated government land in the country is found in the coast province. This is land that can be allocated to private individuals and entities at the discretion of the commissioner of lands.

In addition, other sections of the coast province are classified as Trust Land, which is land entrusted to the relevant local authorities for the benefit of the people resident in the area. There are also settlement schemes, for example in Lamu, and land that is privately owned. When communities live in government land, they are classified as squatters, whether or not they have lived there since pre-independence days and can show that it is their ancestral land.

3.5.6 Observations from the Field

The area by-passed by the proposed transmission power line is mostly remote but has access through a relatively rough but all weather motorrable road. There was also a power

supply line along most of the areas except between Vitengeni, Kakuyuni and across the River Sabaki into Marafa Division. Thus the communities can be expected to have some knowledge on the requirements for way leave for power lines and the demands on land use change on the areas below the power lines.

Most of the area to be under the proposed transmission power line are communal lands or government/county council trust lands with most of the community expressing concerns at what the requirements for compensation in the proposed project will entail. There were several instances in the past where the communities have felt short changed by previous projects as they did not get the compensation expected or reallocated as planned. There were also projects that met with hostility within the areas due to poor or lack of consultation with the local community and the provincial administration.

Rain fed agriculture is the prevalent land use for the production of subsistence food crops except for the area around Rabai that had coconut plantations. Children coming from school and benefiting from school feeding program were a common sight at the villages in Kaloleni and Kilifi Districts in the early afternoon.

CHAPTER 4: NATIONAL POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 General Overview

Environmental Impact Assessment is a tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and peoples' health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighbourhood. Necessary policies and legislation that ensures annual environmental audits (EA) are carried out on every running project, activity or programme and a report submitted to National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates.

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. The NEAP process introduced environmental assessments in the country with among the key stakeholders being industrialists, business community and local authorities. This culminated into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999.

4.2 National Policy Framework

The national policy on Environment and Development presents broad categories of development issues that require sustainable approach. Among the goals of the policy are to:

- Incorporate environmental management and economic development as integral aspects of the process of sustainable development; and
- Encourage sustainable utilisation of resources and ecosystems for the benefit of the present generations, while ensuring their potential to meet the needs of the biosphere and future dependants.

Following on this, the policy outlines the following objectives among others:

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

4.3 National Legal Framework

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

Kenya has approximately 77 statutes that relate to environmental concerns. Most of these statutes are sector specific, covering issues such as public health; SOB erosion; protected areas; endangered species; water rights and water quality; air quality, noise and vibration; cultural, historical, scientific and archaeological sites; land use; resettlement; etc. Previously, environmental management activities were implemented through a variety of instruments such as policy statements and sectoral laws, and also through permits and licences. For example, the Physical Planning Act of 1996 empowers local authorities to request existing facilities to conduct environmental assessments, while under the Local Government Act of 1998, it is an offence to emit smoke, fumes or dust which may be a source of danger, discomfort or annoyance.

The key national laws that govern the management of environmental resources in the country have been briefly discussed below, although it is important to note that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act 1999 prevails:

4.3.1 The Environmental Management and Coordination Act, 1999

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue an EIA license as appropriate.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities or from the licensee. Finally, section 75 requires that parties operating a sewerage system obtain a discharge license from NEMA to discharge any effluent or pollutant into the environment.

Section 87 sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person, while section 88 provides for acquiring of a license for generation, transporting or operating waste disposal facility. According to section 89, any person who, at the commencement of this Act, owns or operates a waste

disposal site or plant or generate hazardous waste, shall apply to the NEMA for a licence. Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides.

Finally the environmental impact assessment guidelines require that the ESIA study be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

4.3.2 The Factories and Other Place of Work Act (Cap 154)

The Factories and Other Places of Work Act makes provision for the health, safety and welfare of persons at such workplaces. The Act is predominantly socio-economic in nature and focuses on the shop floor conditions of the factory, safety devices, machine maintenance, safety precautions in case of fire, gas explosions, electrical faults, provisions of protective equipment among others. In 2004, a subsidiary legislation (legal Notice NO.30) was enacted to provide for the formation of Safety Committees by the occupier of every factory or other workplaces. The Committee is responsible for all health and safety issues of enterprises including undertaking safety audits.

Part VI provides for the general welfare of the workers. Part VII section 51 states in part "In every factory or work place in which, in connection with any process carried on, there is given off any dust or fumes or other impurity of such a character and to such an extent as to be likely to be injurious or offensive to the persons employed, or any substantial quantity of dust of any kind, all practicable measures shall be taken to protect the persons employed against inhalation of the dust or fume or other impurity and to prevent it accumulation in any workroom, and in particular, where the nature of the process makes it practicable exhaust appliances shall be provided and maintained as near as possible to the point of origin of the dust or fumes … ".

Section 4 of Kenya subsidiary legislation of 2004, Legal Notice No. 31 of Kenya Gazette Supplement No. 25 of 24th May, 2004 of the Factories Act Cap 514, requires that, all factories or other workplace owners to establish a safety and health committee, which shall consist of safety representatives from the management and the workers. The number of the committee members will range from 3 to 7 depending on the size (number) of employees. The Act also requires the management to appoint a competent person who is a member of the management staff to be responsible for safety, health and welfare in the factory or workplace.

Section 13 goes ahead to state that a health and safety audit of the workplace be carried out every twelve months by a registered Health and Safety Adviser. If the owner(s) or management contravenes any of the rules, he/she shall be guilty of an offence.

Part IV of the Factories Act. Chapter 514 addresses provisions concerning health. These provisions are to be enforced by the Department of Occupational Health and Safety of the Ministry of Labour.

Part V of the Factories Act elaborately deals with safety requirements, mainly from the point of view of avoiding accidents and injuries at work.

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

Health and Safety Committee Rules: These rules are described in Legal Notice No.31 of the Kenya Gazette Supplement No.25 of May 14, 2004 and apply to all factories and other workplaces that regularly employ twenty or more employees. Among other items, the rules state that:

- The occupier of every factory or other workplace shall establish a Health & Safety committee; the Committee shall consist of safety representatives from the management and the workers;
- The occupier of every factory or workplace shall cause a health and safety audit of the workplace to be carried out at least once in every period of twelve months by a registered health and safety Adviser;
- The above legal notice also describes the functions and duties of the Health & Safety committees, meetings and minutes, and roles in the Committee. It further describes the duties of the occupier and those of the Health & Safety Adviser.

4.3.3 The Public Health Act (Cap. 242)

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. 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. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

4.3.4 The Occupational Health and Safety Act (2007)

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

- Secures safety and health for people legally in all workplaces
- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.

- Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.
- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

4.3.5 Physical Planning Act (Cap 286)

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used. Section 29 of the physical Planning Act gives the county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The act also gives the local authority power to compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority.

Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The environmental impact assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

4.3.6 Local Government Act (Cap 265)

Part XI section 168 provides that every municipal council, town council or urban council may establish and maintain sewerage and drainage works within or without its area of jurisdiction. For purposes of the land required for such development, section 144 states in part “A local authority may, subject to the approval of the Minister, apply to the

government or any other authority having power to acquire land required for purposes of any of its functions, to be acquired compulsorily for and on behalf of, and at the expense of the local authority". The Act, however, does not indicate the repercussions of impacts on landowners.

Section 160 helps local authorities ensure effective utilisation of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on: excavate or opens-up: or injures or destroys an sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

Section 165 allows the local authority to refuse to grant or renew any license which is empowered in this act or any other written law on the grounds that the activity does not conform to the requirements of any by-laws in force in the area of such local authority the granting of the license would be contrary to the public interest.

For maintenance of such sewerage systems, the following relevant clauses have been drawn from section 169 of the Act that reads in part "A municipal council may for purposes of carrying out any drainage or sewerage works------":

"--------cause such sewers, drains and pipes to be made, altered, deepened, covered, laid and maintained either within or without as may be necessary for effectively disposing of the sewage and draining of its area -------"

"-------carry such sewers, drains and pipes through, across, or under any public road, street, square or open place laid out for public road, street, square or open space without paying compensation and after giving 30 days notices in writing to the owner or occupier of the intention to do so ------"

"------from time to time alter, enlarge, divert, discontinue, close-up or destroy any sewers, drains, or pipes under its control ------"

Section 170, allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs. In addition, the municipal Council may establish and maintain sewage farms or disposal works, and dispose of the effluent therefrom, but shall not be liable for any nuisance or damage as a consequence of proper and ordinary conduct of the sewage farms or disposal works (section 171). To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

The Act under section 176 gives power to the local authority to regulate sewerage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be

charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 264 also requires that all charges due for sewerage, sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the "polluter-pays-principle".

4.3.7 The Land Planning Act (Cap 303)

Section 9 of the subsidiary legislation (The development and use of land regulations 1961) requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to acquaint the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce conflict with other interests such as settlement and other social and economic activities

4.3.8 Building Code By-Laws

The By-laws of Building code 3 (1) states 'A person who erects a building or develops land or changes the use of a building or land, or who owes or occupies a building or land shall comply with requirements of these by-laws'. By-law 5 states that a person who intends to erect a building or materially change the use of a building or part of a building shall furnish the council in the manner provided in Part A of the First Schedule to these By-laws. Section 194 requires that where a sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and that all wastewater must be discharged into the sewers.

4.3.9 Occupiers Liability Act (Cap. 34)

Section 3 requires that an occupier of premises owe the "common duty of care" to all visitors and workers. Rules of Common Law regulates the duty which an occupier of premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

4.3.10 Waste Management Regulations (2006)

The Waste Management Regulations (2006) are contained in the Kenya Gazette Supplement No 69, Legal Notice No 121. Of immediate relevance to proposed development for the purposes of this project report is Part II, Sections 4(1-2), 5 and 6.

Section 4 (1) states that 'No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle'

Sections 4 (2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides methods of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through: conserving raw materials and energy.

4.3.11 Land Acquisition Act (Cap. 295)

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

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

4.3.12 The Limitations of Actions Act (Cap.22)

There is currently no law in Kenya that provides for recognition and protection of the rights or for compensation for loss of these rights for squatters. Squatters do not have legally recognized rights to public land which they occupy. The above provisions relate to compensation for those who have a legal right to land and whose land has been compulsory acquired for public purposes. However, if squatter have been in occupation of private land for over twelve (12) years, then they would have acquired rights as adverse possessors of that land as provided under the limitation of Actions Act, section 7. They would however need to seek a declaration from the High Court and prove that their entry into the land was open, without consent of land owner and was uninterrupted for 12 years if the land is Government land (as is the case for this project). Then they have no rights to it, as the doctrine adverse possession can not be invoked against the government.

4.3.13 The Environmental Management and Coordination (noise and excessive vibration pollution) (control) Regulations, 2009

Part II section 3 (I) states that: no person shall make or cause 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 and section 3 (2) states that in determining whether noise is loud, unreasonable, unnecessary
or unusual, the following factors may be considered-
(a) time of the day;
(b) proximity to residential area;
(c) whether the noise is recurrent, intermittent or constant;
(d) the level and intensity of the noise;
(e) whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
(f) whether the noise can be controlled without much effort or expense to the person making the noise.

Part II Section 4 states that: except as otherwise provided in these Regulations, no person Shall (a) make or cause to be made excessive vibrations **which** annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations **which** exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

Part III, Section **11** (1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, **which** is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

Section **13 (**1) states that except for the purposes specified in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out **including but not limited to requirements regarding**
(a) machinery that may be used, and (b) **the** permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

It further states that the relevant lead agency shall ensure that mines and quarries **where** explosives and machinery **used** are located in designated areas and not less than two kilometers away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

4.3.14 The Factories Act (Cap. 514)

This Act deals with factories and other places of work. Part VI provides for the general welfare of the workers with respect to supply of drinking water, washing facilities and first aid among other aspects. Related to the workers welfare, Part VII section 51 states in part "In every factory or work place in which, in connection with any process carried on, there is given off any dust or fumes or other impurity of such a character and to such an extent as to be likely to be injurious or offensive to the persons employed, or any substantial quantity of dust of any kind, all practicable measures shall be taken to protect the persons employed against inhalation of the dust or fume or other impurity and to prevent it accumulation in any workroom, and in particular, where the nature of the process makes it practicable exhaust appliances shall be provided and maintained as near as possible to the point of origin of the dust or fumes …….".

Section 4 of Kenya subsidiary legislation of 2004, Legal Notice No. 31 of Kenya Gazette Supplement No. 25 of 24th May, 2004 of the Factories Act Cap 514, requires that, all factories or other workplace owners to establish a safety and health committee, which shall consist of safety representatives from the management and the workers. The number of the committee members will range from 3 to 7 depending on the size (number) of employees. The Act also requires the management to appoint a competent person who is a member of the management staff to be responsible for safety, health and welfare in the factory or workplace. Section 13 goes ahead to state that a health and safety audit of the workplace be carried out every twelve months by a registered health and safety adviser.

4.4 National Administrative Framework

4.4.1 The National Environment Council

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

4.4.2 The National Environment Management Authority

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

4.4.3 The Standards and Enforcement Review Committee

In addition to NEMA, the Act provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the Standards and Enforcement Review Committee (SERC).

4.4.4 The Provincial and District Environment Committees

The Provincial and District Environmental Committees also contribute to decentralised environmental management and enable the participation of local communities.

CHAPTER 5: CONSULTATIVE PUBLIC PARTICIPATION

5.1 Overview

It is a Government policy that beneficiaries of and members of public living near new project sites (both public and private) are consulted to seek their views and opinions regarding the projects before they are implemented. To that end, this assessment was carried out in line with NEMA requirements and in general good practice by the Proponent to remain compliant with the law.

The Public consultation process involved visiting the areas along the 300 kilometre stretch along which the way leave for the transmission line will be sought. The stakeholders were identified and consulted with the objective of describing the existing socio-economic conditions within the proposed project area of influence and the immediate surroundings.

5.2 Objectives of the Process

Public consultations were conducted for 12 days from 8th to 19th May 2009 and the specific objectives were to:

- Consult and gather recommendations from the local administration (District Commissioners, District Officers, Chiefs, Assistant Chiefs, Councilors and Village Elders) and communities that have a stake in the project; and
- Provide an opportunity to all the stakeholders and communities in the areas where the proposed transmission line is expected to pass to raise issues and concerns pertaining to the project, and allow the identification of alternatives and recommendations

5.3 Methodology and Data Collection

5.4 Areas visited along the proposed transmission line route

The Table below is a summary of the areas the team visited and held consultations with the resident community and provincial administration along the 300 km stretch that the power line is to follow.

Table xx: Summary of areas visited by the team during the Public Consultation Process

District	Division	Location	Sub location	Village
Kaloleni		Rabai		Kisuritini
	Mariakani	Kadzonzo	Kawala	Ngwenzeni
		Kirumbi	Kirumbi	Mnyenzeni
			Kirumbi	Madzimbani
			Kirumbi	Mikoba Chenda
		Tsangatsini		Tsangatsini
Kilifi	Bamba	Bandari		Bandari
	Vitengeni	Mwahera		Mwahera
			Mwangeya	Mwangeya
Malindi	Magharini		Gongoni	Mkanda simiti
			Gongoni	Kadzuhuni
	Malindi		Mungotini	
			Kakuyuni	Kakuyuni secondary
		Goshi	Paziani	
		Jilore	Kakoneni	Sosoni A
				Sosoni B
				Vitunguni A
				Vitunguni C
				Jilore A
				Kabalengani
				Madumadu
Garsen	Garsen	Danisa		Danisa A
		Danisa		Danisa B
		Danisa		Danisa C
		Isdoe		Isdoe town
	Tarasaa			Tarasa Town
Lamu	Mpeketoni			Mpeketoni Town
	Hindi			Hindi Town
			Mkunumbi	Mkunumbi
	Witu			Witu Town

At this time, consultations were carried out with various stakeholders that included District Commissioners, District Officers, Chiefs, Assistant Chiefs, Councilors, Village elders and community members resident in the proposed transmission line area. Annex VI is the list of the persons with whom consultations were made.

5.5 Results of the Consultations

Overall in the five districts 100 persons responded to semi-structured interviews and household's questionnaires, 15 focus groups discussions and 6 public barazas were held. All the provincial administrators and the communities would support the project except the community at Isodoe village in Garsen. It should be noted that most of information was obtained from the public barazas, focus group discussions and semi-structured interviews. The household interviews were picked at random and included those likely to be affected, just who at times were not so forthright with their responses given that they did not know the details of the planned project: they feared that by answering the questions they would be committing themselves without sufficient time to think over the issues that they had just been made aware.

The results of the consultations are presented below by District:

5.5.1 Kilifi District

From the series of public consultations held, it was found that the provincial administration, local leaders and residents support the project. They however stressed the need for consultations at all stages of implementation so as to address their concerns and expectations. The following is a summary of the key social issues that they flagged out:

- Assurance that the local people would be employed as technicians, where the relevant skill is available, and as unskilled laborers in order to improve their livelihoods and alleviate poverty;
- Fear, particularly in Tsangatsini village, that the project would cause the same fate as the army barracks project where the Mugoya residents were displaced and not fully compensated;
- Ensuring that the elders are involved to make sure the project is a success since some decisions on communally owned lands could only be made after their guidance;
- The fear of under-valuation of tree crops such as the neem and palm trees to which they attached more value compared to other areas where these trees are common or grow easily within the Coast;
- The request that a mechanism for their acquisition of land title deeds be in place so that their non adjudicated land status does not jeopardize their level of compensation;
- The compensation is given before the commencement of the project, for fear of being sidelined due to lack of title deeds if it was to come later; and
- In Rabai location graveyards that are of great significance to their community should be compensated since they would incur a lot of expenses if they were to shift them from one place to the other.

5.5.2 Malindi District

The provincial administration and the communities in all the villages where public consultation was conducted supported the proposed transmission line project. Their concerns and expectations are summarized as follows:

- Ensuring that full compensation for the land and their trees for which the community assigned great value and significance;
- Employment for youth and women as unskilled labourers as opposed to outsiders from the area;
- Ensuring that communities are assisted with dispensaries and schools in order to uplift their living standards;
- The proposed project will be a major boost towards the economy and particularly Malindi as a tourist destination;
- In a previous incidence community members were not compensated on similar operations and warned that a repeat of such a case should not occur since they are willing to give their land for the power line project;
- In Mungotini sub-location most of the land is forest in Madunguni and mostly inhabited by squatters, no major challenges would be met when the operation begins;
- No major challenge or resistance is foreseen since most of the land was not adjudicated but there would be need to consult the communities since many people have lived on the parcels of land for a very long time;
- Members of this community expressed the hope that they would be employed as unskilled laborers on commencement of the project; and
- Women were also keen that they too benefit in terms of employment opportunities because they felt it was the only way they could benefit from the proposed project as the line would not benefit them directly.

5.5.3 Garsen

Most of the area along which the transmission line would pass in Garsen is sparsely populated and occupied by group ranches. The provincial administration did not foresee any challenges in getting the way-leave. However at Isidoe the villagers rejected the proposed project claiming that where they had settled was the only high ground that ensured that they were safe from the flooding. Other concerns and expectations of the community were as follows:

- Most people have lived in fear of the effects of infrastructure projects, which have had negative impacts on their settlements;
- It was suggested that the transmission line to be redirected between Minjila and Tulu since most of the population resided along Isidoe, which happens to be the only higher place because the other places are prone to floods;
- The current energy supply has less voltage and cannot run industries; and
- If people were not well compensated just like the Gamba rice plantation project, which is now on hold due to lack of consultation the local community, then the proposed project would not succeed; and
- Requested that employment opportunities be given to their youths as skilled and unskilled laborers, and also wanted to see dispensaries built near the community.

5.5.4 Lamu

From the public consultations there would be full support of the transmission line project by the provincial administration, local leaders and the resident community. The concerns and expectations of the community are as follows:

- Energy is a key component to development, and will create job opportunities to the youth and small scale farmers and thus uplift their living standards;
- Witu is a historical town where most of the inhabitants were Arab settlers who are no longer residents but claimed title to land since 1908. Most of the other land is the government's most of which is occupied by forest and few settlement schemes;
- Most of the houses to be displaced by the transmission line would be rental and no farming activities take place in the area;
- Required a distribution line to be constructed that would lead to the starting of many small businesses in the juakali sector and small workshops; and
- Raised concerns about the road project carried two years ago and due to the lesson leant by the community it might pose a threat to the proposed project.
- The community has both skilled and unskilled laborers and they should be considered for employment;
- Good road network to be enhanced as a good will to the community;
- Common diseases being Malaria and HIV/AIDS due to the presence of military personnel who contribute to a large percentage of AIDS due to high levels of poverty hence an increase in prostitution.;
- Equal distribution of work on commencing since the place has different tribes to minimize conflicts amongst different tribes; and
- Most of the land is being owned by government with an exception of a scheme of which has a title deed and said most people along those areas are farmers who grow cotton, maize and receive a lot of rainfall making the land more fertile hence high yield.

5.6 Emerging Issues

There is a general acceptance of the project by the majority of the communities living in the area and the major issues raised by the participants during these social interactions are summarized and listed in the sections above.

Only the community at Isodoe in Garsen Delta was against the proposed project for the main reason that where they have settled is high ground and densely populated. This Community did not wish to be moved as the other areas are on the lower grounds and are prone to floods. Their experience with a previous project during the construction of the Garsen –Lamu road left them with a bad experience which they felt would recur with the proposed project.

CHAPTER 6: ANTICIPATED IMPACTS AND MITIGATION MEASURES

6.1 Introduction

This chapter largely focuses on the anticipated impacts from the construction and operation of the transmission line and its associated impacts which would include site preparation, building works, commissioning and operation. Impacts to the environment can be positive or negative, direct or indirect, reversible or irreversible. The extent of the environmental impact is determined by its significance and adversity, as well as its temporary or permanent state, long or short-term effect, localised or widespread nature.

A number of positive and negative anticipated impacts to the environmental and social wellbeing have been identified thus far. Among the broad areas of impacts include:

i. Waste generation; soil erosion and sedimentation; dust emissions; the potential for hazardous materials to contaminate the environment; and occupational health and safety issues during the construction phase; and
ii. Positive impacts such as tourism and increased business opportunities, as well as negative impacts on biological diversity and occupational health and safety issues during the operations phase.

6.2 Impacts during Construction

6.2.1 Positive Impacts

The following potential impacts have been identified during the construction phase:

i. Employment generation and income opportunities for the contractor, construction staff, and other professional service providers;
ii. The locals' employment as unskilled laborers during construction of the proposed transmission line; and
iii. New business opportunities for the local community leading to the establishment of new trade centres and the growth of the existing ones especially where the contractors will establish their camps.

6.2.2 Construction Waste Generation

During the construction phase various activities will be carried out and involve the demolition, excavation and transport of large amounts of construction materials. It is anticipated that during the materials transportation phase, the implications will be on the transport load of materials and the total transport distance, in the case of using the same transport machine. Generally, the total transport distance will reduce because the transportation of rock blocks in RFC could be transported from aggregate manufacturing plant to job site directly especially if located locally.

However, waste during the construction period will arise from: spoil during excavation work, deleterious material from aggregate screening; maintenance and repair of machinery; workers domestic waste; as well as waste water.

Therefore, the most appropriate options in waste management are: identification of the waste types; segregation into the various categories; and the establishment of suitable mechanisms for collection, storage, transfer, and final disposal.

Mitigation Measures for Solid Waste

- *Domestic solid waste to be stored in refuse bins temporarily before being taken away for proper disposal by NEMA licensed waste management firms;*
- *Construction solid waste generated by activities that are unsuitable for use should be disposed in a landfill in an area that will be identified before commencement of construction activities. These areas should be covered with soil and the area later re-vegetated; and*
- *Concrete, asphalt and other waste aggregate on site should be stored if there is a need for the material to be used as fill, provided that adjacent water bodies, including ground water supplies will not become impaired as a result of doing so.*

Mitigation Measures for Liquid Waste:

- *All waste water must be directed to a waste water treatment plant designed to meet the waste capacity before being discharged into the river;*
- *An area for the disposal of spilled or excess concrete should be identified near the mixing site;*
- *Waste water from concrete batching and aggregate screening should be discharged into nearby sedimentation pools and clean water re-used;*
- *A specific area for washing of cement trucks should be identified;*
- *Waste water from maintenance and the repair of machinery should be passed through an oil interceptor until the oil falls down to acceptable levels after which it can be discharged to a nearby river;*
- *All equipment must be fuelled at properly designed fuelling stations. Oil and fuel extractions from storage areas should be supervised and routine inspections and maintenance be carried; and*
- *All sewage and waste water from the construction camps and facilities will be disposed should disposed off in well designed and constructed septic tanks to meet both maximum population and rainfall.*

6.2.3 Soil erosion and sedimentation

Construction activities have the potential to loosen soils, particularly on slopes, which can then be washed down into the lower areas (streams and valleys) and soil quality degradation is also likely to occur during construction as a result of disposal of construction materials on the adjacent lands,

Mitigation Measures:

- *Excavated earth should be held on locations of the site not susceptible to storm water runoff. The earth removed for external disposal should be deposited carefully on selected sites without the risk of being washed away during heavy rains and where such deposits will not compromise other land use activities in the areas affected; and*
- *Re-vegetation of exposed areas around the site should be carried out rapidly in order to mitigate erosion of soil through surface water runoff and wind erosion*

6.2.4 Impact of power transmission lines on migratory fauna

The proposed transmission line may impact bats, birds and terrestrial migratory species as their migration routes could be disrupted due to construction activities. Although the Sabaki estuary is an important bird area, it is not anticipated that there will be any significant impacts on migratory fauna, however the following mitigation measure are recommended:

Mitigation Measures:

- *Selection of right of way that avoids sensitive habitats; and*
- *Use of common corridors to minimize impacts on undisturbed areas*

6.2.5 Aquatic Habitat Alteration

The route of the proposed transmission line crosses the Sabaki and Tana River. This may require the construction of corridors crossing aquatic habitats that may disrupt these watercourses and wetlands as well as require the removal of riparian vegetation. In addition, sediment and erosion from construction activities and storm water runoff may increase turbidity of surface watercourses.

Mitigation Measures:

- *Minimizing clearing and disruption to riparian vegetation; and*
- *Management of construction site activities as per sections 6.2.2 and 6.2.3 of this report.*

6.2.6 Risk of Fires

Uncontrolled burning of wastes during construction or operations may cause risk of fire, especially during the dry season especially as the surrounding area is characterized by bushes, trees and grass. During operations, high voltage power may also cause a fire risk in the event of electrical faults with equipment. Bat and bird collisions with power lines may result in power outages and fires. Also, if underlying growth is left unchecked, or slash from routine maintenance is left to accumulate within right of way boundaries, sufficient fuel can accumulate and as such promote forest fires.

Mitigation Measures:

- *No uncontrolled burning to be carried out;*

- *Carrying out controlled burning which adheres to application regulations, fire suppression equipment requirements and monitored by a fire watcher; and*
- *Establishing a network of fuel breaks of less flammable materials or cleared land to slow progress of fires and allow fire fighting access.*

6.2.7 Air Quality

The following emissions will be expected to result from construction activities. This would in turn lead to poor quality of life as well as upper to lower respiratory infections and silicosis condition:

- Dust from excavations and earth moving vehicles as well as materials delivery);
- Particulate matter from dry materials, more specifically sand, cement, gravel and murram, etc.), and
- Emissions such as smoke, hydrocarbons and nitrogenous gases among others from machinery exhausts

Mitigation Measures

- *Personal protective equipment (PPE) such as dust masks must be worn in the immediate vicinity of the operations during quarrying and handling of cement. Additional protective masks should be worn at the vicinity of drill sites;*
- *The stockpiles of earth generated during construction works should be suppressed by spraying water or water based mixtures. Spraying should also be carried out on unpaved road accesses regularly and at handling sites for cement;*
- *Controlling the suspension of dust drilling and blasting by sequential blasting, covering shielding or enclosing the area;*
- *All machinery and equipment should be maintained in good working order to ensure minimum emissions including carbon monoxide, oxides of Nitrogen and Sulphur, as well as suspended particulate matter;*
- *Drivers of construction vehicles and delivery trucks should be cautioned to drive slowly near the site to avoid creating dusty conditions;*
- *Construction trucks removing soils from the site , delivering sand and cement to the site should be covered to minimize dust blowing into the surrounding neighbourhood;*
- *No burning of any materials whatsoever should be permitted at the site; and*
- *Drivers of construction vehicles and delivery trucks must be supervised so that they do not leave vehicles idling and limit their speeds so that dust levels are lowered.*

6.2.8 Risk of leaks and spills

Petroleum hydrocarbons present both an environmental and fire risk. The storage of petroleum hydrocarbons on site presents a hazard source and the release of hydrocarbons into the environment could result in significant impacts on a variety of receptors. The

pathway for pollution is soil or water, and the primary receptors include the sub-soil and groundwater. Other receptors include air (from fuel vapours) and people (through dermal contact, inhalation or ingestion). It is however worth noting that the risks of a major oil spillages occurring are minimal.

Mitigation Measures:

- *Regular maintenance of site equipment and machinery should be carried out to ensure any leakages are detected and controlled. The motor vehicles and heavy equipment should be serviced according to manufacturer's requirements to limit the exhaust emissions.*
- *Investigate the possibility of fitting catalytic converters especially for the heavy equipment to convert harmful substance in the exhaust fumes to less harmful substances;*
- *Safety procedures for fuel storage and re-fuelling should be well understood and implemented by site staff; and*
- *Oil residuals including waste oil, lubricants, used filters, should be carefully collected and stored for safe disposal, in order to prevent migration of contaminant hydrocarbons into storm water or groundwater resources.*

6.2.9 Occupational Health and Safety Issues

Potential impacts during construction include: exposure to physical hazards from the use of heavy equipment; trips and fall hazards; and exposure to dust and noise. The uncontrolled proximity to high vehicular traffic during transportation of construction materials and equipment may lead to injuries or fatalities due to traffic accidents. Other injuries or fatalities may result from workers operating equipment without adequate training or with a lack of personal protective equipment or extended exposure to outdoor weather resulting in heat-related lethargy.

Mitigation Measures:

- *Ensure all equipment is inspected before use for appropriate safe guards and that the machine operators are trained on machine safety; and*
- *Ensure the working hours are controlled and that employees are not allowed to extend the working hours beyond an acceptable limit for purposes of gaining extra pay.*

The use of jack hammers for crushing rocks during the construction site may lead to whole body vibrations of the jack hammer operators which are likely causes of impaired functions of the chest, abdominal organs and the musculoskeletal system

Mitigation Measure:
Avoid the use of jack hammers and employ other form of technology for crushing of rocks
Due to the high vehicular traffic expected during the construction phase, it is likely that traffic accidents may become an important factor especially for children from neighboring communities crossing the roads leading to the project site.

Mitigation Measures:

- *Ensure appropriate road safety signage is placed and drivers adhere to the requirements of such signage; and*
- *Erection of bumps where human and vehicular traffic have high interaction opportunities*

During the construction phase, several manual tasks will be carried out by the project workers. Repetitive tasks have the effect of imparting ergonomic disorders especially when they are carried out over long periods of time

Mitigation Measures:

- *Provide adequate manual labor to suffice the tasks; and*
- *Eliminate repetitive task by semi-automation where possible*

6.2.10 Noise and Vibration

There will be noise and vibrations generated during the construction phase but it will be no different from that on any other typical construction site. The noise impact during construction is expected to be negative and short-term.

Major sources of noises and vibration will come from: drilling during construction equipment to place charges; blasting to get aggregate; crushing to obtain aggregates and earthmoving machinery, as well as noise from the work force itself. The major receptors are expected to be the construction workers as well as any immediate neighbouring premises.

Excessive vibrational forces from blasting of hard granite rocks and the use of vibrators may impair functions of the chest, abdominal organs and musculoskelotol system as well as contribute to fatigue and decrease in concentration.

Excessive production of high noise by the blasting of hard granite rocks, rotating turbines, vehicular traffic and machinery operations may result in poor quality of life and potential loss (or reduction) in hearing.

Mitigations Measures:

- *Conduct noise measuring to determine levels and extent of harmful noise and provide PPE (hearing protection) to persons who must operate within or visit the identified high noise areas;*
- *Investigate the possibility of investing in silencers to reduce the quantity of noise produced;*
- *Create a barrier well beyond the perimeter of the high noise level area to protect the unsuspecting public who may approach the project site;*
- *Ensure that the works are distant from the settlement areas, and vibration is not expected to have impacts beyond its site boundaries;*
- *In order to meet noise level requirements, the works will be equipped with standard noise attenuation features. Machines that exceed acceptable noise limits*

will be equipped with silencers or lagging materials or specially designed acoustic enclosures; and

- *Inform local residents of any abnormal noise generating construction activities to minimize disruption to local residents*

6.2.11 HIV/AIDS

Today the world has 42 million people living with HIV; in 2010 it is expected that this figure will be 90 million. The number is rising in every region of the world. The impact has a devastating effect on individuals and families as well as whole communities. The movement of people exposing them to new situations, meeting new people and experiencing a change of their daily life creates an enhanced risk of acquiring HIV and/or other sexually transmitted diseases (STDs). Even small changes in a normally structured life can cause people to change behavior and react in different ways than usual. Also the influx of new people – like construction workers - can affect the number of new cases of HIV, because they often interfere with an otherwise stable situation and at the same time the newcomers themselves are at higher risk.

During the construction phase of the project, there may be an increase in the interaction of persons of both genders. This interaction may at times result in sexual relations with potential subsequent increase in HIV/AIDS infection rates.

Mitigation Measures:
The objective of the HIV/AIDS initiatives would be to reduce the risks of exposure to and spread of the HIV virus in the project area. Major targets would be construction workers, institutional communities and the general members of the community, particularly the youth. Recommended measures are as follows:

- *Review the activities of the Dam construction to integrate with the HIV/AIDS campaigns;*
- *Develop appropriate training and awareness materials for information, education and communication (IEC) on HIV/AIDS;*
- *Identify other players (local CBOs, NGOs, and government organizations) on HIV/AIDS for enhanced collaboration;*
- *Develop an intervention strategy compatible with the Dam construction programme to address success of the HIV/AIDS prevention and provide peer educators for sustainability in collaboration with other stakeholders; and*
- *Integrate monitoring of HIV/AIDS preventive activities as part of the Dam constriction supervision. Basic knowledge, attitude and practices are among the parameters to be monitored, and particularly on provision of condoms, status testing and use of ARVs.*

6.2.12 Terrestrial Habitat Alternation and Disruption

Forests and wildlife are critical natural assets for Kenya since the country is endowed with few other natural resources such as minerals. Forests (which comprise slightly less than

3% of the total land) are vital as wildlife habitats and water catchment areas as well as sources of water that support agriculture, the main GDP earner.

The construction (and maintenance) of transmission line rights-of-way, could also result in terrestrial habitat alteration and disruption. Specific impacts include loss of wildlife habitat (including for nesting), establishment of non-native plant species and visual/auditory disturbance due to the presence of machinery, construction workers, transmission towers and associated equipment.

Mitigation Measures:

- *Siting of transmission line and distribution right-of-way, access roads, lines, towers and substations to avoid critical use, through the use of existing utility and transport corridors, as well as existing roads and tracks for access roads, where possible;*
- *Installation of transmission lines above existing vegetation to avoid land clearing;*
- *Re-vegetation of disturbed areas with native plant species; and*
- *Removal of invasive plant species during routine vegetation maintenance.*

6.2.13 Impact on Access Roads

Although it is anticipated that the existing accesses are adequate for the transportation of materials, the Contractor must maintain these roads during the construction period.

Mitigation*:*

- *Traffic should abide by the speed limits and by-laws of the area;*
- *Movement of heavy construction traffic should be planned appropriately*.

6.2.14 Camp Sites

The project is likely to have three categories of camp sites, namely workers camps, operation camp (offices, stores and workshops) and material site camps (materials preparation sites). The anticipated impacts to the environment would be as follows:

(i) Workers camps associated with domestic wastes (sewage and garbage) running into water sources and land. People's health would be at risk,
(ii) Construction materials holding and preparation sites with waste oils, bitumen residuals, machine parts, etc. that could infiltrate into water sources, land and air. Effects are mainly people's health and physical environmental degradation,
(iii) Uncontrolled disposal of office wastes could also be a nuisance to the local inhabitants and the environment,
(iv) Material sites (gravel, hard stones, sand and water) have risks to people's safety, environmental pollution and degradation among other undesirable occurrences.

Mitigation Measures:

- *Exhaust and rehabilitate one material site before opening another section;*

- *Provide PPE for employees (safety gears) and safety warnings for the public;*
- *Exhausted quarries and borrow pits be isolated, protected and rehabilitated;*
- *Hold top soils and vegetation matter near the quarries for backfilling;*
- *Ensure reduced stagnation of water in abandoned quarries and borrow pits;*
- *Ensure controlled spoil dumping; and*
- *Develop appropriate contractual agreement with landowners on conditions and terms of quarrying.*

6.3 Impacts during Operations and Maintenance

The following potential impacts have been identified during operations and maintenance:

6.3.1 Positive Impacts

It is anticipated that the operations phase of this project will result in:

i. Improved supply of electricity to the Region;
ii. Creation of employment during the construction period;
iii. Spur developments as industrialization increases within the district;
iv. Provision of power to the local centers, houses, schools and even workshops which will create employment for the youth and women in the area.;
v. Impact positively on the tourist industry since more tourist hotels will have sufficient electricity; and
vi. Distribution of power to local centres that would support *jua kali* industries and other small industries and attract agricultural and manufacturing investors. There would also be sufficient power for the planned Lamu Port and the agricultural investments in Garsen Delta. Also the fishing industry will be boosted especially having cold storage for their fish and other produce

6.3.2 Occupational Health and Safety Issues

The following occupation health and safety impacts have been identified during operations and maintenance:

i. Proximity to strong electromagnetic fields such as the immediate power lines from the power generation station may lead to exposure to high electromagnetic fields. Electromagnetic field exposure is known to cause alterations in heart rhythm. The resultant effects of the change in heart rhythms are not clearly known but major speculation suggests that it could lead to cardiac problems. Strong electromagnetic fields are also known to polarize the blood but the medical effects of these are still not understood.

Mitigation Measures:

- *Ensure strict access controls to the electricity power lines; and*
- *Enforce way leave requirements for power lines.*

ii. Uncontrolled access to the high current-carrying wires in the operations phase may lead to accidental electrocution of passer-bys especially in cases where cables have dropped and are still live.

Mitigation Measures:

- *Ensure strict access controls to the electricity power lines; and*
- *Enforce way leave requirements for power lines.*

iii. Workers' exposure to occupational hazards from contact with live power lines during construction, maintenance and operation activities.

Mitigation Measures:

- *Only allow trained and certified workers to install, maintain and repair electrical equipment;*
- *Deactivate and ensure live power distribution lines are properly grounded before work commences; and*
- *Ensure live wire work is conducted by trained workers with strict adherence to safety and standards.*

iv. Workers' exposure to occupational hazards when working at elevation during construction and operation

Mitigation Measures:

- *Ensure that structures are tested for integrity prior to commencing work;and*
- *Implementation of a fall protection program that includes training in climbing techniques and the use of fall protection measures*

6.3.3 Sensitive Sites

No social sensitive sites were noted throughout the site.

6.3.4 Electromagnetic interference with radio telecommunications systems,

The corona of overhead transmission line conductors and high frequency currents of overhead transmission lines may result in the creation of radio noise.

Transmission line rights-of-way and conductor bundles are usually created to ensure radio reception at the outside limits remains normal. However, periods of rain increases the streaming corona on conductors and may affect radio reception in residential areas near transmission lines.

6.3.5 Impacts on public health as a result of EMF radiation

Everyone is exposed to a complex mix of weak electric and magnetic fields, both at home and at work, from the generation and transmission of electricity, domestic appliances and industrial equipment, to telecommunications and broadcasting. Exposure to electromagnetic fields is not a new phenomenon. However, during the 20th century, environmental exposure to man-made electromagnetic fields has been steadily increasing

as ever-advancing technologies and changes in social behaviour have created more and more artificial sources.

There are however additional factors that need to be taken into account in assessing any possible health effects. Populations as a whole are not genetically homogeneous and people can vary in their susceptibility to environmental hazards. There are well-established examples in the literature of the genetic predisposition of some groups, which could influence sensitivity to disease. There could also be a dependence on age. Following a detailed comparison of the NRPB and the International Commission on Non-Ionising Radiation Protection (ICNIRP) guidelines and the implications for practical hazard assessment, the NRPB issued the following statement on the exposure to electromagnetic fields (EMF): "...In relation to furthering knowledge on possible health effects of exposure to EMFs, the Board supports the need for further epidemiological and experimental studies."

Research into this area is therefore still ongoing and in the meantime, standards-setting organizations and government agencies continue to monitor the latest experimental findings to confirm their validity and determine whether alterations in safety limits are needed in order to protect human health.

Countries set their own national standards for exposure to electromagnetic fields. However, the majority of these national standards draw on the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This non-governmental organization, formally recognized by WHO, evaluates scientific results from all over the world. Based on an in-depth review of the literature, ICNIRP produces guidelines recommending limits on exposure. These guidelines are reviewed periodically and updated if necessary.

It is important to note that electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to the power lines.

Mitigation

- *Evaluating potential exposure to the public against the reference levels developed by ICNIRP.*

6.3.6 Compensation and Relocation of People Affected by the Project

The parcels of land acquired will necessitate land acquisition and resettlement include the transmission lines whose width is 40 meters and a length of 320 Kms. In addition, there is need for land acquisition and resettlement to accommodate the three sub-stations namely Malindi, Garsen and Lamu each with 5-50 acres totaling to between 15 and 150 acres. For purposes of acquisition estimates, it is assumed that about 100 acres would be acquired for substations.

The socio-economic survey process involved visiting the corridor along the 320 kilometer stretch along which the way leave for the transmission line. The stakeholders were

identified and consulted with the objective of describing the existing socio-economic conditions within the proposed project area of influence and the immediate surroundings. The Project affected Persons can be grouped into four broad categories namely, those:

- Whose whole land, farms and housing structures will be fully acquired
- Whose land and farms will partially be acquired but housing structures remain
- Whose land and farms will partially be acquired including housing structures
- Who will be affected due to acquisition/relocation of joint public facilities (schools and water among others)

According to field survey, about 159-200 households would be affected by the way leave, with a population of approximately 1200 people.

The envisaged crops and trees to be cleared will include mango trees (indigenous and exotic), coconut, cashew nuts, cassava, bananas, gum tree and *Casseurinna* among others. Except in cases where there were large ranches and bush, there were no plantations along the corridor. The crops affected were found on the homesteads hence they were valued together with the land.

Mitigation Measures:

- *A resettlement action plan (RAP) has therefore been prepared as past of this assessment and submitted to the Proponent;*
- *The Proponent will make the respective land acquisition and easements contracts with each land owner before the project can start; and*
- *Awareness creation to the community on land use alternatives that promote intensive use of their remaining land or is compatible with overhead power cables*

6.3.7 Noise (Humming) and Ozone Emissions

Noise in form of buzzing or humming can often be heard around transformers or high voltage power lines producing corona Ozone, a colourless gas with pungent odor may also be produced.

Neither the noise nor ozone produced by power distribution lines (or transformers) carries any known health risks (IFC, 2007) and the acoustic noise produced by transmission lines is greater with high voltage power lines (400-800 kV).

6.3.8 Avian and Bat Collisions and Electrocutions

The combination of the height of the transmission towers, distribution poles and electricity carried by transmission and distribution can pose potentially fatal risks to birds (including raptors) and bats through collision and electrocutions. Birds and bats may be electrocuted by power lines in one of three ways: simultaneously touching an energized wire and a neutral wire; simultaneously touching two live wires; and simultaneously touching an energized wire and any other piece of equipment on a pole or tower that is bonded to earth through a ground wire (IFC, 2007). Avian collisions with power lines can occur in large

numbers if located within daily flyways or migration corridors, or if groups are travelling at night or during low light conditions.

Mitigation Measures:

- *Maintaining a 1.5 meter spacing between energized components and grounded hardware;*
- *Covering energized parts and hardware; and*
- *Installing visibility enhancement objects (marker balls*

6.3.9 Aircraft Navigation Safety

Power transmission lines, if located near an airport or know flight paths (such as the Wote airstrip which has not been in use) can impact air safety directly through collision or indirectly through radar interference.

Mitigation:

- *Consultation with regulatory air traffic authorities prior to installation; and*
- *Adherence to air safety regulations;*

6.3.10 Right of Way Maintenance

Regular maintenance of vegetation within the right-of-way must be carried out to avoid disruption to overhead power lines and towers. Regular maintenance may involve the use of mechanical methods (mowing machines) that may disrupt wildlife and their habitats. Excessive vegetation maintenance may remove unnecessary amounts of vegetation resulting in the continual replacement of succession species and an increased likelihood of the establishment of invasive species.

Mitigation Measures:

- *Scheduling maintenance activities to avoid breeding and nesting sessions;*
- *Avoiding clearing in riparian areas;*
- *Avoiding use of machinery in the vicinity of watercourses; and*
- *Observing manufacturer machinery and equipment guidelines, procedures with regard to noise as well as oil spill prevention and emergency response.*
-

6.3.11 Social Impacts

i. The proposed project will create displacement of communities when acquiring land for the proposed power transmission line.
Mitigation Measures:
   - *A resettlement action plan (RAP) has been prepared as past of this assessment and submitted to the Proponent*
   - *The Proponent will make the respective land acquisition and easements contracts with each land owner before the project can start.*

ii. There will also be conflicts arising between members of the family after compensation since each will claim ownership of the land.

Mitigation Measures:

- *Project can promote activities that are common to the communities and project employees that will provide for opportunities to create understanding such as sports; and*
- *Where possible, awareness creation amongst the community on the project facts, what it can do and its limitations specifically to address the expectations expressed*

iii. Increase in social vices such as prostitution, spread of HIV/AIDS, emergence of fake currency due to circulation of cash and also illicit brew and drug-use and abuse.

Mitigation Measures:

- *Where possible, Information Education and Communication (IEC) conducted amongst the community making them aware of the potential dangers and alternative behavior that will be needed so as to protect themselves;*
- *Local community, provincial administration and the project to form joint committees that can look into the security of persons and property in the area over the project period; and*
- *Awareness raising amongst the traders and communities on incidences of fake currency as they occur and the risk of giving credit to persons they might not have details on where to follow for action should they default to pay.*

CHAPTER 7: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

7.1 General

Along with the potential impacts presented in this chapter, proposed mitigation measures have also been highlighted for appropriate action. Some impact mitigation has already been proactively addressed in the design, and legal and regulatory framework, while others would be undertaken through considered incorporation in the implementation of the project and guided by the environmental management plan (EMP) developed under this report.

The EMP provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitorable indicators. Implementation timeframes and responsibilities are also defined. It is however recommended that a detailed decommissioning audit be undertaken at the appropriate time.

The responsibility for the integration of the mitigation measures for the proposed development lies with the Contractor during the construction stage while the Proponent takes over the duty upon commissioning of the project. At every stage, the objective would be to ensure that the specified mitigation measures are implemented.

There also needs to be long term coordinated efforts that are geared at building partnerships with community groups, non-governmental organizations, business and industries; and facilitating public awareness and provision of educational opportunities for people to learn about conservation and sustainable human development.

7.2 Environmental Management Plan

The scope of this environmental management plan (EMP) document is to give guidelines to all parties involved in construction, maintenance and utilization of the transmission line in fulfillment of environmental and social requirements. The management plan has a long-term objective to ensure that:

(i) Environmental management conditions and requirements are implemented from the start of the project and post construction period, and
(ii) Precautions against Damage to environment and property and claims arising from Damages are compensated expeditiously.

The tables below therefore summarise the Environmental Management Plan for this project. They describe the parameters that can be monitored, and suggests how monitoring should be done, how frequently, and who should be responsible for monitoring and action

7.3 Environmental Management Plan (EMP) Matrix

Table 3: Environmental Management Monitoring Plan Matrix

Environmental/ Social Aspect	Proposed Mitigation and Aspects for Monitoring	Responsibility for mitigation, monitoring and/or maintenance during design, construction and operations period	Monitoring means (c) = construction (o) = operation	Recommended frequency of monitoring	Cost estimate (Ksh)
Environmental Management Plan	- Ensure implementation of the Environmental Management Plan	- Proponent	- (c)(o) inspection, records, reports	- (c)(o) routine	- Internal cost
	- Establishment of management commitment - Identification of a core functional team - Development of a policy, environmental, occupational Health and Safety (OH&S) objectives and targets - Development of a legal/regulatory register - Environmental, OH&S objectives and targets - Allocation of resources, roles and responsibility for OH&S - Development of communication and consultation procedures - Establishment of a documentation system - Establishment of operation controls - Establishment of Emergency Response Plans - Establishment of monitoring and measuring systems	- Proponent	- (c)(o) inspection, records, reports	- (c)(o) routine	- Internal cost

Environmental/ Social Aspect	Proposed Mitigation and Aspects for Monitoring	Responsibility for mitigation, monitoring and/or maintenance during design, construction and operations period	Monitoring means (c) = construction (o) = operation	Recommended frequency of monitoring	Cost estimate (Ksh)
	- Development of procedures for corrective and preventive action - Establishment of a record keeping system				
Community Engagement	- Develop a grievance mechanism which should outline how the Proponent will address any complaints or grievances raised by the communities. - All communication with the community should be documented - Develop an environmental and social responsibility programme	- Community Liaison Officer (Ministry of Energy)	- (o) inspection, records, reports	- (o) routine	- Internal cost
Monitoring and Reporting	- Review environmental, social and OH&S matters regularly - Develop a Corporate Environmental and Social Responsibility Report which should be accessible to the public	- Community Liaison Officer (Ministry of Energy) - Environmental Officer (Ministry of Energy)	- (o) inspection, records, reports	- (o) monthly - (o) yearly	- Internal cost

Table 4: Impacts Mitigation Matrix

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Soil Erosion	Construction	Control the earthworks and contain excavated soils on site, Soil removal process not to deposit residuals in the drains, Efficiency of erosion control measures, Landscaping to create contours towards the drainage systems,	Supervising Foreman and Contractor	Continuous throughout construction phase	Silt loading in the drainage systems during rains Part of the soil and surface water drainage, pavings and landscaping. No Costs Estimate
	Occupation	Compact loose soils and apply binding materials.	Ministry of Energy	Continuous activity	
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Air Pollution (dust, emissions and particulate matter)	Construction	Maintain construction machinery in working order at all times Control speed of construction vehicles around the site Keep the loose soils and dry materials at the construction site moist at all times, Delivery vehicles with dry materials be covered, Sensitise construction workers on aerial emissions.	Supervising Foreman and Contractor	Continuous throughout the construction phase	Complaints from the neighbours, Physical appearance in the immediate air space, Depositions on surfaces (buildings, plants and stationary vehicles) Dust mask @ Ksh
	Occupation	No burning materials (plastics, papers or fabrics) on site,	Ministry of Energy	Continuous	100
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Noise and vibration	Construction	Sensitise the workforce and truck drivers on issues equipment maintenance, Supervise construction traffic,	Supervising Foreman and Contractor	A continuous observance throughout the construction	Complaints from the neighbours, Audible noise levels at the nearest home

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
		Maintain plant and equipment, Undertake construction only during the daytime for peace of the neighbours, Workers to wear ear plugs/muffs as part of the personal protective gear.		Spot checks of noise levels every month	not to exceed 50 Decibels, Sound proofing material approx. KSh 600 per kilogram
	Occupation	No workshops and noise intensive activities shall be operated at the site, Consider the possibility of investing in silences to reduce quantity of noise produced Create a barrier wall beyond the perimeter of the high level noise are and the community	Ministry of Energy	Continuous	Maintenance: internal cost
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	No complaints from the residents
Contamination of Ground and Surface Water : oil spills, silt, leachate from solid wastes, suspended matter, infiltration into water supply pipes, sewage	Construction	Proper storage, handling and disposal of oil and oil wastes from machinery, Discourage servicing of machinery and vehicles on site	Supervising Foreman and Contractor	Continuous through the construction period	Nature of surface runoff from the site No cost estimates (Part of the earthworks and landscaping)
	Occupation	Avoid unnecessary wastage and spillage of water, Sewer pipes not to discharge into drainage systems,	Ministry of Energy	Continuous monitoring	Nature of surface runoff from the site No specific cost estimates (part of the sanitary and plumbing installations)
Waste Management, Sanitation and Hygiene	Construction	Special attention on the site sanitary facilities,	The Architect	Wastes expected throughout the	Compatibility of the waste types with the

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
		Construction concrete debris be disposed off safely preferably re-used on road graveling, Earth excavate be dumped on pre-identified and approved land fill sites, Other inert materials (wood, steel bars, nails, papers, glass, etc. be recycled off site OR dumped in dumping sites approved by the City Council, Plan materials (logs and branches) may be used offsite for building or firewood while leaves and lesser be dumped in approved dumping sites, Provide segregated waste holding units on every floor as temporary storage bins,	Contractor, Supervising Foreman	construction phase	recipient physical and social environment. Value of the wastes types to the generation points and the recycling agents. Temporary latrine approx. Ksh 10,000
	Occupation	Solid waste holding bins (segregated into different compartments), Engage approved refuse handling agents for the various waste types emanating from the building, Carry out an annual waste audit to determine quantities and characterization of wastes and hence mode of disposal, Identify hazardous wastes for specialized disposal.	Care Taker or Property Manager	Facilities and mechanisms to be in place upon commissioning	
	Decommissioning	Ensure safe disposal of the waste generated during the decommissioning process, Everything be done in accordance to the decommissioning audit.	Proponent	> 50 years	No cost estimates
Road Safety	Construction and	Enforce speed limits for construction	Contractor	Initiate action upon	Number of reported

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
	Occupation stages	vehicles during construction, Design a separate vehicle entry different from the common entrance with the residents, Streamline traffic flow into and out of the premises, Initiate changes in traffic flow in the micro-area upon commissioning, Install appropriate cautionary signage for motorists entering the premises.		commissioning of works and a transition onto operation of the building	cases, Complaints from the residents, Inconveniences from visiting motorists. No cost estimates
Loss of Vegetative Cover	Construction and Occupation	Rehabilitate sites used for construction	Contractor	To be accomplished within the commissioning period	Vegetation cover on all open spaces.
Inappropriate disposal of waste	Construction and operations	Proper design and construction of on-site treatment and disposal systems – septic tanks, VIP toilets. Trash processing to be managed with proper on-site incinerator for burnable trash; system of triple rinse, puncture and return-to-supplier for chemical containers; fenced off trash bit for organic wastes	Design and Supervising Engineer & Contractors. Ministry of Energy in operation phase	Continuous throughout the construction & operations phases	Observations on trash & operational status of sewerage treatment & disposal systems.
	Construction and operations	Contamination of water sources by oils, fuels and vehicle chemicals can be mitigated through proper design and construction of on-site treatment and disposal systems – spent-oil, used parts, tyres to be collected & off-site disposal, proper fuel depot;	Design and Supervising Engineer & Contractors. Ministry of Energy in operation phase	Continuous throughout the construction & operations phases	Observations on trash & operational status of vehicle garages and parking areas.

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Waste Generation	Construction and operations	- Identification (through consultation) of suitable landfill sites; and - Disposal of solid waste and building debris in an appropriate manner - Ensure best practice with regard to waste disposal	Ministry of Energy Contractor	Continuous during construction and operations	Disposal of waste by a licensed waste handler Internal cost
	Decommissioning	As per the decommissioning report	Ministry of Energy	> 50 years	
Risks of leaks or spills	Construction	Regular maintenance of site equipment Investigate the possibility of catalytic convertors Safety procedures for fuel storage and re-fuelling Dispose of oil residues carefully		Throughout construction	Spot checks by the proponent Internal cost
Risk of Fire	Construction and Operation	Provision of fire safety system that includes training, fire fighting equipment; Regular maintenance of machinery, vehicles and equipment; and No burning activities to be allowed close to or within the site.	Contractor Ministry of Energy	Throughout construction and operations	Internal cost Internal cost Spot checks by Proponent

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Exposure to physical hazards	Construction and Operation	Ensure all equipment is inspected prior to use	Ministry of Energy Contractor	Continous	Internal cost
Trips and Falls hazards	Construction and operation	Provide fall protection measures to all workers on site	Contractor Ministry of Energy (OHS Officer)	Continuous	Incidences and accidents record book Internal cost
Risk of traffic accidents	Construction	Ensure appropriate road safety signage Ensure all drivers adhere to the traffic laws and requirements Erection of bumps where human and vehicular traffic have high interaction opportunities	Ministry of Energy	Continuous	Internal cost
Spread of HIV/AIDS	Construction	Review activities of Dam construction to integrate with HIV/AIDS campaigns Develop appropriate training and awareness materials for IEC on HIV/AIDS Identify other players (CBOs, NGOs etc) on HIV/AIDS for enhanced collaboration Integrate monitoring of HIV/AIDS proactive activities	Ministry of Energy Ministry of Health NGOs CBOs	Continous	Internal cost as part of CSR policy

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Impact on access roads		Traffic to abide by speed limits and local by-laws Movement of heavy construction traffic to be planned appropriately	Contractor	Continuous	Internal Cost
Impact of camp sites on the environment		Exhaust and rehabilitate one material site before opening another section Exhausted quarries and borrow puts be isolated, protected and rehabilitated Ensure controlled spoil dumping	Contractor	Continuous	Internal Cost
Exposure to high electromagnetic fields and high current carrying wires	Operation	Ensure controlled access to the electricity power lines Enforce way leave requirements for power lines	Ministry of Energy Ministry of Energy KLPC	Continuous	Minimal
Compensation and relocation of project affected persons	Operation	Make the respective land acquisition and easements contracts with each land owner prior to the start of the project	Ministry of Energy	Continuous	Use Government compensation rates
Cultural diffusion	Operation	Facilitate promotion of cultural preservation	Ministry of Energy	Continuous	Minimal - as part of CSR Policy
Impact of power transmission lines on migratory fauna	Construction	Selection of right of way that avoids sensitive habitats Use of common corridors to minimise impacts on undisturbed areas	Ministry of Energy Contractor	Continuous	Visit to the site by an ecologist immediately prior to construction to confirm the presence of migratory species

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Monitorable Indicators / Cost Estimates (KShs.)
Terrestrial habitat alteration and disruption	Construction	Installation of transmission lines above existing vegetation Re-vegetation of disturbed areas with native plant species Removal of invasive plant species during routine vegetation maintenance	Contractor	Continuous	Minimal
Impact on public health as a result of EMF radiation	Operation	Evaluate potential exposure to the public against the ICNIRP reference levels	Proponent	Continuous	Internal – as part of annual environmental audit
Avian and bat collisions/electrocutions	Operation	Cover energised parts and hardware Install visibility enhancement objects Maintain a 1.5 m spacing between energised components and grounded hardware	Proponent	Continuous	Minimal
RoW maintenance	Operation	Schedule maintenance to avoid breeding and nesting seasons Avoid clearing in riparian areas Avoid use of machinery in the vicinity of watercourses Observe manufacturer machinery and equipment guidelines	Proponent	Continuous	Minimal

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The primary objective of this project is to improve energy supply in the Country and there is acceptability and goodwill from the community living in the project area. However, there are significant environmental and social issues associated with the construction and operation of the proposed project. To that end, mitigation measures have been integrated in the components of the environmental management plan (EMP) in this report for consideration in the final design, construction and maintenance of the Dam.

The EIA and preparation of this Study Report was carried out to fulfil legal requirements, as outlined in the Environmental Management and Co-ordination Act (1999), and the Environmental (Impact Assessment and Audit) Regulations (2003).

Recommendations for corrective measures for the potentially significant and/or adverse environmental impacts and safety risks have been provided as an integral part of this EIA report.

Rigorous implementation of the Environmental Management and Monitoring Plan will facilitate the mitigation and/or prevention of potentially adverse environmental impacts.

Diligence on the part of the Contractor and proper supervision by the Proponent will be crucial for ensuring success of the EMP and for ensuring that the recommended measures are implemented throughout the design, construction and operational phases in order to avert any negative impacts

8.2 Recommendations

The benefits related with this project, mainly the security of energy supply in the Country, supersede the negative impacts and hence the justification for the raising. To that end, recommendations for corrective measures for the potentially significant and/or adverse environmental impacts, and safety risks, have been provided as an integral part of this EIA study report.

Rigorous implementation of the Environmental Management Plan will facilitate the mitigation or prevention of potentially adverse environmental impacts. Diligence on the part of the contractor and proper supervision by the project proponent will be crucial for ensuring success of the EMP and for ensuring that the recommended measures are implemented throughout the design, construction and operational phases to avert any negative impacts.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place and the importance of this Dam, the development of this project is considered strategic and beneficial and should therefore be allowed to proceed

A summary of the recommendations for the prevention and mitigation of potentially adverse environmental and socio-economic impacts are stated below:

(i) Ensure the sentiments expressed by the community under this report are integrated in the implemented plan of the project, especially where aspects of social interest are concerned;

(ii) Institute effective communication, education and awareness towards the project beneficiaries for enhanced acceptability and social harmony;

(iii) Ensure proper design and construction methods in relation to borrow pits, roads and excavations during construction;

(iv) The Proponent should rehabilitate all sites that are may be used for construction activities such as camps, sites for storage materials and any paths, tracks that may be established during the construction phase;

(v) The Proponent should ensure the selection of right of way that avoids sensitive habitats;

(vi) Use of common corridors to minimize impacts on undisturbed areas;

(vii) Minimal clearing and disruption to riparian vegetation;

(viii) No uncontrolled burning to be carried out;

(ix) Regular maintenance of site equipment and machinery to detect and control leaks;

(x) The transmission lines should be installed above existing vegetation to avoid land clearing;

(xi) Any disturbed areas should be re-vegetated with native plant species;

(xii) Movement of heavy construction traffic should be planned appropriately;

(xiii) Provide PPE for workers and safety warnings for the public during construction;

(xiv) Ensure strict access controls to the electricity power lines once operational;

(xv) Enforce way leave requirements for the power lines;

(xvi) Only allow trained and certified workers to install, maintain and repair electrical equipment;

(xvii) Ensure that structures are tested for integrity prior to commencing work;

(xviii) Evaluate potential exposure to the public against the reference levels developed by ICNIRP;

(xix) The Proponent should make the respective land acquisition and easements contacts with reach land owner before the project can start; and

(xx) Consultations should be held with regulatory air traffic authorities prior to installation.

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ANNEXES