ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT REPORT FOR PROPOSED TWO 250 KW WIND TURBINES AT MARSABIT

JUNE 2010
CERTIFICATION:

Client: The Kenya Power & Lighting Company Limited
Assignment: To carry out an Environmental & Social Impact Assessment of the proposed two 250 KW Wind Turbines at Marsabit

Project Cost: The project cost is Euros 1,765,696.24 (Euros One Million, Seven Hundred Sixty Five Thousand, Six Hundred and Ninety six Cents twenty four only) and KES. 17,028,107.00 (KES Seventeen Million, Twenty Eight Thousand, One hundred and Seven only).

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EXECUTIVE SUMMARY

Introduction and Study Objectives
The KPLC intends to install and commission two 250 KW Wind Turbines at Marsabit to efficiently and safely generate 500 KW of green power to its off-grid system. Under The Least Cost Power Development Plan 2010-2030, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150MW. The national economic growth for Kenya is on upward trajectory as exemplified by the economic performance of 2009 that recorded 2.6 percent. The country’s economy is projected to grow between 4 percent and 5 percent for 2010 - 2011 financial year. It is anticipated that the economic growth pattern will surpass the economic growth pattern witnessed before December 2007 of 7.1 percent as the country gears towards the realization of vision 2030. Significant effect of this growth is notable in agriculture, tourism and construction among others. Considering that electricity demand is derived demand that is heavily influenced by the economic performance of the country, there is need to plan for sufficient electricity capacity additions to meet the growth aspirations of the Vision 2030.

The national planning stakeholders, who include amongst others, the Ministry of Energy, The KPLC, Kenya Electricity Transmission Company (KETRACO), Kenya Energy Generating Company (KenGen) and Energy Regulation Commission (ERC) have carried out the country’s power demand projections for the medium term. The results indicate a need for capacity enhancement to satisfy the projected demand.

Marsabit town and its environs has 1500 KPLC customers with projected connections of 270 new customers per annum. The source of Electricity is Thermal Generation from a set of Diesel Generators which burn on average 1000 litres of Industrial Diesel Oil (IDO) per day. Diesel generators pollute the environment through exhaust emissions of particulate matter, green house gases (Cox and Sox) Ozone Depleting substances (Nox), noise pollution, and can cause contamination of soils and water in case of oil spills.

KPLC intends to install two 250 KW wind Turbines in Marsabit on Kofia Mbaya hill which lies along the Kenya wind corridor which runs from Tana-river through Garissa, Wajir and Marsabit. Marsabit records average wind speeds of 381.5 Kilometers per day. The Diesel Generators have an installed capacity of 1200 KW and the maximum demand is currently 740 KW. This should allow for expansion and the proposed wind project comes in handy to meet the increasing power demand as well as enhancing environmental conservation.
The study objectives were to:
- Conduct an Environmental Impact Assessment to identify both positive and negative impacts of the proposed project and propose most appropriate interventions during construction, operation and decommissioning of the project;
- Collect baseline socioeconomic data of the project area and potential impacts expected from project construction, implementation, operation and decommissioning;
- Develop an Environmental Monitoring Program during construction and operation and present plans to minimize, mitigate, or eliminate negative effects and impacts;
- Develop Environmental Management Plan implementation mechanisms;
- Identify and contact stakeholders to seek their views on the proposed project;

Scope Objective and Criteria of the Environmental & Social Impact Assessment (ESIA)

The Government of Kenya policy on all new projects, programs or activities requires that an Environmental Impact Assessment is carried out at the planning stages of any proposed undertaking. The scope of this Environmental Impact Assessment, therefore, covers:
- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Public participation
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Development of an Environmental Management Plan outline.

The scope covered various activities related to; construction works of the proposed development which included all works of civil, mechanical, electrical or other nature necessary to construct, commission and decommissioning of the wind power project.

Terms of reference:
- Establish the suitability of the proposed location to set up two 250 KW Wind turbines to utilize optimally the wind to efficiently and safely generate and evacuate 500KW of electric power to The KPLC Off-grid system.
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
• A description of the technology, procedures and processes to be used, in the implementation of the project.
• A description of materials to be used in the construction and implementation of the project, the products, by-products and wastes to be generated by the project.
• A description of the potentially affected environment.
• Carry out ambient air quality, noise levels and soil quality baseline measurements.
• A description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
• To recommend a specific environmentally sound and affordable wastes’ management system.
• Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
• Analysis of alternatives including project site, design and technologies.
• Development of Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
• Provide an action plan for the prevention and management of the foreseeable hazardous activities in the cause of the project cycle.
• Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management of emergencies.
• An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
• An economic and social analysis of the project.

Study Methodology
This study was carried out through desktop studies and field investigations. The experts conducted extensive literature review relevant to this project. During the field investigation, reconnaissance survey was conducted to gather information on biophysical and socio-economic aspects of the area and its environs.

In order to address these issues the study team adopted a participatory approach where the client and the immediate surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes, design and relevant project documents. Among the key activities undertaken during the assessment were:
Interviews and consultations with stakeholders and the immediate neighbouring land users. Questionnaires were circulated to obtain their honest opinion regarding the project (samples have been annexed to this report),

Review of documents with necessary information on the proposed project, the site planning and implementation plan as well as the desired structural design.

Physical inspections of the proposed site and photography,

Evaluation of the activities around the site and the environmental setting of the wider area, through review of existing information, literature and physical observations.

The Environmental considerations evaluated for the proposed development include: Ecological considerations (biological diversity, sustainable use of ecological resources and ecosystem maintenance), social considerations (economic impacts, social cohesion or disruption, effects on human health, immigration or emigration, communication and effects on culture and objects of cultural value), Landscape considerations (views opened up or closed, visual impacts, compatibility with surrounding areas and amenity opened up or closed) and land use considerations (water sources, effects of proposal on surrounding land use potentials and possibility of multiple uses).

The proposed project will involve supply, installation and commissioning of two 250 KW Wind Turbines at Marsabit. The proposed project site is a 2.7 hectares parcel of land on Kofia Mbaya hill at Marsabit approximately three Kilometres from Marsabit town. Preliminary works include construction of all necessary temporary facilities and utilities including fencing, gate and a Guard house. The contractor is expected to source civil work parts, transformers, full wind turbines components, tools, electrical equipment, and delivery to project site. Contractor will undertake Civil works on site including construction of site tracks and drainage, drilling and concrete works, Wind turbines assembly, fitting gin pole erection, loading test, tower supports and verticality, Aero generator preparation and assembly on towers, cover bracket, blades installation, transformers installation, wiring, testing, turbines electrification, evacuation of Electricity through transmission line to control room and testing before it is ejected into the existing off-grid system. Post construction clean-up, restoration and landscaping of site will be done followed by commissioning of the project. The project Life span is targeted to be twenty years after which major renovations or project overhaul or if need be decommissioning.

The project cost is Euros 1,765,696.24 (Euros One Million, Seven Hundred Sixty Five Thousand, Six Hundred and Ninety six Cents twenty four only) and KES. 17,028,107.00 (KES Seventeen Million, Twenty Eight Thousand, One hundred and Seven only).
Public Consultation

Consultations were undertaken as part of the ESIA in order to obtain the views of stakeholders, their concerns and suggestions towards sustainable implementation of the project. Members of the immediate community, interested and affected persons within the immediate area to be influenced by the project were consulted. The consultation was done through a stakeholder consultative meeting, structured project screening forms, household visits and administration of Public participation questionnaires.

PROJECT POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

Both positive and negative impacts that are associated with the proposed Wind Turbines Project during the construction phase, operation phase and decommissioning phase were identified. The following positive and negative impacts are associated with the proposed project.

Positive Impacts

- Reduction in environmental pollution as it displaces thermal electricity.
- Direct and indirect skilled and non-skilled employment opportunities.
- Gains in the local and national economy and increase in revenue.
- Provision of market for supply of construction materials.
- Informal sectors benefits.
- Optimal use of land and existing natural resource (wind).
- Improvement in security as a result of increased lighting.
- Improvement in social infrastructures.
- Acceleration of the investment process in the region.
- Reduction in pressure on biomass which comes from forest resources.
- Improved communication

Negative Impacts

Against the background of the above positive impacts, there will be negative impacts emanating from the construction and subsequent operation activities of the Wind Turbines. The negative impacts will include:

- Visual intrusion
- Cultural exchange
- Possibility of increased incidence of disease transmission
- Increased risk of accidents - Occupational hazards & Small aircraft collisions
- Loss of habitat
- Destruction of flora and fauna
- Soil erosion and siltation
- Ecological Pollution from lubricating oils & light red pollution (aircraft warning red light)
- Increase in noise levels
- Birds’ mortality through collisions
- Solid waste generation
- Dust pollution
- Stress on local infrastructure
- Affect Radio Waves Transmission
- Fire Outbreaks

**SUMMARY OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)**

<table>
<thead>
<tr>
<th>Environmental Impact</th>
<th>Recommended Mitigation Measures</th>
<th>Time Frame</th>
<th>Responsible Party</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraction of Raw Materials</td>
<td>Source Raw Materials from NEMA approved sites</td>
<td>C &amp; D</td>
<td>Proponent &amp; Contractor</td>
<td>Included in contract</td>
</tr>
<tr>
<td></td>
<td>Ensure accurate budgeting to ensure only Necessary material is ordered</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>Included in contract</td>
</tr>
<tr>
<td></td>
<td>Proper storage to ensure minimal lose</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>Included in contract</td>
</tr>
<tr>
<td></td>
<td>Use recycled and recyclable materials where possible</td>
<td>C</td>
<td>Contractor</td>
<td>-</td>
</tr>
<tr>
<td>Vegetation Clearance, disturbance and Habitat Loss</td>
<td>Ensure Proper demarcation and clear only necessary areas</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>500000</td>
</tr>
<tr>
<td></td>
<td>Specify Parking, Loading and Off loading Zones within the site</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Design and Construct access road</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td>Use equipment designed with Noise Control Elements</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Limit Vehicles and equipment to minimum idling limits</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Set and Observe speed Limits and avoid raving of engines</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Observe and Comply with NEMA’s 2009 Noise and Vibration Regulations</td>
<td>C, O &amp; D</td>
<td>Contractor and Proponent</td>
<td>50000</td>
</tr>
<tr>
<td>Exhaust Emissions</td>
<td>Minimize Vehicle Idling</td>
<td>C, O &amp; D</td>
<td>Contractor</td>
<td>-</td>
</tr>
<tr>
<td>Environmental Impact</td>
<td>Recommended Mitigation Measures</td>
<td>Time Frame</td>
<td>Responsible Party</td>
<td>Cost (Ksh)</td>
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</tr>
<tr>
<td></td>
<td>Maintain Vehicle and powered equipment in a good state of repair</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Cost of the contract</td>
</tr>
<tr>
<td></td>
<td>Fuel and Lubricants to be of standardized quality and sourced from approved suppliers</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td>Dust</td>
<td>Sprinkle water on loose surface as necessary during access road construction</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Personal Protective Equipment to be provided and used appropriately</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td>Increased Water Demand</td>
<td>Sensitize staff on efficient water use</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td>Oil Spills</td>
<td>Any service/ Repair of vehicles to be done offsite in approved garages or service stations</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Vehicle and Equipment to be in a good state of repair</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Proper storage of oil and careful refilling of Transformers</td>
<td>O</td>
<td>Proponent</td>
<td>100000</td>
</tr>
<tr>
<td></td>
<td>In case of contamination, scoop and dispose off soil appropriately</td>
<td>O</td>
<td>Proponent</td>
<td>50000</td>
</tr>
<tr>
<td>Encroachment</td>
<td>NEMA and Marsabit County Council to carry out an EIA of Kofia Mbaya hills and advise on sustainable land use and address the issue</td>
<td>NEMA &amp; Marsabit County Council</td>
<td>2 Months</td>
<td>-</td>
</tr>
<tr>
<td>Avi - Fauna Mortalities</td>
<td>Use of reflective colours for greater visibility</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Ensure Wind Turbines not set on Migratory Paths</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Regular Monitoring and record any Avi - Fauna deaths</td>
<td>O</td>
<td>Proponent</td>
<td>40000</td>
</tr>
<tr>
<td>Fire Hazards</td>
<td>No burning of any litter/ cleared vegetation on site</td>
<td>C</td>
<td>Contractor</td>
<td>Part of the contract</td>
</tr>
<tr>
<td></td>
<td>Avoid Careless handling of cigarette butts</td>
<td>C &amp; O</td>
<td>Contractor / Proponent</td>
<td>-</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>Ensure provision and proper use of Personal protective Equipments</td>
<td>C, O &amp; D</td>
<td>Contractor / Proponent</td>
<td>100000</td>
</tr>
<tr>
<td></td>
<td>Follow safe work procedures</td>
<td>C &amp; O</td>
<td>Contractor / Proponent</td>
<td>50000</td>
</tr>
<tr>
<td></td>
<td>Use trained and skilled labour</td>
<td>C, O &amp; D</td>
<td>Contractor / Proponent</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Staff Training and regular equipment service and testing</td>
<td>O</td>
<td>Proponent</td>
<td>500000</td>
</tr>
<tr>
<td></td>
<td>Maintain a fully stocked and accessible first aid kit</td>
<td>C, O &amp; D</td>
<td>Contractor / Proponent</td>
<td>50000</td>
</tr>
<tr>
<td></td>
<td>Observe OSHA 2007 regulations</td>
<td>C, O &amp; D</td>
<td>Contractor / Proponent</td>
<td>-</td>
</tr>
<tr>
<td>Decommission</td>
<td>Redeployment in suitable placements</td>
<td>After D</td>
<td>Proponent</td>
<td>-</td>
</tr>
</tbody>
</table>
Proposed two 250 KW Wind Turbines at Marsabit

<table>
<thead>
<tr>
<th>Environmental Impact</th>
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<th>Time Frame</th>
<th>Responsible Party</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ing and Staff layout</td>
<td>within the Company</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adequate Compensation</td>
<td>After D</td>
<td>Proponent</td>
<td>As per Working Terms</td>
</tr>
<tr>
<td></td>
<td>Inform affected staff in good time and Counselling</td>
<td>D</td>
<td>Proponent</td>
<td>100000</td>
</tr>
</tbody>
</table>

Key:-
PC : Pre-Construction
C: Construction
O: Operation
D: Decommissioning

Conclusion and Recommendations

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

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

It is quite evident from this study that the construction and operation of the proposed two 250 KW Wind turbines will bring positive effects in the project area including Reduction of Environmental pollution, improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, Informal sectors benefits, Increase in national industrial production, Increase in revenue, Improvement in the quality of life for the workers and residents, Optimal use of land, wind and Improved security.

However, although the project will bring various positive impacts, negative impacts will also be experienced hence the need to address and mitigate them.
It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the wind power Turbines, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and may be allowed to proceed.
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<th>Full Form</th>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon Monoxide</td>
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<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
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<tr>
<td>DELDO</td>
<td>District Environment &amp; Land Development Officer</td>
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<td>DO</td>
<td>District Officer</td>
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<tr>
<td>DC</td>
<td>District Commissioner</td>
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<td>EA</td>
<td>Environmental Audit</td>
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<td>Environmental Impact Assessment</td>
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<td>ERC</td>
<td>Electricity Regulatory Commission</td>
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<td>ESIA</td>
<td>Environmental &amp; Socio-economic Impact Assessment</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>EMCA</td>
<td>Environmental Management and Coordination Act, 1999</td>
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<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<td>ESMP</td>
<td>Environmental and Social Monitoring Plan</td>
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<td>GHGs</td>
<td>Green House Gases</td>
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<td>HEP</td>
<td>Hydro Electric Power</td>
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<tr>
<td>HVF</td>
<td>Heavy Vehicle Fuel</td>
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<td>IDO</td>
<td>Industrial Diesel Oil</td>
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<tr>
<td>KenGen</td>
<td>Kenya Energy Generating Company</td>
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<td>KPLC</td>
<td>Kenya Power &amp; Lighting Company</td>
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<tr>
<td>KETRAC O</td>
<td>Kenya Electricity Transmission Company</td>
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<tr>
<td>KV</td>
<td>Kilo Volt</td>
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<tr>
<td>KVA</td>
<td>Kilo Volt Amps</td>
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<tr>
<td>KW</td>
<td>Kilo Watt</td>
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<td>KWS</td>
<td>Kenya Wildlife Service</td>
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<tr>
<td>L.R</td>
<td>Land Registration</td>
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<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
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<td>NEMA</td>
<td>National Environment Management Authority</td>
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<td>NOx</td>
<td>Oxides of Nitrogen</td>
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<tr>
<td>PM</td>
<td>Particulate Matter</td>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<tr>
<td>SEM</td>
<td>Sustainable Environmental Management</td>
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<tr>
<td>SOx</td>
<td>Oxides of Sulphur</td>
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<tr>
<td>SHE</td>
<td>Safety Health and Environment</td>
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<td>STD</td>
<td>Sexually Transmitted Diseases</td>
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1 CHAPTER ONE: INTRODUCTION

1.1 Project Background

KPLC intends to install and commission two 250 KW Wind Turbines at Marsabit to efficiently and safely generate 500 KW of green power to its off-grid system. Under The Least Cost Power Development Plan 2010-2030, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150MW. The national economic growth for Kenya is on upward trajectory as exemplified by the economic performance during the first quarter of 2009 that recorded an economic growth of 3.6%. It is anticipated that the economic growth pattern will surpass the economic growth pattern witnessed before December 2007 of 7.1% as the country gears towards the realization of vision 2030. Significant effects of this growth are notable in agriculture, tourism and construction among others. Considering that electricity demand is derived demand that is heavily influenced by the economic performance of the country, there is need to plan for sufficient electricity capacity additions to meet the growth aspirations of the Vision 2030.

The national planning stakeholders, who include amongst others, the Ministry of Energy, KPLC and Energy Regulation Commission (ERC) have carried out the country’s power demand projections for the medium term. The results indicate a need for capacity enhancement to satisfy the projected demand.

Marsabit town and its environs has 1500 KPLC customers with projected connections of 270 new customers per annum. The source of Electricity is Thermal Generation from a set of Diesel Generators which burn on average 1000 litres of Industrial Diesel Oil (IDO) per day. Diesel generators pollute the environment through exhaust emissions of particulate matter, green house gases (COx and SOx) Ozone Depleting substances (NOx), noise pollution, and can cause contamination of soils and water in case of spills.

KPLC intends to install two 250 KW wind Turbines in Marsabit on Kofia Mbaya hill which lies along the Kenya wind corridor which runs from Tana-river through Garissa, Wajir and Marsabit. Marsabit records average wind speeds of 381.5 Kilometers per day.

The Diesel Generators have an installed capacity of 1200 KW and the maximum demand is currently 740 KW. This should allow for expansion and the proposed wind project comes in handy to meet the increasing power demand as well as enhancing environmental conservation.

The ESIA was conducted to assess any potential impacts (both negative and Positive) that may arise from the construction, operation and decommissioning of the proposed wind Turbines. The goal of the ESIA is to enhance sustainability of vital ecosystem, to improve or restore ecosystem health and biodiversity. Environmental sustainability in relation to the proposed wind power generation project will be enhanced by designing the wind turbines such that they can optimize the electrical power output under available wind speeds and generated power can efficiently be evacuated to existing off - grid system that will give competitive advantage over existing Diesel Generators. The overall benefits of the proposed Wind power system are expected to outweigh the potential negative impacts. The aim of the ESIA is to enable National Environment Management Authority (NEMA), the Public, Local and...
the relevant government Authorities and the Proponent to consider the potential environmental consequences of the proposal, and to make recommendations to reduce the environmental consequences if necessary. This ESIA in essence provides the basis for sound ongoing Environmental Management.

1.2 Scope and Objectives of the Study

The National Environment Management Authority (NEMA) Policy on all new projects, programs or activities requires that an Environmental Impact Assessment is carried out at the planning stages of any proposed undertaking that is out of character with the host environment to ensure that Potential environmental and social impacts are taken into consideration during the design, construction, operation and decommissioning of the facility.

1.2.1 Scope

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

The assessment was undertaken in full compliance with the Environmental Management and Coordination Act 1999 and also the Environmental Impact Assessment and Audit Regulations, 2003. In addition, appropriate sectoral legal provisions relevant to such projects have also been referred to for the necessary considerations during the construction, commissioning operation and decommissioning of the proposed Wind Turbines.

Specific objectives of the study included the following:

- Present an outline of the project background,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,
- Identify key areas for environmental, health and safety concerns as well as the anticipated impacts associated with the proposed project implementation and commissioning,
- Establish a comprehensive environmental management plan covering the construction, operation and decommissioning phases of the project,
- Preparation of a comprehensive Project Report in accordance with the local environmental legislation and submission to NEMA for further instructions and/or approval.

The ESIA scope largely covered the following areas:

(1) Baseline Conditions:
- Environmental setting (climate, topography, geology, hydrology, ecology, water resources, sensitive areas, baseline noise levels, air quality and soil quality analysis.
• Socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
• Infrastructural issues (roads, water supplies, drainage systems, electricity distribution system, etc.).

(2) Legal and policy framework:
• Focusing on the relevant national environmental laws, regulations and by-laws and other laws and policies focusing on allied activities relative to the proposed project.

(3) Interactive approach was adopted for the immediate neighbourhood in discussing relevant issues including among others:
• Land use aspects,
• Neighbourhood issues,
• Project acceptability,
• Social, cultural and economic aspects,

(4) Environmental impacts:
• Physical impacts,
• Biological impacts,
• Legal Compliance.

1.2.2 Terms of Reference (ToR) for the ESIA Process
The ESIA Experts were assigned the task of carrying out Environmental and Social Impact Assessment of the proposed wind power project in Marsabit. The scope covered various activities related to; construction works of the proposed development which included all works of civil, mechanical, electrical or other nature necessary to construct, commission and decommissioning of the wind power project. The output of this work is a comprehensive Environmental and Social Impact Assessment Report which will aid NEMA in deciding whether to approve or disapprove installation and operation of the wind power Project as well as meeting the requirements of the World Bank Environmental and Social Safeguard Policies.

The ESIA experts conducted the study by using the following terms of reference:

• Establish the suitability of the proposed location to set up two 250 KW wind turbines
• A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
• A description of the technology, procedures and processes to be used, in the implementation of the project.
• A description of materials to be used in the construction and implementation of the project, the products, by-products and waste to be generated by the project.
• A description of the potentially affected environment.
• A description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
• Analysis of alternatives including project site, design and technologies.
• Development of an Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
• Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the course of project construction, operation and decommissioning.
• Propose measures to prevent health hazards and to ensure safety in the working environment for the employees and the neighbouring community.
• An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
• An economic and social analysis of the project.

1.2.3 ESIA Approach and Methodology

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the Environmental Impact Assessment and Audit Regulations, 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning.

In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, informal interviews with a random sample of people from the surrounding community, use of public participation forms, site checklist, photography, and discussions with other stakeholders.

The key activities undertaken during the assessment were:

⇒ Continuous discussions with the stakeholders and accessing other sources of information on the proposed project details, the site planning and implementation plan,
⇒ Physical inspection of the proposed site, photography, and interviews with people in the immediate neighbourhood. Public participation forms were used to record their opinion regarding the project (samples have been annexed to this report).
⇒ Evaluation of the activities around the site and the environmental setting of the wider area. This was achieved through existing information, literature and physical observations,
⇒ Review of available documentation,
⇒ Reporting, review and submissions.

Below is an outline of the basic ESIA steps that were followed during this assessment:
Step 1 : Project Concepts

The project details, scope, design, implementation, tests, commissioning were first analyzed.
Step 2: Terms of Reference (ToR)

The terms of Reference were developed guided by EMCA 1999 and The Environmental Impact Assessment/ Audit regulations 2003. Any new developments out of character with their surrounding must have an EIA undertaken; for review, Approval and Licensing by NEMA.

Step 3: Project Screening

Details about baseline conditions and potential environmental and social impacts was collected through desktop study, stakeholder consultations, site visits, photography, and inductive methods.

Step 4: Identification of Potential Environmental and Social Impacts

The Potential Environmental impacts were identified, Classified and magnitude determined.

Step 5: Impact Assessment and Consultations

The Environmental and Social Impacts were analyzed, assessed and discussed in details involving consultations with the Proponent, Contractor and other stakeholders.

Step 6: Formulation of Mitigation measures

Mitigation measures to ameliorate or minimize the potential Environmental and Socio-economic impacts were formulated for the entire project life.

Step 7: Development of an Environmental & Social Management and Monitoring Plan:

An E&SMP for the project life was development indicating parameters to be monitored, persons responsible, timing and costs involved.

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

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

Figure 1: Summary of ESIA procedure
CHAPTER TWO: PROJECT DESCRIPTION

2.1 Site Location Characteristics
Marsabit District is situated in Eastern province, Kenya and the geographical coordinates for Marsabit town are 2° 20’ 0” North, 37° 59’ 0” East. The proposed wind Turbines will be installed at Kofia Mbaya hills located approximately 3 Kilometers from Marsabit town. The Google map below gives the coordinates and parameters of the project site with M showing an existing KenGen Mast on project site with coordinates 2° 20’ 02” North, 37° 58’ 28” East within the project site marked by Markings A, B, C, &D. The two Wind Turbines will be installed within the project site marked by A, B, C & D and will be 55 meters from the ground Surface. The area is steep sloping and from the top of the hill the height of the Turbines will be 39 Metres.

Figure 2: Google Map showing proposed site and Coordinates
Currently the project site has an old non functioning Wind Master (background on photo below) that was commissioned on June 1991 and broke down in 2004.

![Figure 3: Photo showing proposed project site on Kofia Mbaya hill at Marsabit](image)

The project site is fenced but there are three households proximal to the fenced plot. Eight plots touching the fence will be affected. One household headed by a single lady with eight dependants will be most affected with initial designs showing guy ropes being anchored about 10 meters from her house.

### 2.2 Nature of the Project

The two 250 KW Wind Turbines will utilize optimally the wind to efficiently and safely generate and evacuate at least 500 KW of electricity to the KPLC off-grid system under conditions prevailing on Site over a period of at least 20 years using modern generating and control equipment. The works shall conform to current best practice in the international wind industry in all respects. The wind Turbines will incorporate appropriate design for off-grid operation so as to take care of small loads during off-peak and maximum and efficient
utilization of wind energy as well as maximum saving on maintenance costs. (Refer to Annex II for Proposed wind Turbines Layout Plan). The Wind Turbines mast will be fifty-five (55) metres above ground level and thirty-nine Metres from the top of the Kofia Mbaya hill. The rotor blades will be expected to utilize wind speeds in the area which are at an average speed of 381.5 Kilo meters per day as per Marsabit District Development Plan 2002-2008.

The wind turbines will be connected to generators mounted on top of the masts and the total Voltage generated will be 11 kV -550 KW and power generated will be 315 KVA for each or the two Transformers before it is Transmitted to the Control Station for evacuation into the existing off-grid system. This will be a boost and an alternative source of electricity relieving the existing Thermal diesel Generator and contributing immensely towards environmental conservation. Wind Power is Green Energy and in Kenya it is not adequately harnessed yet the country has a massive Potential. Projects of similar nature are in progress in the country. The greatest is Lake Turkana Wind Power Project which once completed will generate 300 MW and will supply up to 25% of the current electricity demand. The Lake Turkana Wind Power Project is forecast to reduce carbon emissions by 16 million tons, thus gaining valuable carbon credits. The Proposed two 250 KW Wind Turbines for Marsabit will be expected to meet at least 40% of Marsabits’ energy demand and this would translate to great savings regarding quantity of fuel burnt for thermal generation. This prompted some of the stakeholders in the consultative meeting held on May 12th, 2010 to question whether Marsabit could qualify for Carbon credits once the Turbines become operational.

The site installations will include:
- Two 250 KW wind Turbines complete with:
  - Rotor blades
  - Complete Switch gear
  - Air Circuit breakers
  - Protection relays
  - Auxiliary Relays
- Energy meters
- Anti Vermin Guards protecting cables from rodents etc.
- Bus Bar connections and their support
- Earthing Facilities
- Current Transformers
- Indicator Lamps
- Generator and feeder panels
- Any other equipment and spares that may be necessary.

2.3 Site Ownership
The proposed site is classified as trust land under the custody of Marsabit County Council. The KPLC will require 2.7 Hectares for the project. The area where the old wind Master was erected is fenced with a guarded gate but the fence is in a bad state of disrepair. KPLC is liaising with Marsabit County Council on documentation of the project sites’ parcel of land. (See annexed Reference Documents).
2.4 Project Justification

According to the Least Cost Power Development Plan 2010-2030, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150MW. The national economic growth has also been on upward trend-rising from 1.8% in 2003 to 5.8% in 2005. This was disrupted by 2007 Post election Violence with the economy slowly recovering and according to the 2010 Economic Survey released May 20, 2010, the economy is expected to grow between 4-5% in 2010 up from 2.6 percent growth recorded in 2009. Significant effects of this growth are notable in agriculture, tourism and construction among others. Considering that electricity demand is derived demand that is heavily influenced by the economic performance of the country, there is need to plan for sufficient electricity capacity additions to meet the growth aspirations of the Vision 2030.

The national planning stakeholders, who include amongst others, the Ministry of Energy, The KPLC and Energy Regulation Commission (ERC) have carried out the country’s power demand projections for the medium term. The results indicate a need for capacity enhancement to satisfy the projected demand. Marsabit is not connected to the National grid and relies on power generated from a set of Diesel Generators. Power from Fossil fuel burning is costly and has several negative environmental and Socio-economic impacts ranging from natural resource (Fossil oil deposits) depletion, consequential unpredictable tectonic plates movement and land capsizing and resultant socio-economic losses, green house gas emissions, Ozone Layer depleting substances, and Particulate matter emissions and associated climatic Change and ailments among other environmental pollutants like Noise, accidental oil spills and maintenance costs.

The KPLC plans to install two Wind Turbines to supplement the existing Diesel Generated power. Wind energy is green energy with minimal negative environmental and Socio-economic impacts and Green energy exploration is the direction to environmental conservation. Similar Green energy sources yet exploited to their potential in Kenya include Solar, Geothermal and Nuclear energy. These Green energy ventures will ensure continued supply of reliable electrical energy with minimal interruptions or rationing compared to one source reliance of Hydro Electric Power (HEP) which is prone to environmental catastrophes like Drought.

2.5 Project Activities

It is expected that the proposed site will undergo alteration during the construction process to install the Wind Turbines and associated structures. Safety protocol, established National and International Environmental Protection Regulations/ Standards shall guide the Contractor and project operator.

Modest construction procedures will be followed to reduce noise levels and the production of dust that may affect the neighbouring community.
2.5.1 Construction activities Outline

Construction activities will involve the following:
(i) The Contractor shall perform any site investigations in good time as may be necessary for the progress of design and construction on a sound engineering basis.
(ii) Site preparation (clearance of vegetation, preparation of a site office and store, Construction of a toilet, Guard house, fencing and Gate installation.
(iii) Supply of Civil work parts, transformers, full wind Turbines, tools, electrical equipment and delivery to project site.
(iv) Civil works on site including construction of access road, Drilling and concrete works.
(v) Wind Turbines assembly, fitting, gin pole erection, loading test, wiring, tower supports, verticality, Aero generator preparation, assembly on towers, cover bracket, blades installation, transformers installation, wiring, testing, turbines electrification, evacuation of Electricity through transmission line to control room and testing before it is ejected into the existing off - grid system.
(vi) Remedying of defects after functional tests
(vii) Throughout execution of the works, the contractor shall observe Safety and shall as appropriate, erect warning signs to warn on any potential hazards, ensure proper and efficient use of Personal Protective equipment (PPE) for all on site and observe safe work procedures.
(viii) Provision of spare parts, special tools and test equipment
(ix) Training of the proponents Operating and maintenance personnel
(x) Post construction clean - up, restoration and landscaping of site followed by commissioning of the Wind Turbines.
(xi) Throughout the project life, the Proponeent and Contractor shall adhere to all requirements of National Environmental Management Authority (NEMA) and any other applicable legislation regarding Environmental and Socio - economic impacts.

2.5.2 Input Materials

The Wind Turbines will be constructed in accordance with current best practice and procedures in the international wind industry that are not expected to compromise the safety of the neighbouring communities as well as the general environment and to ensure the longevity and efficient operation of the works. The following inputs will be required for construction:
(i) Two 250 KW wind Turbines complete with alternator, tower, Wind Turbine controls, Power cables.
(ii) Control Panel and Control cables
(iii) Air Circuit Breakers
(iv) Current Transformers
(v) Protection Relays, Auxiliary Relays and control devices
(vi) Earth Fault Relays
(vii) Ammeters
(viii) Raw construction materials e.g. sand, cement, and Ballast
(ix) Timber (e.g. doors and frames),
(x) Generator Sets,
(xi) A construction labour force (of both skilled and unskilled workers).
2.6 Project Budget

The project cost is Euros 1,765,696.24 (Euros One Million, Seven Hundred Sixty Five Thousand, Six Hundred and Ninety six Cents twenty four only) and KES. 17,028,107.00 (KES Seventeen Million, Twenty Eight Thousand, One hundred and Seven only).

2.7 Target Group for the ESIA Report

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

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

- Funding agencies and donors;
- Relevant government ministries and agencies;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the Wind Turbines;
- Contractor to be engaged in the construction works for the Wind Turbines;
- People to be involved in the management and operation of the Wind Turbines and associated infrastructures.
- The KPLC
3 CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA

This chapter gives the physical description of the project site in terms of position and size, topography, climate and soils.

3.1 Location

The site is located about three Kilometers from Marsabit Town in Marsabit District, Eastern Province of Kenya. Marsabit District borders Laisamis District to the South and North-West, Chalbi District to the North and South - East. The District lies between Latitudes 10°15’ North and 04°27’ North and Longitudes 36° East and 39°59’ East. The District lies between 300m to 900 M and is an extensive plain broken by melbergs and volcanic cones and calderas. The proposed site is located on a 2.7 hectare parcel of land along Kofia Mbaya hill approximately three Kilometers from Marsabit Town.

Figure 4: View of the proposed site. At the background is broken Old Wind Master and Transmission line. The forefront is the dilapidated access road.
3.2 **Site Neighbouring land-uses**

The proposed site is a trust land under Marsabit County Council. The area is a protected area but there are encroachments with settlements of small households doing subsistence crop (maize and beans) farming, small scale Khat growing, small scale livestock keeping in very small land parcels. The proposed project is compatible with the existing and proposed land uses factoring its minimal or insignificant effect to the existing environmental parameters.

3.3 **Topography**

The district has a variety of topographical features. The landscape is largely plain and lies between 300 and 900 meters above sea level and is surrounded by hills and mountain ranges. The district is characterized by hill masses formed from tertiary and quartiary volcanoes like Mt. Marsabit (1865 m) Karare Hills and Kofia Mbaya hills.

3.4 **Climate**

Rainfall in most parts is generally low, unreliable and unevenly distributed. Short rains are received in October and November while Long rains are received in March, April and May. Average rainfall is about 700 mm annually and less than 15000 hectares of the 2071.8 Square Kilometers of the district land is under cultivation due to unreliability of rainfall. Temperature varies between 18°C and 23°C with January and April being very hot, May to August relatively cool and September to December fairly hot. The average daily relative humidity for June is around 68%.

3.4.1 **Wind:**

The average daily wind speed is around 37 kph, that’s the equivalent to about 23 mph, or 20 knots. In recent years the maximum sustained wind speed has reached 119 kph, that’s the equivalent of around 74 mph, or 64 knots *(source: www.myweather2.com)*. The Wind speed in Marsabit District is 381.5 km per day *(Source: Marsabit District Development Plan 2002-2008)*. The Proposed Wind Turbines will be installed on Kofia Mbaya hill which lies along the Kenya Wind corridor which runs from Tana - river through Garissa, Wajir and Marsabit.

3.5 **Geological Setting and soils**

The high parts of Mt. Marsabit, hills and surrounding areas is characterized by volcanic rocks and volcanic soils which are well developed and have a high water retention capacity. On the slopes of the Mountain and hills; soils are Combisol and some other areas soils are moderately deep clay and rocky.

3.6 **Surface Hydrology and Groundwater**

Rainfall is inadequate and unreliable. Along the mountain area of Central Division where rainfall dominate, the volcanic soils have a good water retention capacity with a phyto – biomass formation of 0.5 - 2 % in the topsoil making the area agriculturally rich. The rest of the district is generally dry. The District has no permanent rivers but has springs at Songa...
and Badasa. Other Water bodies include Sorkote - Dikko and Lake Paradise found in Marsabit Forest. During rainy seasons a seasonal river is formed out of Badasa and Songa spring run-off. Ground water resources are low and saline because of the basement rock systems. Due to the increase in population and growing economic activity, water resources are becoming increasingly scarce.

3.7 Ecology (Fauna and Flora)

The district is divided into four Agro - Ecological zones namely sub - humid 111, Semi Arid 1V and V, and very Arid.

**Ecological Zone 111** covers Mountainous area of the district namely Mt. Marsabit, Karare hills and Kofia Mbaya hills. These Mountain areas have high rainfall and low evaporation rates which have induced dense ever green forest. These forests are extensive and serve as water catchment area. However some forested areas have been degraded. Below these forests lies a belt of vegetation characterized by deciduous thorn tree (5-15 high) and tall perennial grasses. This zone is suitable for agriculture and various horticultural crops including maize, beans, pawpaw, tomatoes, bananas and coffee are grown. The forest harbours Tree species like *Olea Africana*, *Croton Megalocarpus*, *Stombosia*, *Schefferi*, *Cassupourea molosona*, and *Diarphrus Abyssinia*. Wild animals found in the forest include Black Rhino (*Diceros bicornis*), Greater Kudu (*Tragelaphus strepsiceros*), Elephants (*Loxodonta africana*), Buffaloes (*Syncerus caffer*), Bush Bucks, lions, Bamboons, Leopards, Zebra (*Equus grevyi*), Grant Gazelle *Gazella granti*, Reticulated Giraffe and a variety of birds.

**Ecological Zone 1V** covers the low parts of Mt. Marsabit and the surrounding hills. It is suitable for Livestock grazing mainly cows, sheep and goats and sedentary cultivation of maize, millet, fruits and vegetables is also practiced.

**Ecological Zone V** mainly on the plains is characterized by acacia Commiphora, tufted and annual grasses and some other areas of dry rocky bare grounds.

![Figure 5: Photo of Missionaries Shirine and Mt. Marsabit Forest at the Background](image)
The proposed project area is fenced with tuft grass locally known as *luchole* and low lying shrubs mainly of edible fruit locally known as *Dagam*. Some poisonous fruits are also growing in the proposed project area in low lying shrubs. See Photo templates.

![Edible fruit (local Rendille name: Dagam)](image1) ![Poisonous fruit (Local Rendille name: Biqa)](image2)

**Figure 6: Fruits varieties in the project site**

### 3.8 Infrastructure

The district has limited coverage of classified roads, 62.7 km gravel surface and 37 km earth Surface roads which are frequently maintained by the ministry of roads. The earth surfaced roads are impassable during rainy seasons. Electricity from KPLC's Diesel Gensets is connected to the main town and its environs through the Off Grid Distribution System. The District has one District General Hospital, One Mission and three private health facilities. The health facilities experience shortage of staff, drugs and water.
3.9 Population

Marsabit District has a population of 37445 comprising of 18746 males and 18699 Females according to the 1999 population census. The Population was projected to increase to 48144 by 2008 and to a further 53886 by 2012. This rapid population growth will impact negatively on socio-economic development with increased demand in food, water, energy and shelter.
4 CHAPTER FOUR: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Introduction

There are many environmental problems and challenges in Kenya today. Among the cardinal environmental problems include: loss of biodiversity and habitat, land degradation, land use conflicts, human animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment.

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Development activities have the potential to damage the natural resources upon which the economies are based. Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound.

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

4.2 Environmental Policy Framework

Environmental Impact Assessment (EIA) critically examines the effects of a project on the environment. An EIA identifies both negative and positive impacts of any development activity or project, how it affects people, their property and the environment. EIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. EIA is basically a preventive process. It seeks to minimize adverse impacts on the environment and reduces risks. If a proper EIA is carried out, then the safety of the environment can be properly managed at all stages of a project-planning, design, construction, operation, monitoring and evaluation as well as decommissioning. The assessment is required at all stages of project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws.

4.3 Institutional Framework

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environment Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others.
4.3.1 National Environment Management Authority (NEMA)

The objective and purpose for which NEMA was established was to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. However, NEMA’s mandate is designated to the following committees:

4.3.2 Provincial and District Environment Committees

According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints Provincial and District Environment Committees of the Authority in respect of every province and district respectively. The Provincial and District Environment Committees are responsible for the proper management of the environment within the Province and District in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

4.3.3 Public Complaints Committee

The Committee performs the following functions:

• Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.

• Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and

• To perform such other functions and excise such powers as may be assigned to it by the Council.

4.3.4 National Environment Action Plan Committee

This Committee is responsible for the development of a 5-year Environment Action Plan among other things. The National Environment Action Plan shall:

• Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.

• Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.

• Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.

• Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.

• Set out operational guidelines for the planning and management of the environment and natural resources.

• Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist.
• Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts.
• Propose guidelines for the integration of standards of environmental protection into development planning and management.
• Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment.
• Prioritise areas of environmental research and outline methods of using such research findings.
• Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities and;
• Be binding on all persons and all government departments, agencies, States Corporation or other organ of government upon adoption by the national assembly.

4.3.5 Standards and Enforcement Review Committee
This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

4.3.6 National Environment Tribunal
This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

4.3.7 National Environment Council (NEC)

EMCA 1999 No. 8 part III section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organisations and such other organisations engaged in environmental protection programmes.

4.4 Kenyan Environmental Legal Framework
Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licences and sectoral laws. There was however need for a stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management and Coordination Act (EMCA) in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

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

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

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

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 a 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 a study be conducted in accordance with the issues and general guidelines spelt out in the Second and Third schedules of the Environmental Regulations (2003). 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.
Under EMCA 1999 NEMA has developed regulations to establish guidelines for better management of the environment and promote sustainable development. To date, the regulations presented in the following sections have been gazetted.

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

The Environmental Impact Assessment and Audit Regulations state in Part III Rule No. 6 that an Environmental Impact Assessment study shall be conducted in accordance with the terms of reference developed.

Part III Rule 16, takes into account environmental, social, cultural, economic, and legal considerations, and shall:

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

The Proponent has commissioned the Environmental Impact Assessment study in compliance with the Act. The environmental management and monitoring plan laid out in this report shall be adhered to by the Proponent.

b) Environmental Management and Coordination (Water Quality) Regulation 2006

These regulations are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 74, September 2006. The regulation applies to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

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

The regulations outline:

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

This Legal Notice on Water Quality provides that anyone who discharges effluent into the environment or public sewer shall be required to apply for Effluent Discharge License. The
license for discharge is Ksh 5,000 while annual license fee for discharge into the environment will be Ksh. 20,000 or Ksh 100,000 depending on the facility. Non compliance with the regulations attracts a fine not exceeding Ksh 500,000 and the polluter pay principle may apply depending on the court ruling. Table 4, gives Waste Water Discharge Guidelines from NEMA

Table 2: NEMA Waste Water Discharge Guidelines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Discharge into public sewers</th>
<th>Discharge into open water bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>-</td>
<td>6.0 - 9.0</td>
<td>6.0 - 9.0</td>
</tr>
<tr>
<td>BOD (5 days at 20° C) not to exceed</td>
<td>Mg/l</td>
<td>500</td>
<td>20</td>
</tr>
<tr>
<td>COD not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>50</td>
</tr>
<tr>
<td>Total suspended solids not to exceed</td>
<td>Mg/l</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>n-hexane extract not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>30</td>
</tr>
<tr>
<td>Oils (mineral, animal &amp; vegetable)</td>
<td>Mg/l</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Total phenol not to exceed</td>
<td>Mg/l</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Copper (Cu) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Zinc (Zn) not to exceed</td>
<td>Mg/l</td>
<td>5.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Lead (Pb) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Arsenic (As) not to exceed</td>
<td>Mg/l</td>
<td>0.2</td>
<td>0.002</td>
</tr>
<tr>
<td>Total Mercury (Hg) not to exceed</td>
<td>Mg/l</td>
<td>0.05</td>
<td>0.005</td>
</tr>
<tr>
<td>Alkyl mercury not to exceed</td>
<td>Mg/l</td>
<td>0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>PCB (Polychlorinated biphenyl) not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>0.003</td>
</tr>
<tr>
<td>Pesticides residues not to exceed</td>
<td>Mg/l</td>
<td>Nil</td>
<td>0.05</td>
</tr>
<tr>
<td>Sulphates not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>500</td>
</tr>
<tr>
<td>Dissolved manganese (Mn)</td>
<td>Mg/l</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Chromium (total)</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Chloride not to exceed</td>
<td>Mg/l</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Fluoride not to exceed</td>
<td>Mg/l</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>Coliform bacteria</td>
<td>-</td>
<td>-</td>
<td>1000/100ml</td>
</tr>
<tr>
<td>Free ammonia not to exceed</td>
<td>Mg/l</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Sulphides (S) not to exceed</td>
<td>Mg/l</td>
<td>2.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Cadmium (Cd) not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>Cyanide (CN) total not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Organic phosphorous not to exceed</td>
<td>Mg/l</td>
<td>30</td>
<td>1.0</td>
</tr>
<tr>
<td>Chromium six (Cr 6) not to exceed</td>
<td>Mg/l</td>
<td>0.5</td>
<td>0.005</td>
</tr>
<tr>
<td>Total dissolved solids not to exceed</td>
<td>Mg/l</td>
<td>3000</td>
<td>1200</td>
</tr>
<tr>
<td>Selenium (Se) not to exceed</td>
<td>Mg/l</td>
<td>1.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Nickel (Ni) not to exceed</td>
<td>Mg/l</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Barium (Ba) not to exceed</td>
<td>Mg/l</td>
<td>10</td>
<td>2.0</td>
</tr>
<tr>
<td>Temperature not to exceed</td>
<td>-</td>
<td>+/- 2° of the ambient temperature of the sewer</td>
<td>+/- 2° C of ambient temperature of the water body</td>
</tr>
<tr>
<td>Oil/ grease</td>
<td>Mg/l</td>
<td>No trace</td>
<td>Nil/ no trace</td>
</tr>
<tr>
<td>Toxic substances</td>
<td>Mg/l</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Odour</td>
<td>-</td>
<td>-</td>
<td>Not objectionable to the nose</td>
</tr>
<tr>
<td>Colour</td>
<td>-</td>
<td>-</td>
<td>Not objectionable to the eye or not to exceed 5 mg Pt/l</td>
</tr>
</tbody>
</table>


C) Environmental Management and Coordination (Waste Management) Regulation 2006

These regulations are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69, September 2006. These Regulations apply to all categories of waste as provided in the regulations. These include:

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

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

The regulation provides that a waste generator shall use cleaner production methods, segregate waste generated and the waste transporter should be licensed. The notice further states no person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by the National Environment Management Authority.

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

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

Additionally, these links provide for the local enforcement of the International Convention on Biological Diversity (CBD).

The proposed site has no rich biodiversity and there is no known rare or endangered species in the site.

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

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

This legislation gives caution to proponent and contractor on careless handling of fuels and possible consequences for failing to observe.
f) Environmental Management and Coordination, (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

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

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

These regulations are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 21, May 2009. These regulation prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. It also prohibits excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations. 
This regulation guides on permissible noise levels during construction, operation and decommissioning phases.

4.4.2 Public Health Act (Cap. 242)

This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others. The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases.

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 that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be 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.

The environmental management plan (EMP) advises the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost.
4.4.3 Local Government Act (Rev. 1998)

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

Section 160 helps local authorities ensure effective utilization of the sewages systems. Section 170, allows the right to access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers.

The Act under section 176 gives powers to local authority to regulate sewage 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 sewage 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”

Section 163 allows the County Council to prohibit all business, which may be or become a source of danger, discomfort, or annoyance due to their noxious nature through smoke, fumes, dust, noise, or vibrations. 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.

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 utilization 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 any 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.
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.

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

4.4.4 Physical Planning Act, 1996

The Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

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 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. At the same time, sub-section 5, re-enforce it further that, no licensing authority shall grant under any written law, a license for commercial use for which no development permission had been granted by the respective 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 it's original conditions.

The Proponent has applied for Development Permission from the local authority and has also commissioned an Environmental Impact Assessment study for approval by NEMA.

4.4.5 Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to involve the owners of any land affected by such plans.

The proponent is liaising with Marsabit District Planning officer to get clearance as concerns the intended project and existing development plans.

4.4.6 Water Act, 2002

The Act vests the water in the State and gives the provisions for the water management, including irrigation water, pollution, drainage, flood control and abstraction. It is the main legislation governing the use of water especially through permit system.
Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

The Water Act Cap 372 vests the rights of all water to the state, and the power for the control of all body of water with the Minister, the powers is exercised through the Minister and the Director of water resources in consultation with the water catchments boards, it aims at provision of conservation of water and appointment and use of water resources.

Part II Section 18 provides for national monitoring and information systems on water resources. Following on this, Sub-section 3 allows the Water Resources Management Authority to demand from any person, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept and the information thereof furnished to the authority on demand.

Section 25 of the Act requires a permit to be obtained for among others any use of water from a water resources, discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an Environmental Impact Assessment as per the Environmental Management and Coordination Act, 1999. The conditions of the permit may also be varied if the authority feels that the water so used is causing deterioration of water quality or causing shortage of water for other purposes that the authority may consider has priority. This is provided for under section 35 of the Act.

Section 73 of the Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorised to take. Under the Act, the licensee could be a local authority, a private Trust or an individual and the law will apply accordingly under the supervision of the Regulatory Board.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

Construction of access road will ensure leveling and soil erosion prevention measures. All construction, operation and decommissioning phases will take caution to contain oil spills to prevent soil and water pollution.
4.4.7 Energy Act of 2006

This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes. The Energy Act of 2006 replaced the Electric Power Act of 1997 and The Petroleum Act, Cap 116. The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. The Energy Act, 2006, also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006.

In this respect, the following environmental issues will be considered before approval is granted:

1. The need to protect and manage the environment, and conserve natural resources;
2. The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Licensing and authorisation to generate and transmit electrical power must be supported by an Environmental Impact Assessment Report (EIA) approved by NEMA.

Part IV Section 80(1) provides that a person shall not conduct a business of importation, refining, exportation, wholesale, retail, storage or transportation of petroleum, except under and in accordance with the terms and conditions of a valid licence.

Part IV Section 90 (1) stipulates that a person intending to construct a pipeline, refinery, bulk storage facility or retail dispensing site shall before commencing such construction, apply in writing to the Energy Regulatory commission for a permit to do so. The application shall: specify the name and address of the proposed owner; be accompanied by three (3) copies of plans and specifications and be accompanied by an Environmental Impact Assessment (EIA) Report.

Part IV section 91(1) stipulates that the Energy Regulatory Commission shall, before issuing a permit under section 90, take into account all relevant factors including the relevant government policies and compliance with Environment Management and Coordination Act, 1999 and in particular EIA report as per Impact Assessment and Audit Regulations 2003, the Physical Planning Act, 1996 and the Local Government Act.

Part iv section 100 (1) provides that it is an offence if a person being the owner or operator of a refinery, pipeline, bulk liquefied Petroleum gas or natural gas facility, service station, filling station or storage depot, fails to institute appropriate environmental, health or safety control measures. The offence if convicted, he/she shall be liable to a fine not exceeding two million shillings or to a maximum term of imprisonment of two years, or to both.

*The proposed project will be required to follow the guidelines set out in this Act.*
4.4.8 The Standards Act Cap 496

The Act is meant to promote the standardization of the specification of commodities, and code of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control.

The proponent will ensure that commodities and codes of practice utilized in the project adhere to the provisions of this Act.

All materials and spares used to construct the wind turbines will comply with the Standardized specifications and Certification.

4.4.9 Penal Code Act (Cap.63)

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighborhood or those passing along public way, commits an offence.

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

4.4.10 The Wildlife Conservation and Management Act, Cap 376


This Act provides for the protection, conservation and management of wildlife in Kenya. The provisions of this Act should be applied in the management of the project.

Part III Section 13 subsection (1) stipulates that any person who not being an officer of Kenya Wildlife Service hunts any animal in a National Park shall be guilty of a forfeiture offence and liable to a fine or imprisonment. Subsection 2 of the Act likewise provides that any person who, without authorisation conveys into a National Park, or being within the area thereof, in possession of, any weapon, ammunition, explosive, trap or poison, shall be guilty of a forfeiture offence.

The Act provides that no person is allowed to use any aircraft, motor vehicle or mechanically propelled vessel in such a manner as to drive, stampede or unduly disturb any protected
animal or game animal. Therefore it will be prudent that the construction workforce is conversant with the provisions of this Act.

The proposed project is located within a conservation/protected area and this acts requirements will be observed.

4.4.11 The Lakes and Rivers Act Chapter 409 Laws of Kenya:

This Act provides for protection of rivers, lakes and associated flora and fauna. The provisions of this Act may be applied in the management of the project.

4.4.12 The Forestry Services Act, 2005

The Act led to the establishment of Kenya Forest Service which is charged with management of forests in consultation with the forest owners. The body enforces the conditions and regulations pertaining to logging, charcoal making and other forest utilisation activities.

To ensure community participation in forest management, the service collaborates with other organizations and communities in the management and conservation of forests and for the utilisation of the biodiversity.

Section 43 (1) provides that if mining, quarrying or any other activity carried out in the forest, where the activity concerned is likely to result in forest cover depletion, the person responsible shall undertake compulsory re-vegetation immediately upon the completion of the activity.

The proposed project is next to a conservation area (Mt. Marsabit National Park - Forest and provisions of this act will be observed.

4.4.13 Occupational Safety and Health Act, 2007

This is an Act of parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of the Act is to:

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

The Act provides that before any premises are occupied, or used as a workplace, a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the health, safety and welfare for employees at workplaces. This shall be considered at the construction, implementation and decommissioning phases of the project. The following are other provisions of the Act.
4.4.13.1 Health

The premise must be kept clean; a premise must not be overcrowded. The circulation of fresh air must secure adequate ventilation of workrooms. There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. There should also be sufficient and suitable sanitary conveniences separate for each sex, must be provided subject to conformity with any standards prescribed by rules. Food and drinks should not be partaken in dangerous places or workrooms. Provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving exposure to wet or to any injurious or offensive substances.

4.4.13.2 Safety

Fencing of premises and dangerous parts of other machinery is mandatory. Training and supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Floors, passages, gangways, stairs, and ladders must be soundly constructed and properly maintained and handrails must be provided for stairs. Special precaution against gassing is laid down for work in confined spaces where persons are liable to overcome by dangerous fumes. Air receivers and fittings must be of sound construction and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

4.4.13.3 Welfare

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all female workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting.

Every premise shall be provided with maintenance, readily accessible means for extinguishing fire and person trained in the correct use of such means shall be present during all working periods.

Regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible within normal working hours.

The (OSH) Act provides for development and maintenance of an effective programme of collection, compilation and analysis of occupational safety. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered.

The environmental management plan (EMP) advices the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost.

This Act provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc. In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken.

4.4.15 Occupiers Liability Act (Cap. 34)

This Act provides that it’s the duty of occupier of the 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.

4.4.16 The Radiation Protection Act (Cap 243 Laws of Kenya)

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

Since 1982, Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243) in November 1984 to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose.

The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed. The Act is administered by the Chief Radiation Protection Officer assisted by a Radiation Protection Board.

The proposed project won’t emit/produce ionizing radiations.

4.4.17 The Traffic Act Chapter 295 Laws of Kenya

This Act consolidates the law relating to traffic on all public roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users.
Many types of equipment and fuel shall be transported through the roads to the proposed site. Their registration and licensing will be required to follow the stipulated road regulations.

The Act also prohibits encroachment on and damage to roads including land reserved for roads. *The project will observe the provisions of the Act.*

### 4.4.18 The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)

Section 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent landowners seeking permission to construct the respective roads.

The project design concept has left the required road reserves and relevant road widening surrenders.

This Act consolidates the law relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including land reserved for roads.

*The proposed facility location complies with the provision of the Act. It is not on road reserves.*

### 4.4.19 The Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and may recover any expense incurred by the Government in so doing from the offender.

*The proposed site has some settlements proximal to the fence and some guy ropes supporting the wind masts may cross into some of the plots. This has to be addressed in liaison with Marsabit County Council.*
4.4.20  The Agriculture Act, Cap 318 of 1980 (revised 1986)

This Act has stated objectives to promote and sustain agricultural production, provide for conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with accepted practices of good land management and good husbandry.

*The proposed site is on a hill (Kofia Mbaya) and no agricultural activities will be done on site.*

4.4.21  Antiquities and Monuments Act, 1983 (Cap 215)

This Act aims to preserve Kenya’s national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums is the custodian of the country’s cultural heritage. Through the National Museums many of these sites are protected by law by having them gazette under the Act.

*The project site is an Aircraft Memorial site, One Warden in Stakeholder Consultative meeting held on 12th May 2010, urged the proponent to conserve the Memorial site.*

4.4.22  The Registration of Titles Act Cap 281

This Act provides for the transfer of the land by registration of tittles. Parts within the Act elaborate on mechanisms of bringing lands under the Act, and for related purposes. The Act also elaborates on the incorporation of group representatives and the administration of groups.

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

*The Proponent has applied for registration of the project site through Marsabit County Council. The area is Trust land. (See attached documents on land in Appendices section)*
4.4.23 The Land Titles Act Cap 282

The Land Titles Act Cap 282 section 10 (1) states that there shall be appointed and attached to the Land Registration Court a qualified surveyor who, with such assistants as may be necessary, shall survey land, make a plan or plans thereof and define and mark the boundaries of any areas therein as, when and where directed by the Recorder of Titles, either before, during or after the termination of any question concerning land or any interest connected therewith, and every area so defined and marked shall be further marked with a number of other distinctive symbol to be shown upon the plan or plans for the purposes of complete identification and registration thereof as is herein after prescribed.

The proponent has held consultative meetings with District Survey Office, land adjudication office and the Marsabit County Council over this issue.

4.4.24 The Land Acquisition Act Chapter 295 Laws of Kenya

The 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 do things such as survey upon necessary authorisation 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.

Part II of the Act allows for the temporary acquisition of the land for utilisation in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the landowners.

4.4.25 The Civil Aviation Act Cap 394

Under this act, the Kenya Civil Aviation Authority (KCAA) has to authorize and approve the height of Transmission lines and masts when they are on or proximal to flight Paths so as to ensure the safety of flying aircraft.
Under Section 9 of this act, notwithstanding the provisions of any written law, or terms of any deed, grant, lease, or license concerning the use and occupation of land, the minister may, where he considers it to be necessary in the interests of air navigation, by order published in the Gazzette, prohibit the erection within a declared area of any structure above height specified in the order. Failure to adhere to the provisions of this act, one commits an offence and upon conviction shall be liable to a fine not exceeding two million shillings or to imprisonment for a term not exceeding three years or to both.

The proposed Wind Turbines will be 55 meters from the ground level and 39 meters from the hill top. KCAA should advice the KPLC on whether or not aircraft warning lights should be installed depending on the height and locality of the wind Turbines.

4.5 International Environmental Guidelines

Kenya is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant International treaties and conventions include:

- Vienna Convention for the Protection of the Ozone Layer. Inter-governmental negotiations for an International agreement to phase out ozone depleting substances concluded in March 1985 with The adoption of this convention to encourage Inter-governmental co-operation on research, systematic observation of the ozone layer, monitoring of CFC production and the exchange of information;

- Montreal Protocol on Substances that Deplete the Ozone layer: Adopted in September 1987 and intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessment, the Protocol was adjusted to accelerate the phase out schedules and has since been amended to introduce other kinds of control measures and to add new controlled substances to the list;

- The Basel Convention: Sets an ultimate objective of stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system;

- Kyoto Protocol: Drawn up in 1997, pursuant to the objectives of the United Nations Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990;

- Convention on Biological Diversity (CBD, 1992): This Convention entered into force on 29 December 1993, and its objectives are to: conserve biological diversity; use biological diversity in a sustainable fashion and share the benefits of biological diversity fairly and equitably. This Convention governs Kenya’s international obligations regarding biological diversity;

- UNESCO Convention for the protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972): This Convention aims to encourage the identification, protection, and preservation of Earth’s cultural and natural heritage. It
recognizes that nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops;

- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention): The Convention was signed in Iran in 1971 and came into force in 1975. It represents the first attempt to establish a legal instrument providing comprehensive protection for a particular type of ecosystem. The Ramsar parties agree to implement their planning so as to promote conservation of the wetlands included in the list. There is no Ramsar site near the proposed site.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of International trade. CITES is an important line of defense against the threat posed to diversity by invasive species.

- The Africa-Eurasia Migratory Water Bird Agreement (AEWA, 1995): The goal of the agreement is to protect migratory waterfowl by ensuring that they are protected for the entire length of their migratory routes. The list of birds protected under the AEWA Convention covers 235 species of birds.

- African Convention on Conservation of Nature and Natural Resources (1968): This Convention of the African Union is ratified by 40 African countries, including Kenya. The fundamental principle requires contracting states to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people.

Kenya has a duty under these multilateral agreements. The project should adhere to strict guidelines and procedures to ensure the agreements are not violated.

4.6 World Bank /IFC Environment and Social Safeguards Policies

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

The Safeguard Policies aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.
4.6.1 Environment Assessment (Operational Policy, OP/BP 4.01)

The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is considered to be the umbrella policy for the Bank’s environmental ‘safeguard policies’.

*The proposed project triggers this policy because although there is justification of the proposed Wind Turbines, there are environmental and social concerns associated with the construction and operation of the proposed project.*

4.6.2 Natural Habitats (Operational Policy, OP/BP 4.04)

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

*The proposed project doesn’t trigger this policy because the project won’t cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project). The area is trust land and is protected land. The Wind turbines will pose insignificant environmental impacts.*

4.6.3 Indigenous Peoples (Operational Policy 4.10)

The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples; (ii) ensure that adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous peoples receive culturally appropriate, gender and intergenerationally inclusive social and economic benefits.

*The proposed project doesn’t trigger this policy because the proposed site demarcated as a protected area not for settlement.*
4.6.4 Physical Cultural Resources (Operational Policy 4.11)
The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, "physical cultural resources" are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

The policy will be triggered because the proposed project is in the vicinity of, recognized cultural heritage sites (Aircraft crash Memorial site).

4.6.5 Involuntary Resettlement (Operational Policy, OP/BP 4.12)
The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.

The policy will be triggered because some plots are touching the fence of proposed project site and some guy ropes are expected to be mounted within some of the plots.

4.6.6 Forests (Operational Policy, OP/BP 4.36)
The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy will be partially triggered because site is next to Marsabit National Park (Forest).

4.6.7 Pest Management (Operational Policy, OP/BP 4.09)
The objective of this policy is to: promote the use of biological or environmental control and reduce reliance on synthetic chemical pesticides; strengthen the capacity of the country's regulatory framework and institutions to promote and support safe, effective and environmentally sound pest management. More specifically, the policy aims to (a) Ascertain that pest management activities in Bank-financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest
Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects. (b) Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user. (c) As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM-based pest management and (ii) regulate and monitor the distribution and use of pesticides.

The policy is not triggered because no procurement of pesticides or pesticide application equipment is envisaged and the project won’t lead to substantially increased pesticide use and subsequent increase in health and environmental risk

4.6.8 Safety of dams (Operational Policy, OP/BP 4.37)

The objectives of this policy are as follows: For new dams, to ensure that experienced and competent professionals design and supervise construction; the borrower adopts and implements dam safety measures for the dam and associated works. For existing dams, to ensure that any dam that can influence the performance of the project is identified, a dam safety assessment is carried out, and necessary additional dam safety measures and remedial work are implemented.

This policy is not triggered because the project doesn’t involve construction of a large dam (15 m or higher) or a high hazard dam and is not dependent on an existing dam.

4.6.9 Projects in International Waters (Operational Policy, OP/BP 7.50)

The objective of this policy is to ensure that Bank-financed projects affecting international waterways would not affect: (i) relations between the Bank and its borrowers and between states (whether members of the Bank or not); and (ii) the efficient utilization and protection of international waterways.

The policy applies to the following types of projects: (a) Hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial and similar projects that involve the use or potential pollution of international waterways; and (b) Detailed design and engineering studies of projects under (a) above, include those carried out by the Bank as executing agency or in any other capacity.

This policy is not triggered because project site does not fall within International waters.

4.6.10 Projects in Disputed Areas (Operational Policy, OP/BP 7.60)

The objective of this policy is to ensure that projects in disputed areas are dealt with at the earliest possible stage: (a) so as not to affect relations between the Bank and its member countries; (b) so as not to affect relations between the borrower and neighboring countries; and (c) so as not to prejudice the position of either the Bank or the countries concerned.

This policy won’t be triggered because the proposed project won’t be in a “disputed area”.

Environmental and Social Impact Assessment Project Report

May 2010
5 CHAPTER FIVE: PUBLIC PARTICIPATION

5.1 Sources of Information

Public participation was a key component of the ESIA of the Proposed two 250 KW wind turbines at Marsabit. Positive and negative views and comments of the immediate neighbours was sought as from 11th to 16th May 2010. The exercise was conducted through a consultative stakeholder meeting held on 12th May 2010 at District Commissioner’s Board Room Marsabit and also through pre-designed questionnaires and interviews with neighbours proximal to the project area. All the Stakeholders consulted welcomed the project and concurred with the KPLC’s approach before implementing the project. Their responses are found in Annex 111.

The table below shows the names of the stakeholders involved in consultative meeting held at DC’s Board Room at Marsabit on 12th May 2010.

**Table 3: List of Stakeholders Consulted**

<table>
<thead>
<tr>
<th>Name of Respondent</th>
<th>Organization</th>
<th>Position</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mr. Mamo B.M</td>
<td>NEMA</td>
<td>District Environment Officer Marsabit, Laisamis,</td>
<td>Address Environmental issues associated with the project and get necessary approvals</td>
</tr>
<tr>
<td>2 Peter Muringi</td>
<td>Marsabit County Council</td>
<td>Clerk</td>
<td>An important investment and involve all stakeholders affected</td>
</tr>
<tr>
<td>3 Denge G. Kuro</td>
<td>Public Health</td>
<td>District Public Health Officer</td>
<td>Address environmental issues concerned</td>
</tr>
<tr>
<td>4 Jack Makubu</td>
<td>KWS</td>
<td>Warden, Marsabit National Park</td>
<td>A welcome idea and project. Address environmental issues</td>
</tr>
<tr>
<td>5 Peter K. Mbugua</td>
<td>Administration</td>
<td>D.O</td>
<td>Project is environmentally friendly and a source of clean energy</td>
</tr>
<tr>
<td>6 Mugendi G. Moses</td>
<td>Physical Planning</td>
<td>District Physical Planning Officer</td>
<td>Welcome project likely to promote urban development</td>
</tr>
<tr>
<td>7 Yusuf H. Rajab</td>
<td>Survey</td>
<td>District Surveyor</td>
<td>Project good. Secure required land</td>
</tr>
<tr>
<td>8 Andrew Khaemba</td>
<td>Land Adjudication and Settlement</td>
<td>District Land Adjudication and Settlement Officer</td>
<td>Ensure site is properly surveyed</td>
</tr>
<tr>
<td>9 Fatuma Godana</td>
<td>Maendeleo ya Wanawake</td>
<td>Chairlady</td>
<td>Project welcome. Address environmental issues</td>
</tr>
<tr>
<td>10 Councillor Adam Ali</td>
<td>Politician</td>
<td>Area Councillor</td>
<td>Address land issues for</td>
</tr>
</tbody>
</table>
5.2 Issues Raised by the would be affected community

The following issues were raised by the project neighbours during public participation exercise for the proposed two Wind Turbines at Marsabit.

5.2.1 Positive Issues

Reduction of pollution associated with thermal Power Generation:

The area lies along Kenya wind corridor which runs from Tana-river through Garissa, Wajir and Marsabit. Utilizing wind speed which average 381.5 km per day to generate at least 500 KW of Green Energy will cut down over reliance on Thermal generation and will help reduce environmental pollution and depletion/over exploitation of oil.

Employment opportunities

Most neighbours close to the proposed project site especially expected the project to create casual and permanent employment opportunities during the proposed project construction work, operation and decommissioning phases. The employment opportunities could be either directly in the project or indirectly through associated businesses. One of the main positive impacts during projects construction phase will be the availability of job opportunities especially to casual workers and other specialised workers.

Improvement of local and national economy

Through the use of locally available natural resource (wind) to generate electricity, it is expected cost of electricity will go down, more customers would be connected and retail of reliable electricity by The KPLC will attract taxes to the country.
Boosting of the informal sector

During the construction, operational and decommissioning phase of the proposed two Wind Turbines it is expected that the other businesses in the informal sector will flourish. These include activities such as hotel and accommodation, shops and may be food vending who will be benefiting directly from the construction, operational and decommissioning staff members who will be buying commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

Improved Electricity Supply

The project aims to provide at least an additional 500 KW power to the existing off-grid. The beneficiaries mainly Marsabit town and its environs residents, were optimistic that power outages will be minimized and that they will not be subjected to power rationing. With this additional reliable electricity in the off-grid, the country and the local area are expected to attract more investments.

Corporate Social Responsibility (CSR)

Most of the stakeholders urged The KPLC to consider the area and include it in the Company’s CSR plans. They urged the proponent to consider funding Social development initiatives within Marsabit such as Boreholes, Classroom construction and other community based initiatives geared towards improving their livelihoods.

Education

Teachers from nearby primary school concurred that the proposed wind Turbines once installed and subsequent wind power generation would offer practical lessons to students / pupils giving a boost to education. It could also offer research opportunities for scholars.

Accessibility

The development of an access road to the site will help nearby residents to have an easier accessibility to their premises.

5.2.2 Negative Issues

Visual Impacts:

Visual intrusion and ‘shadow flicker’ caused by the erected and rotating turbines cause alteration to natural scenery. Wind Towers fitted with aircraft warning lights create red light pollution. One stakeholder urged the proponent to ensure earth colours were used in order to enable the project blend with the environment. It should however be noted that aesthetic issues are subjective and some people may find the Wind Turbines to be an attractive feature and may in the long run be tourist attractions and a source of income to the community.
Change in Land use:

The total area required for the project is 2.7 hectares which will be fenced and will result to change of existing land use practices such as settlement, subsistence farming and pasture.

Increased Noise Level and Vibration

There was concern over the possibility of high noise and vibration levels in the project site as a result of construction works and from the rotation of the wind blades. However, the proponent will have to take appropriate steps to minimize noise production especially during construction and ensure that construction works are done between 8.00 a.m and 6.00 p.m and take the shortest time possible to complete the project implementation.

Social concerns

Some neighbours thought that the location of the project and construction activities will attract people to the area. This may lead to social vices like drug abuse, spread of diseases including HIV and insecurity and requested for sensitization and awareness to the community before the construction works start.

Encroachment

The area is Trust land and demarcated as a hill hence a protected area. Some stakeholders interviewed were of the opinion that setting up the Wind Turbines in a protected area would encourage encroachment and incompatible land use practices in the area.

Safety:

Workers are faced with hazards during construction, operation and maintenance that can result to injuries and or deaths due to blade failures, falls, or being trapped. Aircraft can crash due to collisions with turbines or support structures as reported in a previous incidence especially when visibility is not clear and no warning signals are installed. The residents urged that the plot remains fenced and guarded to ensure security.

Increased Dust emission:

Increased dust emissions expected especially as the contractor moves materials to and from site and during the access road construction.

Avi – fauna mortalities

Some respondents said terrestrial birds and bats could suffer collisions with wind panels leading to mortalities and Biodiversity loss. The rotating blades and shadow flicker could also disturb birds and small wild animals causing them to migrate.
CHAPTER 6: IDENTIFICATION OF ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS OF THE PROPOSED TWO 250 KW WIND TURBINES PROJECT

6.1 Introduction

This Section identifies and discusses both negative and positive impacts associated with the proposed two 250 KW Wind Turbines at Marsabit. The impacts are identified according to Phases namely: Construction Phase, Operational Phase and Decommissioning Phase.

The project being a national development agenda in the energy sector has immense benefits that could save the area losses in terms of power rationing due to Thermal Generation Failures, contribute enormously towards environmental conservation and open up opportunities for research and learning for pupils, students and Scholars. However poor planning and implementation of the project could also affect the environment in terms of pollution, soil erosion and rejection of the project by host community.

The summary of the main potential impacts of the proposed project are listed in Table below and analysed into different categories based on stakeholder’s views and perceptions as well as the consultant’s experience and trainings in undertaking ESIA of similar nature.

The project impacts are classified as positive or negative. However the study goes further to categorize the impacts in terms of direct or indirect, temporary or permanent, major or minor.

Table 4: Summary of Project Potential Impacts

<table>
<thead>
<tr>
<th>Environmental &amp; Social Impact</th>
<th>Positive/ Negative</th>
<th>Direct/ Indirect</th>
<th>Temporary/ Permanent</th>
<th>Major/ Minor</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment Opportunities</td>
<td>Positive</td>
<td>Direct &amp; Indirect</td>
<td>Permanent/ Temporary</td>
<td>Major</td>
<td>Construction Operation Decommissioning</td>
</tr>
<tr>
<td>Gains in the Local and National Economy</td>
<td>Positive</td>
<td>Direct</td>
<td>Permanent</td>
<td>Major</td>
<td>/</td>
</tr>
<tr>
<td>Provision of Market for Supply of Building Materials</td>
<td>Positive</td>
<td>Direct</td>
<td>Temporary</td>
<td>Major</td>
<td>/</td>
</tr>
<tr>
<td>Informal Sectors Benefits</td>
<td>Positive</td>
<td>Direct &amp; Indirect</td>
<td>Temporary</td>
<td>Minor</td>
<td>/</td>
</tr>
<tr>
<td>Environmental Benefits - Reduction in pollution from thermal power generation</td>
<td>Positive</td>
<td>Indirect</td>
<td>Permanent</td>
<td>Major</td>
<td>x</td>
</tr>
<tr>
<td>Noise pollution &amp; increased</td>
<td>Negative</td>
<td>Direct</td>
<td>Temporary/ Permanent</td>
<td>Major</td>
<td>/</td>
</tr>
</tbody>
</table>
6.2 **Positive Impacts during Construction Phase**

The positive impacts associated with the proposed two 250 KW Turbines project during construction phase are as discussed below;

**Employment Opportunities**

With the construction of the two 250 KW Wind Turbines, there will be employment opportunities especially for casual workers from the local community. Creation of
employment opportunities has both economic and social benefit. Skilled and unskilled labour will be used in economic production while socially these young and energetic otherwise poor people will be engaged in productive employment other than remaining idle. Employees with diverse skills are expected to work on the site during the construction period.

6.2.2 Gains in the Local and National Economy

There will be gains in the local and national economy as a result of the construction of the proposed wind Turbines, through consumption of locally available materials including: cement, ballast and available labour. The consumption of these materials in addition to fuel oil and others will attract taxes including Value Added Tax (VAT) which will be payable to the government. The cost of the materials will be payable directly to the producers.

Provision of Market for Supply of Building Materials

The project will require supply of small quantities of building materials most of which can be sourced locally in Marsabit town like cement, doors and window, Fencing materials. This provides ready market for local enterprises with such materials.

Boosting of the informal sector

During the construction phase of the proposed two Wind Turbines it is expected that the other businesses in the informal sector will flourish. These include activities such as hotel and accommodation, shops, artisan industries and may be food vending who will be benefiting directly from the construction, operational and decommissioning staff members who will be buying commodities from them. This will promote the informal sector in securing some temporary revenue and hence livelihood.

Accessibility

The development of an access road to the site will help nearby residents to have an easier accessibility to their premises.

Environmental Benefits

Landscaping during and after construction and revegetation of cleared places will give a boost to environmental conservation.

6.3 Negative Impacts during Construction Phase

The following negative impacts are associated with the construction phase of the proposed two 250 KW turbines in Marsabit.
Noise pollution

The proposed area is relatively tranquil. The construction works is most likely to be noisy especially during movement of materials to and from site and also from the workers.

Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by Motor vehicles that will be used to ferry construction materials and the impacts will be direct, Temporary and not significant.

Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, drilling and access road construction. During the installation of the wind turbines there is a very small possibility of particulate matter affecting the nearby vegetation, site workers and even neighbours health given the construction method and type of wind masts to be installed.

Disposal of Excavated Soil

Though little excavation is likely to take place especially during access road construction, construction of Wind Turbines and Guy rope pads; the excavated material will be used for levelling and no cart away of soil or cleared vegetation from site. The impact will be direct, temporary and minor.

Increased water demand

Water will be used during the construction of tower and guy rope pads. This will be minimal and no water sources within and neighbouring the project site and is expected to be sourced away from the construction site. More water will also be used as necessary to sprinkle to minimise dust generation during access road construction. The increase in water demand will be direct, temporary and minor.

Workers accidents and hazards during construction

Workers will be faced with hazards such as falls and accidents like cuts, injuries during construction and erection of the wind turbines. The impacts will be direct, permanent and minor.

Energy Consumption

Fossil fuels (mainly diesel) will be used to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. Exhaust emissions also have deleterious effect to the environment. The impact will be direct, temporary and minor.
Extraction and Use of Building Materials

Building materials such as hard core, ballast, cement, rough stone and sand required for the construction of guard house, Guy rope pads, and Fencing post pads will be obtained from hardware shops and NEMA approved quarries. The impact of extraction will be direct, temporary and minor. The concreted pads will have direct, permanent and minor environmental impacts.

Solid Waste Generation

Very minimal solid waste will be generated and will include small quantities of cleared vegetative matter, a few bags of cement and probably food packagings. This will be disposed off appropriately and no burning of litter will be allowed on site. This impact will be direct, temporary and minor.

Possible Exposure of Workers to Diseases

Workers are likely to be exposed to diseases associated with low temperatures, high wind speeds and reduced atmospheric pressure in addition to possibility of small quantities of dust inhalation. Occupational health and safety standards will be observed and workers to use personal protective equipments.

Increased Storm Water Runoff from New Impervious Areas

Construction of the access road to the project site will lead to creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural area, and increased storm runoffs are a common occurrence as was observed on the existing old access road. The impact will be direct, permanent and minor.

Soil Erosion

There are possibilities of soil erosion occurring during the construction of access road to project site by water or wind. The impact will however be minimal as the area to be disturbed is small and compacting and sprinkling of water will be done. The impacts will be direct, temporary and minor.

Fire Outbreaks

Due to cleared vegetation and increase in human population at project site during construction activity, fire outbreaks can occur. Handling of inflammable products and careless disposal of cigarette butts may increase fire risks. The impact will be direct, temporary and major.
Social Vices

Construction activities will attract an influx of people to the project area. This may lead to social vices like drug abuse, spread of diseases including HIV and insecurity and sensitization and awareness creation need to be done before and during the construction works.

6.4 Positive Impacts during Operation Phase

Like construction phase, there are positive impacts associated with the installation of the two 250 KW Wind Turbines at Marsabit.

Reduction of pollution associated with thermal Power Generation:

Wind energy is green energy and will displace large amounts of power that needed to be sourced from the thermal generation plant. This would imply less diesel would be burnt leading to reduction of Carbon and Sulphide gases, reduced particulate matter and noise emission since it will not be necessary to run all the Diesel Gen sets to feed the off-grid.

Employment opportunities

Skilled workers will be deployed to man the wind turbines, and Semi Skilled labour will be deployed as guards. More power to retail would mean increased business opportunities for the residents of Marsabit such as welding, salons, and small scale processing activities. These impacts will be direct, permanent and major.

Improvement of local and national economy

Through the use of locally available natural resource (wind) to generate electricity, it is expected cost of electricity will go down, more customers would be connected and retail of reliable electricity by The KPLC will attract taxes to the country.

Improved Electricity Supply

The project aims to provide an additional 500 KW power to the existing off-grid. The beneficiaries mainly Marsabit town and its environs residents, were optimistic that power outages will be minimized and that they will not be subjected to power rationing. With this additional reliable electricity in the off-grid, the country and the local area are expected to attract more investments.

Net Energy gain

Energy consumed to manufacture and transport the materials used to build a power plant is equal to the energy generated by the wind station within a few months of operation. Considering the initial installation costs and maintenance and operation costs, it is evident that the cost of generating wind energy will in overall offset funds that can be allocated in other sectors of development / environmental conservation resulting to a net energy gain.
Education

Teachers from nearby primary school concurred that the proposed wind Turbines once installed and subsequent wind power generation would offer practical lessons to students / pupils giving a boost to education. It could also offer research opportunities for scholars.

Accessibility

The development and maintenance of an access road to the site by the proponent will help near by residents to have an easier accessibility to their premises. This will also lead to opening up of the area in case some persons get attracted to the site as a tour and view point site. This impact will be direct, permanent and relatively minor or major.

Improved Security

With the establishment of the proposed wind Turbines, the level of security will be improved around the project area. This is as a result of more security lights and security personnel being employed to guard the project site. The project site will also be well fenced. Hence if the level of security is increased, the residents will feel more secure than before. The impact will be direct, permanent and minor.

6.5 Negative Impacts during Operation Phase

Visual Impacts:

Visual intrusion and ‘shadow flicker’ caused by the erected and rotating turbines cause alteration to natural scenery. Wind Towers fitted with aircraft warning lights create red light pollution. Earth colours should be used in order to enable the Turbines blend with the environment. As pointed earlier it should be understood that aesthetic issues are subjective and some people may find the Wind Turbines to be an attractive feature and may in the long run be tourist attractions and a source of income to the community.

Noise Pollution

Noise pollution from wind Turbines greatly depend on the average annual wind speed (i.e. the higher the wind speed, the greater the noise output can be) and the size of the blades.

With technological advancement, We have Wind turbines that produces a lot less sound pollution compared to conventional turbines. These improvements have eliminated most of the mechanical noise and have decreased the aerodynamic noise that the rotor produces from improved rotor designs. This table compares general pressure level of wind turbines noise to other daily urban activities.
Table 5: Sound Pressure of Urban Activities (Source: http://windturbinezone.com)

<table>
<thead>
<tr>
<th>Source/Activity</th>
<th>Indicative noise level dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold of hearing</td>
<td>0</td>
</tr>
<tr>
<td>Rural night-time background</td>
<td>20-40</td>
</tr>
<tr>
<td>Quiet bedroom</td>
<td>35</td>
</tr>
<tr>
<td>Wind farm at 350m</td>
<td>35-45</td>
</tr>
<tr>
<td>Car at 40mph at 100m</td>
<td>55</td>
</tr>
<tr>
<td>Busy general office</td>
<td>60</td>
</tr>
<tr>
<td>Truck at 30mph at 100m</td>
<td>65</td>
</tr>
<tr>
<td>Pneumatic drill at 7m</td>
<td>95</td>
</tr>
<tr>
<td>Jet aircraft at 250m</td>
<td>105</td>
</tr>
<tr>
<td>Threshold of pain</td>
<td>140</td>
</tr>
</tbody>
</table>

Table 6: Maximum Permissible Levels (Source: www.kenyalaw.org)

<table>
<thead>
<tr>
<th>ZONE</th>
<th>Sound Level Limits dB(A) (Leq, 14 h)</th>
<th>Noise Rating Level (NR) (Leq, 14 h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td>A Silent Zone</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>B Places of Worship</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>C Residential: Indoor/Outdoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 Indoor</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>C2 Outdoor</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>D Mixed residential (with some</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>B Commercial</td>
<td>60</td>
<td>35</td>
</tr>
</tbody>
</table>

Time Frame:
Day: 6.01 a.m. - 8.00 p.m. (Leq. 14 h)
Night: 8.01 p.m. - 6.00 a.m. (Leq. 10 h)

Table 7: Maximum Permissible Levels for Construction Sites (Source: www.kenyalaw.org)

(Measurement taken within the Facility)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Maximum Noise Level Permitted (Leq) in dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i Health Facilities, educational institutions,</td>
<td>Day</td>
</tr>
<tr>
<td>homes for disabled etc.</td>
<td>60</td>
</tr>
<tr>
<td>ii Residential</td>
<td>60</td>
</tr>
<tr>
<td>iii Areas other than those prescribed in (i)</td>
<td>75</td>
</tr>
<tr>
<td>and (ii)</td>
<td></td>
</tr>
</tbody>
</table>

Time Frame:
Day: 6.01 a.m. - 6.00 p.m. (Leq. 14 h)
Night: 6.01 p.m. - 6.00 a.m. (Leq. 10 h)
From tables 5, 6 and 7, we can see that the Wind Turbines from a distance of 350 meters would create less noise pollution than a truck, a car, a busy general office, a pneumatic drill and jet aircraft. This situation is expected to apply if all the squatters proximal to project site are relocated.

It should be noted that with the height and technology applied for the wind turbines, and the area generally being not a settlement area, this impact will be direct, permanent and minor.

**Encroachment**

The area is Trust land and demarcated as a hill hence a protected area. Some stakeholders interviewed were of the opinion that setting up the Wind Turbines in a protected area would encourage encroachment and incompatible land use practices in the area. This would be an indirect, permanent and a major environmental effect.

**Occupational Hazards and Accidents:**

Workers will be faced with hazards and accidents during operation and maintenance of the wind Turbines that can result to injuries and or deaths due to blade failures, falls, or being hurt by hand tools. Aircraft can crash due to collisions with turbines or support structures as reported in a previous incidence especially when visibility is not clear and no warning signals are installed. Safe work procedures should be followed and appropriate use of PPEs should be observed.

**Avi – fauna mortalities and migration**

Rotating wind blades can lead to increased collisions with terrestrial birds and bats resulting to mortalities and Biodiversity loss. The rotating blades and shadow flicker could also disturb birds and small wild animals causing them to migrate.

**Oil Spills**

Possible oil spills are likely to occur during transformer oil changes/addition or from accessing vehicles.

**6.6 Positive Impacts during Decommissioning Phase**

The following positive impacts are associated with the Decommissioning phase of the Wind Turbines.

**Site Rehabilitation**

Upon decommissioning of the proposed Wind Turbines; rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was
originally. This will include replacement of topsoil and re-vegetation which will lead to restoration of the visual quality of the area. The impact will be permanent and major.

**Employment Opportunities**

Man power for dismantling and loading of wind turbines and transportation as well as rehabilitation work will be a source of employment. The impact will be direct, temporary and minor.

### 6.7 Negative Impacts during Decommissioning Phase

**Noise and Vibration**

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing loading and transport of the Wind Turbine accessories. The impact will be direct, temporary and minor.

**Solid Waste Generation**

Demolition of the wind Turbines, fence, guard house, toilet and associated structures will lead to generation of solid waste comprised of concrete, metal, stones, wood, glass, paints, adhesives, sealants and fasteners. Such demolition waste is generally considered as less harmful to the environment since it is composed of inert materials, and is mostly recyclable. The impact will be direct, permanent and major.

**Generation of Dust**

Some dust will be generated during demolition works of the proposed Wind Turbines. This will affect demolition staff as well as the neighbours. The impact will be direct, temporary and minor.

**Loss of employment and Livelihood**

The staff previously employed to man and maintain the wind Turbines will loss employment and livelihood. Decreased power supply will also lead to employment loss in the informal sector.
7 CHAPTER SEVEN: MITIGATION MEASURES AND MONITORING PROGRAMMES

This section highlights the mitigation measures for potential negative impacts of the proposed two Wind Turbines at Marsabit. The negative impacts and the possible mitigation measures have herein been analyzed under three categories: Construction, Operational and Decommissioning.

7.1 Mitigation of Construction Related Negative Impacts

The following measures can be applied to ameliorate or minimize the negative impacts associated with the construction of the proposed Wind Turbines at Marsabit during construction phase.

Noise and Vibration

The following noise-suppression techniques will be employed to minimise the impact of temporary construction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use equipment designed with noise control elements.
- Co-ordinate with relevant agencies regarding all construction.
- Limit vehicles to a minimum idling time and observe a common-sense approach to vehicle use, and encourage drivers to switch off vehicle engines whenever possible.
- Set and observe speed limits and avoid raving of Engines.
- Condon the project area to avoid unnecessary access by idlers.

Compliance with the recently issued Noise and Vibration Regulations of 2009 is expected at all the phases of the project.

Exhaust Emissions

- Vehicle idling time shall be minimized.
- Alternatively fuelled construction equipment shall be used where feasible.
- Equipment shall be properly tuned and maintained.
- Emissions of other contaminants (NOx, CO2, SOx, and diesel related PM10) that would occur from Vehicle exhaust emissions could be reduced by maintaining vehicles in good state of service, fuel and lubricants to be of standardized quality and sourced from approved suppliers.

This will also be achieved through proper planning of transportation of materials to be used during construction of the project to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.
Dust Emissions and Air quality

- During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions;
- Construction trucks moving materials to site, delivering sand and cement to the site should be covered to prevent material dust emissions into the surrounding areas;
- All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction.
- During construction, where necessary, sprinkle loose surface earth areas with water to keep dust levels down.
- Masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- Drivers of construction vehicles must be sensitized so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NOx, SOx and suspended particulate matter;

Excavated Soil during Construction

The Excavated soil during the construction of the access road to the project site will not be disposed but will be used for levelling and landscaping

Minimization of increased Water Demand

The proponent and contractor shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use.

Minimization of Worker accidents and hazards during Construction phase

To reduce the workers accidents and hazards during the construction phase of the proposed Wind Turbines, the contractor and proponent are expected to adhere to the provisions of the Occupational Safety and Health Act, 2007 and its subsidiary legislation. It is the responsibility of the project proponent and contractor to provide a safe and healthy environment for construction workers as outlined in the EMP. A Response and Evacuation Plan must be in place in addition to safety education and training shall be provided to the employees.
Follow safe work procedures and obtain permits to work as appropriate

Reduction of Energy Consumption

Contractor should ensure proper planning and transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts and no unnecessary trips to and from site.
Construction Work should be carried out during the day from 8.00 a.m to 5.00 p.m to ensure maximum use of available natural light.
Extraction Sites and Efficient Use of Raw Materials

Building materials such as sand, ballast and hard core will be sourced from NEMA approved sites. Proponent and Contractor will ensure accurate budgeting and estimation of actual construction requirement to ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials. In addition to the above measures, the proponent shall consider reuse of construction materials and use of recycled building materials.

Minimization of Solid Waste during Construction Phase

Main solid waste expected is small amounts of vegetation cleared from necessary points within the site and during access road construction. Any wood material that can be used as firewood will be donated to the local community. No burning of trash will be done on site. Any personal effects like food packagings will effectively be removed by the contractor to appropriate disposal points.

Additional recommendations for minimization of solid waste during construction of the proposed Wind Turbines at Marsabit include:-

i. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time

ii. Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements

iii. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials

iv. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste

v. Use of construction materials containing recycled content where possible and in accordance with accepted standards.

Possible exposure of workers to diseases

Possible exposure of workers to diseases from building materials at construction site shall be mitigated by compliance with occupational health and safety standards. Proper work procedures and efficient use of PPEs will be observed. Sensitization and awareness of HIV/AIDS will be done.

Minimization of Storm Water Run-off and Soil Erosion

Proper drainage channels and levelling especially of the access road to reduce run-off velocity and increase infiltration of rain water into the soil. Proper compaction will also be done along the access road. Within the project site, construction vehicles will be restricted to designated areas to avoid soil compaction, while any compacted areas will be ripped to reduce run-off. Caution will be required during construction at times of heavy rains. Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.
Surface and Underground Water Quality Degradation

Vehicle maintenance and service should be done away from project site in approved garages or service stations to avoid any possible oil and fuel spills that could contaminate soils and possibly ground water quality.

7.2 Mitigation of Operation Phase Negative Impacts

The negative impacts of the proposed Wind Turbines during operation phase are minimal but the following mitigation measures should be applied.

Encroachment:

The County council and NEMA should carry out a detailed Environmental Impact Assessment study of the Kofia Mbaya hills and advise on mitigation measures to address issues of cultivation on steep slopes and soil erosion, squatters, Deforestation, Land Tenure and appropriate/ compatible land use practices for the protected area.

Occupational Hazards

Safe work procedures should be observed. Trained and skilled personnel should man and maintain the wind Turbines. Use of appropriate PPEs should be observed. Necessary medical tests to check the health of workers should be done at least annually. The Wind Turbines and associated equipment should be serviced regularly and as appropriate by qualified Personnel.

Avi - Fauna mortalities and migration:

The wind blades should be coloured with warm and reflective colours to enhance visibility to minimize birds and bats collisions

Aircraft accidents:

The Kenya Civil Aviation Authority (KCAA) should advise on whether a red signal warning light should be fixed at the top of masts to warn low flying aircrafts of impending danger.

Noise

With Modern technology Wind Turbines produce insignificant noise during their operation from the rotor blades. The best mitigation measure for the proposed Wind Turbines at Marsabit is to use the modern up to date Technology turbines and for the authorities to ensure no illegal squatting/ encroachment and settlement in the project area.
Oil Spills

Transformers will be maintained in a good state of repair, regular service as necessary and any change or addition will be done precautionally to avoid any oil spill but in case of accidental spills, contaminated top soil should be scooped and disposed of appropriately.

7.3 Mitigation of Decommissioning Phase Impacts

Just as in the case during the construction and operation phase, the negative impacts of the decommissioning phase of the proposed Wind Turbines at Marsabit can be mitigated as follows:

Minimization of Noise and Vibration

The following noise-suppression techniques will be employed to minimise the impact of temporary destruction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use sound attenuated equipment designed with noise control elements.
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to switch off vehicle engines whenever possible.
- Demolishing works to be daytime from 8.00 a.m to 5.00 p.m.

Efficient Solid Waste Management

Solid waste resulting from demolition of the wind Turbines, fence, guard house, toilet and associated structures will lead to generation of solid waste comprised of concrete, metal, stones, wood, glass, paints, adhesives, sealants and fasteners. Such demolition waste is generally considered as less harmful to the environment since it is composed of inert materials, and is mostly recyclable. The following measures should be applied:

- Provision of facilities for proper handling and storage of demolition materials to reduce the amount of waste caused by damage or exposure to the elements
- Use of materials that have minimal packaging to avoid the generation of excessive packaging waste
- Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided.
- Any recyclables should be sold to recyclable waste dealers and any that can be donated to the community for their livelihood should be given out.
Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as follows:

- Watering all active demolition areas as and when necessary.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.

Site Rehabilitation after Decommissioning

The project operator shall, on decommissioning of the project, restore the site to its original status as far as practicable and plant trees at the site.

Loss of employment and Livelihood

The staff previously employed to man and maintain the wind Turbines will lose employment and livelihood. The proponent should deploy them in suitable positions elsewhere and if not feasible adequate lay off compensation packages should be paid.
8 CHAPTER 8: ANALYSIS OF PROJECT ALTERNATIVES

This chapter describes and examines the various alternatives available for the project. Alternatives examined during the study included;

- Alternative sources of energy
- Possibility of extending KPLC National power grid to cover Marsabit
- Site alternatives in project location particularly with regards to location based impacts and land use conflicts
- Technology alternatives
- A No Project alternative was also assessed to determine the impact of this No Project Scenario.

8.1 Alternative Sources of Energy

8.1.1 Thermal Power Generation:

This would imply continued reliance on the existing Diesel Gen Sets to provide power to Marsabit residents. About 1000 litres of Industrial Diesel Oil (IDO) is burnt daily to generate targeted 1200 KW of electricity at Marsabit. Thermal Generation can also be fueled using alternative fuels such as natural gas, Bio diesel, industrial Kerosene, Heavy Vehicle Fuel, Coal and unleaded petrol. As discussed earlier Thermal power Generation has serious negative environmental impacts hence the need for the proponent to install the proposed wind Turbines.

8.1.2 Solar Energy:

Generating solar power for commercial purposes is not yet adequately explored in Kenya. Solar Power is green energy with minimal maintenance costs but it is capital intensive.

8.1.3 Hydro Electric Power - HEP

This would mean exploring the possibility of extending the Existing National Grid to Marsabit since there are no hydro facilities within the region to facilitate HEP Generation. This is a costly venture and may take some time yet the residents need power for their livelihood.

8.1.4 Other sources of Energy:

Wood fuel is the greatest source of Energy contributing to 80% of energy requirements in Africa. Over reliance on wood has led to deforestation, desertification, global warming and Climatic change among other socio - economic demerits. The Government of Kenya should look into the possibility of using nuclear energy to generate electricity. This is a long term consideration.
8.2 Alternative Site

The Wind Turbines will be installed in land set apart for KPLC which is fenced and accommodates an old non-functioning wind Master. Relocation option to a different site is an option available for the project implementation. The project proponent can look for alternative land to accommodate the scale and size of the project. This will be a costly venture, may take a long time although there is no guarantee that the land would be available. Fresh Project design and planning before the stage of implementation will cost the developer additional money. It is recommendable that the proponent be allowed to install the project in already existing site.

8.3 Interconnection Alternative

Kenya has experience in sourcing electricity from its neighbors. The Possibility of connecting Marsabit with Power from Ethiopia or even the National Generation sources such as the Wind Megawatt Station being implemented in Lake Turkana or generally the existing National grid is an alternative. This would mean foregoing the proposed project and limiting the country to available power.

8.4 No Project Alternatives

The no-project scenario will mean the status quo of the area remains and no occurrence of adverse impacts as well as positive impacts posed by the project implementation.

The no project option will have the forgone costs and benefits including
- The targeted consumers will forgo improved electricity supply
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of electric power will occur
- The country won’t meet its energy requirement
- Over reliance on Thermal generation will lead to increase in associated pollution in Marsabit and the country at large.

8.5 Analysis of Alternative Construction Materials and Technology

The proposed Wind Turbines will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that guarantees efficient use of local wind speeds to generate reliable and maximum power, project design to allow efficient evacuation to the existing off-grid distribution system were looked into.

The design of the Turbines will be easy to install and dismantle with minimum labour requirements and maintenance costs will be minimal.
9  CHAPTER NINE: ENVIRONMENTAL AND SOCIAL 
MANAGEMENT PLAN (ESMP)

9.1  Significance of an ESMP

Environmental and Social Management Plan (ESMP) for development projects provides a logical 
framework within which identified negative environmental and socio-economic impacts can 
be mitigated and monitored. In addition the ESMP assigns responsibilities of actions to various 
actors and provides a timeframe within which mitigation measures and monitoring can be 
done. ESMP is a vital output of an Environmental Impact Assessment as it provides a checklist 
for project monitoring and evaluation. The ESMP outlined below addresses the identified 
potential negative impacts and mitigation measures of the proposed Wind Turbines at Marsabit 
during construction, operational and decommissioning phases, based on the Chapters of 
Environmental Impacts and Mitigation Measures of the expected Negative Impacts.
## Table 8: Environmental and Social Management Plan (ESMP):

<table>
<thead>
<tr>
<th>Environmental Impact</th>
<th>Recommended Mitigation Measures</th>
<th>DURATION</th>
<th>Responsible Party</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraction of Raw Materials</td>
<td>Source Raw Materials from NEMA approved sites</td>
<td>C &amp; D</td>
<td>Proponent &amp; Contractor</td>
<td>Included in the Contract (IC)</td>
</tr>
<tr>
<td></td>
<td>Ensure accurate budgeting to ensure only Necessary material is ordered</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Proper storage to ensure minimal lose</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Use recycled and recyclable materials where possible</td>
<td>C</td>
<td>Contractor</td>
<td>-</td>
</tr>
<tr>
<td>Vegetation Clearance, disturbance and Habitat Loss</td>
<td>Ensure Proper demarcation and clear only necessary areas</td>
<td>PC &amp; C</td>
<td>Contractor</td>
<td>500000</td>
</tr>
<tr>
<td></td>
<td>Specify Parking, Loading and Off loading Zones within the site</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Design and Construct access road</td>
<td>C</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td>Use equipment designed with Noise Control Elements</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Limit Vehicles and equipment to minimum idling limits</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Set and Observe speed Limits and avoid raving of engines</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Observe and Comply with NEMA’s 2009 Noise and Vibration Regulations</td>
<td>C, O &amp; D</td>
<td>Contractor and Proponent</td>
<td>50000</td>
</tr>
<tr>
<td>Exhaust Emissions</td>
<td>Minimize Vehicle Idling</td>
<td>C, O &amp; D</td>
<td>Contractor and Proponent</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Maintain Vehicle and powered equipment in a good state of repair</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Fuel and Lubricants to be of standardized quality and sourced from approved suppliers</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td>Dust</td>
<td>Sprinkle water on loose surface as necessary during access road construction</td>
<td>C</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Personal Protective Equipment to be provided and used appropriately</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td>Increased Water Demand</td>
<td>Sensitize staff on efficient water use</td>
<td>C</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td>Oil Spills</td>
<td>Any service/ Repair of vehicles to be done offsite in approved garages or service stations</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Vehicle and Equipment to be in a good state of repair</td>
<td>C &amp; D</td>
<td>Contractor</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>Proper storage of oil and careful refilling of Transformers</td>
<td>O</td>
<td>Proponent</td>
<td>100000</td>
</tr>
<tr>
<td></td>
<td>In case of contamination, scoop and dispose off soil appropriately</td>
<td>O</td>
<td>Proponent</td>
<td>50000</td>
</tr>
<tr>
<td>Encroachment</td>
<td>NEMA and Marsabit County Council to carry out an EIA of Kofia Mbaya hills and advise on sustainable land use and address the issue</td>
<td>NEMA &amp; Marsabit</td>
<td>2 Months</td>
<td>-</td>
</tr>
<tr>
<td>Environmental Impact</td>
<td>Recommended Mitigation Measures</td>
<td>DURATION</td>
<td>Responsible Party</td>
<td>Cost (Ksh)</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------</td>
<td>-------------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| Avi - Fauna Mortalities | Use of reflective colours for greater visibility  
Ensure Wind Turbines not set on Migratory Paths  
Regular Monitoring and record any Avi - Fauna deaths | C        | Contractor        | IC         |
| Fire Hazards         | No burning of any litter/ cleared vegetation on site  
Avoid Careless handling of cigarette butts | C & O    | Contractor / Proponent | -         |
| Occupational Health and Safety | Ensure provision and proper use of Personal protective Equipments  
Follow safe work procedures  
Use trained and skilled labour  
Staff Training and regular equipment service and testing  
Maintain a fully stocked and accessible first aid kit  
Observe OSHA 2007 regulations | C, O & D | Contractor / Proponent | 100000     |
| Decommission-ing and Staff layout | Redeployment in suitable placements within the Company  
Adequate Compensation  
Inform affected staff in good time and Counselling | After D | Proponent | -          |

Legend:  
PC = Pre – Construction  
O = Operation  
C = Construction  
D = Decommissioning  
IC = Independent Contractor
10 CHAPTER TEN: ENVIRONMENTAL AND SOCIAL MONITORING PLAN (ESMP):

The Environmental and Social Monitoring Plan (ESMP) will provide the basis for monitoring of Potential environmental Impacts associated with the Wind Turbines Project. The implementation of the Monitoring Plan together with the Environmental and Social Management Plan will provide a benchmark for future environmental audits. The ESMP provides effective observation and documentation of monitorable parameters that will help in analyzing the effectiveness of the proposed mitigation measures with the advantages of improving operational efficiency, promoting competitive advantage, improving risk management, reducing liabilities and improving business performance. The environmental and social parameters monitoring procedures and techniques for the Wind Power Turbines are summarized in the Following Table.

Table 9: ENVIRONMENTAL AND SOCIAL MONITORING PLAN (ESMP)

<table>
<thead>
<tr>
<th>Potential Environmental /Social impact</th>
<th>Parameter to be monitored</th>
<th>Timing</th>
<th>Cost</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Measure the Noise Level within the Project plot and at distances of 50 meters up to a distance of 400 meters from turbines</td>
<td>During Construction, Operation and Decommissioning phases</td>
<td>Included in Construction contract and Operating costs</td>
<td>The KPLC and Contractor</td>
</tr>
<tr>
<td>Vegetation and Habitat Loss</td>
<td>Quantify the weight of cleared Vegetation</td>
<td>During Construction</td>
<td>Included in the Construction Contract</td>
<td>Contractor</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Assess size of rills or Gulleys forming from accelerated run off from compacted areas</td>
<td>During operation phase</td>
<td>Included in Operation costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Increased water Demand</td>
<td>Record amount of Litres used</td>
<td>During Construction and Decommissioning Phases</td>
<td>Included in the Construction costs. Demolition to be determined</td>
<td>The KPLC and Contractor</td>
</tr>
<tr>
<td>Oil Spills</td>
<td>Record any leakages from Transformers. Record all accidental spills and number of litres</td>
<td>During Operation phase</td>
<td>Included in the Operating costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Encroachment</td>
<td>Record any new settlements within the proximity of project site</td>
<td>Monthly during the first six Months from start of Construction and</td>
<td>Included in Operating Costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Potential Environmental /Social impact</td>
<td>Parameter to be monitored</td>
<td>Timing</td>
<td>Cost</td>
<td>Responsibility</td>
</tr>
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<td>---------------------------------------</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fire hazards</td>
<td>Record any Fire incidences and investigate on possible causes</td>
<td>Quarterly for the first one year of operation then annually</td>
<td>Included in contract and Operating costs</td>
<td>The Contractor and The KPLC</td>
</tr>
<tr>
<td>Occupational Health and Safety Issues</td>
<td>Record any accidents and Possible hazard scenarios</td>
<td>Throughout project cycle</td>
<td>Included in Contract and operating Costs</td>
<td>The Contractor and The KPLC</td>
</tr>
<tr>
<td>Birds Collisions</td>
<td>Record any dead birds within the project site with signs of rotor blade collisions and injury</td>
<td>Operating Phase</td>
<td>Included in the Operating Costs</td>
<td>The KPLC</td>
</tr>
<tr>
<td>Aircraft accidents</td>
<td>Record any plane crashes due to collision with the wind Turbines</td>
<td>Operational Phase</td>
<td>Included in Operating Costs</td>
<td>The KPLC</td>
</tr>
</tbody>
</table>
11 CHAPTER ELEVEN: CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

The analysis of the ESIA has evidenced that the construction and operation of the proposed Wind Turbines would have positive impacts to the Proponent and Kenyan society at large. The impacts will include Increase in reliable and sustainable clean energy, decrease in pollution emanating from thermal power generation, employment to local community members, improved education standards, increase in the national/local investment, increase in Government revenue, improvement of standards of living for Marsabit Residents. However, despite the outlined positive impacts, the proposed development will cause some negative impacts such as encroachment, Noise Pollution, dust generation, Soil erosion, oil spills, solid waste generation, Occupational hazards among others.

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. The Wind turbines and associated structures will be installed to the required planning/architectural/structural designs and standards to ensure efficient utilization of existing local winds and compatibility with Off-grid system. During project implementation, operation and decommissioning stages sustainable environmental management (SEM) would be ensured; avoiding inadequate use of natural resources, conserving nature sensitively and guaranteeing a respectful and fair treatment of all people working on the project, general public at the vicinity and the expected beneficiaries of the generated power.

In relation to the proposed mitigation measures that will be incorporated during construction, operational and decommissioning phases; the development’s input to the society and environment; the project is considered beneficial and important. The proposed development is a timely venture that will subscribe to the government’s policy under The Least Cost Power Development Plan 2010-2030. The development is the right direction towards Green Energy initiatives by The KPLC to ensure sustainable energy development and towards achieving NEMA’s principle of a Clean and a Healthy Environment for all.

11.2 Recommendations

Recommendations for the prevention and mitigation of adverse impacts are as follows:

- All solid waste materials and debris resulting from installation of the wind turbines must be disposed off at approved dumpsites.
- During construction especially of the access road all loose soils must be compacted to prevent any erosion by wind or water. Other appropriate soil
erosion control measures can be adapted. Any stockpiles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.

- Construction activities must be undertaken only during the day i.e. between 0600 hours to 1800 hours. This will minimize disturbance to the general public within the proximity of the site/project.
- The proponent and contractor should follow the guidelines as set by relevant authorities to safeguard and envisage environmental management principles during installation, operation and decommissioning of the Proposed Wind Turbines.
- Maintenance activities for vehicles must be carried out in service bays and garages off site to reduce chances of oils or grease or other maintenance materials, from coming into contact with environment (water or soil).
- Once installation of the Turbines is done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of low grass (in open areas) and suitable tree species.
- Ensure proper water usage during construction phases.
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- Used and new oils must be handled and stored appropriately to avoid oil leaks and spills on the site.
- Personal utilities like toilet should be constructed at the site before commencement of construction works.
- Workers must be provided with complete protective and safety gear. They must have working boots, complete overalls, helmets, gloves, earmuffs, nose-masks, goggles etc.
- Fully equipped first aid kits must be provided within the site.
- Environmental Audits should be carried annually or as prescribed by the Authority during the operational phase and invitation of Inspectors and Experts from NEMA to ascertain compliance with the provided ESMP and set NEMA regulations and Standards.

It is in the opinion of the Environmental Consultant that the anticipated negative impacts can readily and effectively be mitigated and on the whole the proposed project does not pose any significant threat to the Environment and may be licensed to proceed.

Diligence on the part of the contractor and proper supervision by the proponent is crucial for mitigating the predicted impacts and ensuring structural strength, safety, and efficient operation of the wind turbines.
12 REFERENCES

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Government of Kenya (GoK), The Physical Planning Act

The Way Leaves Act, Cap. 292,
The Survey Act, Cap. 299,
Marsabit District Development Plan, 2002 - 2008
13 ANNEXES
13.1 ANNEX 1: LAND DOCUMENTS
13.2 ANNEX 11: PROPOSED TWO 250 KW WIND TURBINES LAYOUT
13.3 ANNEX 111: STAKEHOLDER CONSULTATIONS
13.4 ANNEX 1V: LEAD EXPERTS NEMA CERTIFICATE AND PRACTICING LICENSE