



Social–Economic Study Report for the Proposed Wind Power Farm at Loiyangalani and the 400kV Power Transmission Line from Loiyangalani to Suswa

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## ABBREVIATIONS AND ACRONYMS

|        |                                             |
|--------|---------------------------------------------|
| ASALs  | Arid and Semi-arid lands                    |
| EMCA   | Environmental Management Coordination Act   |
| EPFI   | Equator Principles Financial Institutions   |
| ERC    | Energy Regulatory Commission                |
| ESRP   | Energy Sector Recovery Project              |
| FDG    | Focus Discussion Groups                     |
| FPE    | Free Primary Education                      |
| GRC    | Grievance Redressal Committee               |
| GRM    | Grievance Redressal Mechanism               |
| GWH    | Giga Watt Hour                              |
| HIV    | Human Immuno-deficiency Virus               |
| IFC    | International Finance Corporation           |
| IPP    | Independent Power Producers                 |
| KenGen | Kenya Electricity Generating Company        |
| KFS    | Kenya Forest Services                       |
| KWS    | Kenya Wildlife Services                     |
| KPLC   | Kenya Power and Lightning Company           |
| KV     | Kilovolt                                    |
| LTWP   | Lake Turkana Wind Power Project             |
| LPG    | Liquefied Petroleum Gas                     |
| MW     | Megawatts                                   |
| MDGs   | Millennium Development Goals                |
| NEMA   | National Environmental Management Authority |
| NGOs   | Non-Governmental Organizations              |
| PAPs   | Project Affected Persons                    |
| REA    | Rural Electrification Authority             |
| ROW    | Right of Way                                |
| RPF    | Resettlement Policy Framework               |
| STIs   | Sexually Transmitted Infections             |

## EXECUTIVE SUMMARY

Kenya relies heavily on electric power generated from hydro electric power that accounts for over 50% of the total installed capacity in the country followed by thermal, geothermal, imported power and an insignificant proportion of wind power. Due to the global climate changes, rain for recharging power generating reservoir have become unreliable making it difficult to generate enough power for the country . As a result, the country has experienced an unstable power network with several outages and consequently unreliable power supply with the attendant slow-down in socio and economic development. Other energy sources such as the diesel powered systems have suffered from extreme fluctuations in global oil prices which have in turn resulted into high power tariffs making the production of goods and uncompetitive.

The country's long term development agenda as envisaged in the Vision 2030 identifies energy as one of the key infrastructural enablers, in making Kenya competitive in the global arena, the country urgently requires to fast track development of renewable energy sources that will not only meet the set out target/ milestones but also in tandem with the global trends.

In view of the foregoing, Lake Turkana Wind Power Limited (LTWP) an Independent Power Producer (IPP) conducted a feasibility study to generate power at Loiyangalani in Marsabit District. The study showed potential to generate more than 300MW from proposed 100 wind turbines to be fed into the National grid via a 400km long 400kV high voltage power transmission line at Suswa. The project will also involve reconstruction/strengthening of 270km road from Laisamis to Loiyangalani. Further, it's proposed to build two main substations at the Rumuruti and Maralal along the transmission line.

This report is on the socio-economic impacts of the proposed project both nationally and in the project area. The study was conducted in accordance with both the national environmental and social impact assessment legislation as embodied in Environmental Management and Coordination Act (EMCA) of 1999 and the Equator Principles Financial Institutions (EPFI). According to the International Finance Corporation (IFC) project screening guidelines, the proposed project was categorized to fall under Category B viz the proposed project present limited adverse social and environmental impacts that are few, generally site specific, largely reversible and readily addressed through mitigation measures.

The Consultant undertook a comprehensive socio-economic assessment study of the proposed project and among the key out put of the study are the key finding at the national level as follows:

1. At its completion, the project is expected to add an extra 300MW into the country's national grid which is equivalent to 25% of the current installed power capacity. This will go along way in enabling the country achieve the planned incremental power supply in the country for the 2008-2012 period set at 325 MW. In essence this will bolster country's plan to expedite rural electrification programmes in the different parts of the County. This will have an attendant multiplier effect on socio- economic benefit likely to arise from power supply.
2. Stabilizing the existing power supply network. The current power supply network in the country suffers frequent outages occasioned by insufficient capacity from the other sources. In what has becoming a common phenomenon, the addition of 25% power from a renewable source will translate in a stable network.
3. Reduced cost of power. The proponent has conducted a feasibility study on the project and developed a bulk tariff for the power to be generated from the project. In effect this implies that the project has the potential to usher the country into a low- power tariff regime in the long run. This not only has an effect on the cost of production but can lead to improved quality of live to the country as a whole.
4. Implementation of the project present the country with an opportunity to rely less on the more expensive diesel powered alternatives as is the current situation in the country now and ushering in of a new era of green energy
5. Kenya has a high potential of generating power from other sources notably geothermal source in Rift valley. These sources have high capital outlay especially in the drilling and installation of the turbines. Construction of the power transmission line from Loiyangalani to Suswa will create capacity/necessary infrastructure in proximity to the potential source and will be used to transmit power generated from these sources to the national grid.

The project is expected to turn around by impacting a great deal areas like Loiyangalani where the LTWP will set up the Wind Farm and other towns/centres like South Horr, Maralal and Rumuruti where the proponent proposes to construct step down substations to provide power to the population including strategic centres. Some of the positive benefits identified include:-

- Availability of potable water supply through desalination of the saline Lake Turkana water and sinking of boreholes, using electrical energy from wind.
- Improved access through construction of more durable road infrastructure. The main road from Laisamis to Loiyangalani will be reconstructed greatly improving accessibility of the site and easing movement of the locals.
- The local economy will benefit from the presence of migrant workers who will seek services and goods that can be availed locally
- Enhancement of fishing industry by possible construction of cooling plant and benefit from a ready market as a result of the project activities (currently the turnover from fishing activity is estimated at \$ 3 million per annum and is projected would increase astronomically to \$163 million annually)
- Livestock industry will benefit through the construction of slaughter houses and refrigeration facilities
- The area will be open up as a tourist destination with the attendant benefits of developing tourist related activities such as sport fishing, yachting, jet skiing etc. This will go a long way in alleviating poverty since most of the youth will be gainfully employed in productive economic activities.
- Power supply will improve the education and health standard since primary, secondary and health facilities will be able to attract and retain qualified personnel. In the same vein, students will be able to devote more time to study at night as opposed to when they have to study during the day light
- Improvement of maternal health as a result of development of up to date health facilities and reduced work load on the women folk who bear the burden as “hewers of wood and fetchers of water”.
- Open up the area since locals will have access to information from a variety of electronic media including television and internet facilities.
- Provision of power will enhance development of Information Communication Technology (ICT) facilities in key centres such as Baragoi and South Horr. The ICT facilities will go a long way in addressing poverty in the area through creation of employment in cyber cafes for internet and other services.
- Small scale traders and businesses in centres located along the transmission corridor, wind farm and the access road will flourish from the increased volume of trade due to

increased demand of basic commodities and services such a food, construction materials and accommodation during construction stage.

At the specific project area, the proposed project was found to have moderately significant negative socio-economic impacts at construction, operational and decommissioning phases. These can however be mitigated through timely compensation of the displaced persons. However the positive impacts likely to arise as a result of the proposed project in the project area far more outweigh the expected negative impacts.

In view of the foregoing, the study concludes that the project has moderately significant negative impacts which can easily be mitigated and recommends timely implementation of the project with strict adherence to the proposed Environmental Management and Social Management Plans.

On the other hand, the study identified that a total of 21700 people from 3700 households are set to benefit around Loiyangalani, Mt Kulal and South Horr. Along the proposed power transmission line and access road corridor, a further 16000 households will directly benefit. To enhance smooth execution of the work, a proper Grievance Redressal Mechanism (GRM) should be put in place to cater for grievances that may arise during and after the project construction.

# 1.0 INTRODUCTION

## 1.1 Power Sector situation in Kenya

The Ministry of Energy is vested with the responsibility to regulate and offer oversight and policy direction on all matters on power sector in the country. Under the Ministry are different bodies undertaking distinct functions. These are:-

1. Electricity Regulation Commission (ERC)- is an independent body responsible for the regulation of the energy sector
2. Kenya Power and Lightning Company (KPLC) -a parastatal responsible for electricity transmission, distribution and supply to customers. The power utility has been split into two companies with distinct functions of power transmission and distribution. The electricity sector in Kenya only reaches an estimated 30% of the population.
3. Kenya Electricity Generating Company (Kengen) –is a parastatal established under the State Corporations Act with a mandate of generating power. Kengen owns all public power generation facilities in the country and generates 80% of the total output, which it sells to KPLC. It generates most of its electricity through hydroelectric and geothermal power plants, along with fossil fuel plants.
4. Rural Electrification Authority- it is the body charged with the mandate of developing and updating rural electrification master plan, promoting use of renewable energy sources, manage rural electrification fund to support electrification of rural areas.

Due to inadequate power capacity within the country, a number of Independent Power Producers (IPPs) have been licensed to undertake power generation activities to supplement existing power generation capacity. These include Iberafrica, Westmont Power, Orpower 4 and Tsavo Power.

Figure 1 shows a breakdown of energy sources in the Country which has a total installed capacity of 1219MW comprising: 677 MW hydropower, 127 geothermal, 0.35MW, wind 383.5MW thermal, and 30MW non –firm import from Uganda.

The effective capacity of interconnected system is about 1,134MW.

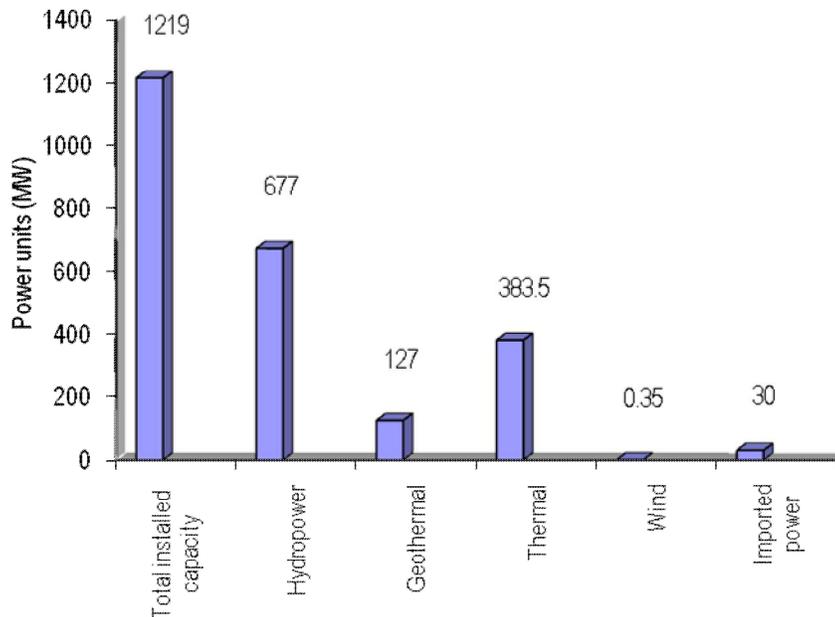


Figure 1: Breakdown of the electricity energy sources in the country and installed capacity.

The transmission and distribution systems are owned and operated by KPLC. The transmission system consists of 1323 Km of 220kV, 2035km of 132 kV transmission lines and some 600km of 66kV sub transmission lines. The distribution system consists of 58km of 40kV, 5973 km of 33 KV and 15267km of 11KV.

## 1.2 Project Background

The Lake Turkana Wind Power (LTWP) limited conducted a feasibility study on the possibility of generating electrical power from wind energy in Loyangalani in Marsabit District. The results are that there is great potential to generate power using wind energy and as a start, LTWP plans to generate 300MW of electrical power, which is equivalent to 25% of the total existing electrical power generation in the country, by 2011. The LTWP is at the final stages of the project preparation for implementation. The negotiations between the Kenya Power and Lighting Company and the Ministry of Energy on one hand and LTWP on the other regarding the implementation of the project are being concluded.

The LTWP project main components include the generation of power at the Loyangalani Wind farm and the 400km transmission line between Loiyangalani and Suswa, where the power will be fed to the KPLC grid through a double circuit transmission line from power transmission line from Olkaria. The project proponents have initiated negotiations with possible financiers of the project and it is in this connection that

a socio-economic study for the project was commissioned. Its outcome will inform governments/institutions the basis of the support of the project.

### **1.3 Wind Power Technology**

The traditional windmill has for long kept the original technology where a horizontal shaft is connected to the wind vanes, which is in turn connected to the vertical shaft through a right angle transmission.

Windmill technology has in the past two decades been developed into modern turbines for generating electricity. The first significant wind turbines had capacity of 100KW, with steel wind blades.

The capacity has since increased significantly with new, larger mills and better materials. The safety was drastically improved by using stronger, but also lighter materials. The knowledge and insight in wind streams and climates lead to development of modern turbines that anticipate the rapidly changing condition during rains, storms, lightening, etc.

The turbine technology has continued to grow with time. While the largest wind turbine in 1990 had a capacity of 225KW, today's turbines can produce up to 6MW each. The diameter of rotor increased from 27m to 112m and the shaft height (hub height) from 30m to 125m.

The latest turbine models are equipped with sensors connected to computers to determine undesired vibrations for preventative actions and for independent control of individual rotor during rotation. This improves the efficiency.

### **1.4 Choice of Technology for Lake Turkana Wind Project**

Lake Turkana Wind Power (LTWP) choice of wind turbines was informed by the following criteria;

- Widely used technology that has proven reliable under the most difficult circumstances
- Ability to operate under the prevailing, extreme conditions, namely dust, high temperature, high wind speeds.
- Low maintenance costs
- The need to generate additional power to drive the economy in consideration of maximum capacity from the existing sources

Based on the above criteria, LTWP has chosen VESTAS, the global market leader in supply of wind turbines. LTWP has chosen Vestas V90 with a capacity of 3MW, which was first launched in 2002 in Sweden. V90 is highly durable because the main bearing is integrated into the transmission. This ensures that the main shaft is better supported over a longer length and less torsion occurs in the shaft. The aerodynamics of V 90 has been improved resulting in decreased total weight. It also uses a fluid based cooling technique that protects turbines from dust and sand.

The project will consist of 100 turbines, each with a capacity of 3 Megawatts. The total power generated by the project will amount to around 300MW, adding about 25% to the total existing installed capacity available in Kenya. The KPLC has confirmed its interest to purchase this capacity.

## **2.0 REVIEW OF COUNTRY'S DEVELOPMENT AGENDA AND POLICY FRAMEWORK IN ENERGY**

### **2.1 Kenya Vision 2030**

Kenya vision 2030 is a new long-term development blue-print for the country. It is motivated by collective aspiration for a much better society than the one there is today, by the year 2030. The aim of Kenya vision 2030 is “the globally competitive and prosperous country with a high quality of life by 2030”. It aims at transforming Kenya into a newly industrializing, middle-income country providing a high quality of life to all citizens in a clean and secure environment. In other words, the Vision aspires to meet the Millennium Development Goals (MDGs) for Kenyans. The vision is anchored on 3 key pillars namely:

- a) The economic pillar- It aims to achieve an economic growth rate of 10% per annum and sustaining the same till 2030 in order to generate more resources to address the MDGs. The Vision has identified a number of flagship projects in every sector of the economy to be implemented over the vision period to facilitate the desired growth that can support the implementation of the MDGs on a sustainable basis. Key sectors addressed include agriculture, education, health, water and environment, among others.
- b) The social pillar – it seeks to create just, cohesive and equitable social development in a clean and secure environment.
- c) The political pillar – it aims to realize an issue-based, people centered, result-oriented and accountable democratic system.

### **2.2 Energy as a foundation of Vision 2030**

Energy is one of the infrastructural enablers of the 3 “pillars” of Vision 2030. The level and intensity of commercial energy use in a country is a key indicator of the degree of economic growth and development.

Kenya is therefore expected to use more energy in the commercial sector on the road to 2030. As incomes increase and urbanization intensifies, household demand for energy will also rise. Preparations have been made to meet this growth in demand for energy under the Vision. Commercial energy in Kenya is dominated by petroleum and electricity as the prime movers of the modern sector of the economy, while wood fuel provides energy needs of the traditional sector including rural communities and the urban poor. At the national level, wood fuel and other biomass account for about 68% of the total primary energy

consumption, followed by petroleum at 22%, electricity at 9% and others including coal at about less than 1%. Solar energy is also extensively used for drying and, to some extent, for heating and lighting.

Electricity remains the most sought after energy source by Kenya society and access to electricity is normally associated with rising or high quality of life. However, its consumption in Kenya is extremely low at 121 kilowatt hours (kwh) per capita (compared to 503kwh in Vietnam or 4,595kwh for South Africa) and national access rate at about 15%. The access rate in the rural areas is estimated at 4%. However, all that is changing rapidly as the country invests more resources in power generation, in addition to policy and institutional reforms in the sector which bring in new providers. The current sources of electrical power generation are hydro 3,025 Gwh (51.2%), thermal oil 1,819 Gwh (30.8%), geothermal 1,046 Gwh (17.7%), cogeneration 6 Gwh (0.09%), wind 0.3 Gwh (0.01%) and imports 11 Gwh (0.2%). Petroleum fuels are imported in form of crude oil for domestic processing and also as refined products, and are mainly used in the transport, commercial and industrial sectors.

The domestic consumption of petroleum products are as follows: light diesel oil 1,035,600 tonnes (34.1%), fuel oil 664,600 tonnes (21.9%), aviation spirit and jet fuel 595,300 tonnes (19.6%), motor spirit 358,200 tonnes (11.8%), illuminating kerosene 279,200 tonnes (9.2%), liquefied petroleum gas 64,600 tonnes (2.1%) and heavy diesel oil 40,700 tonnes (1.3%). Coal is mainly used in the industrial sector, particularly in the cement industry for process heat. Coal utilization has remained low in Kenya despite international prices having been reasonable and fairly stable over the years relative to petroleum.

### **2.3 Challenges**

The challenges facing the power sub-sector include a weak power transmission and distribution infrastructure, high cost of power, low per capita power consumption and low countrywide electricity access. The petroleum industry is constrained by limited supply facilities for fuels including LPG, domestic production of motor fuels which do not meet international quality standards, inadequate distribution infrastructure in the remote parts of the country which contribute to high product prices, proliferation of sub-standard fuel dispensing facilities, under-dispensing of products including adulteration of motor fuels and dumping of export products. This therefore necessitates the production of more and cheap sources of energy like wind energy.

## **2.4 Measures being taken**

The government has continued to finance extension of electricity supply in the rural areas as part of the basic infrastructure to stimulate economic growth and employment creation. The current policy provides for the extension of electricity to market centres, public secondary schools, youth polytechnics, health centres, and water systems, among other community projects. This is intended to increase electricity access in rural areas currently at 4% to 12% by the year 2012. The government is also encouraging the Kenya Power and Lighting Company to adopt affordable connection policies so as to boost the number of customers in the rural areas. This is already happening.

The Company has come up with attractive customer connection policies that include transformer maximization and Umeme Pamoja which have seen the number of connections rising significantly to over 120,000. Further, the company has come up with a more flexible mode of settling the connection fee where a customer is connected upfront upon payment of a deposit while the balance is settled in installments. This has been facilitated through a soft loan arrangement by the Kenya Power and Lighting Company Limited and Equity Bank.

## **2.5 Rural Electrification**

Rural Electrification Authority (REA) charged with the mandate of implementing the Rural Electrification Programme came into operation in July 2007. REA is expected to increase the speed of implementation of several projects that are lined up for implementation throughout the country. Currently, the Authority is in the process of developing a comprehensive rural electrification master plan which shall provide crucial information for selecting projects for funding at a given time. In addition, Ethiopia and Kenya have undertaken a feasibility study financed by several international development partners to facilitate the transfer of electricity to Kenya from a number of large Ethiopian hydropower projects that provide power at lower costs compared to local ones.

Vision 2030 targets connecting one million households between 2008 and 2012. It is projected that out of the one million households, 650,000 households will be in the rural areas and the balance of 350,000 households in urban areas. As shown in Table 1, the total number of rural electricity customers by 2012 is projected to reach 1,400,000 from a current estimate of 750,000. Of the 650,000 rural customers to be

provided with electricity between 2008 and 2012, REA's share is 200,000 rural customers while the remaining 450,000 will be done by the KPLC.

Table 1 Rural Electrification access and connectivity targets

| Phase            | Period    | Access level (%) | Proportion of rural population with Electricity (%) | Projected number of rural electricity Customer | Cumulative additional power demand (MW) |
|------------------|-----------|------------------|-----------------------------------------------------|------------------------------------------------|-----------------------------------------|
|                  | 2008      | 63               | 10                                                  | 750,000                                        | -                                       |
| <b>Phase I</b>   | 2008-2012 | 100              | 22                                                  | 1,400,000                                      | 325                                     |
| <b>Phase II</b>  | 2013-2022 | 100              | 65                                                  | 5,050,000                                      | 2150                                    |
| <b>Phase III</b> | 2023-2030 | 100              | 100                                                 | 9,060,000                                      | 4155                                    |

The key projects to be implemented during 2008 – 2012 period include the following:

- a. A total of 215 rural electrification projects, estimated to cost \$ 18.5 million, were scheduled to be completed by February 2008. These projects include new isolated power stations being erected at Hola (Tana River district), Elwak (Mandera District), Mpeketoni (Lamu district), Merti (Isiolo district), Habasweni (Wajir district) and Mfangano Island (Suba district) at a cost of \$ 6 million. All these projects are being funded solely by the Government of Kenya.
- b. Apart from government funding, Kenya has also received external assistance for its Rural Electrification Programme. The Government of France is currently financing a rural electrification project to the tune of \$33.8 million to cover various parts of the country. Upon completion, the project will facilitate connection of power to 460 trading centres and 110 secondary schools, among other public facilities.
- c. The Government intends to spend \$ 2.3 million to provide solar electricity generators to 74 public institutions including boarding primary and secondary schools, health centres and dispensaries in Baringo, Marakwet, Samburu, West Pokot, Turkana, Makueni, Narok, Kajiado, Moyale, Marsabit and Mandera districts.

- d. The Government has formulated an Energy Access Scale-up Programme through which one million households will be connected with electricity over the next five years at an estimated cost of Kshs.84 billion. The programme will target connecting all major trading centres, secondary and primary schools, community water supply works and health centres in the country. This programme will be financed by the Government as well as development partners. Plans are underway for installation of booster pump stations to double the capacity of the Mombasa to Nairobi oil pipeline from 440m<sup>3</sup>/hr to 880m<sup>3</sup>/hr. Booster pumps four (4) in number will be installed at Samburu, Manyani, Makindu and Konza.
- e. A study has been completed on the projected demand for petroleum products in the country. The Kenya Pipeline Company has selected an Engineering Design and Construction Supervision Consultant for the construction of a 340km parallel oil pipeline from Nairobi to Eldoret.
- f. The Government will also partner with the government of Uganda and Tamoil East Africa Limited in a Joint Venture Company for the extension of 352km oil pipeline from Eldoret to Kampala.
- g. Construction of 6,000 tonne common user Liquefied Petroleum Gas import handling facility in Mombasa through public – private partnership. This is expected to increase parcel sizes imported thus reducing freight costs and making LPG cheaper to Kenyans.
- h. Construction of 2,000 tonne common user LPG handling facility in Nairobi. With increased storage space, supply sources will increase thus competitively priced LPG can be obtained.
- i. Following the completion of appraisal drilling in Mui Basin of Kitui and Mwingi district, Kenya will have access to local coal as an energy source. Initial exploration activities have indicated existence of coal. Appraisal drilling project to ascertain the commercial quality and viability of the deposits are in progress.
- j. Olkaria IV appraisal drilling of 6 wells is expected to produce 70 MW of electricity. The project is expected to prove that commercially exploitable steam is available in the field.

- k. Wind Power generation by IPP's at various sites. It is envisaged that wind power will provide total power installed of about 150MW.
- l. Co-generation Power: Power will also be obtained in the process of producing sugar. It is envisaged that the potential of about 120 mw will be exploited using sugar factories as a base. This will be done through public private partnership.
- m. The Energy Sector Recovery Project (ESRP), funded by the World Bank and some bilateral donors, has a major component on "Distribution Reinforcement and Upgrade" to be implemented over a period of four years. This is intended to improve quality and reliability of supply, reduce system losses and increase access to electricity service especially in the urban and peri-urban areas. This is of special interest to the industrial sector where power outages in the past led to losses.
- n. The Governments of Kenya and Tanzania have obtained funding for implementation of a 330kV transmission line project between Arusha in Tanzania and Nairobi. This will be another source of extra power.

## **2.6 Role of Renewable Energy in Achieving Millennium Development Goals**

Energy is essential for economic growth and development and is required in all spheres of human welfare. Achievement of the eight (8) Millennium Development Goals requires appropriate energy as an important output. Energy contribution to one MDG can also contribute to the achievement of another goal. For example, provision of electricity to higher percentages of households will, also address school-related needs by freeing girls and women from the drudgery of collecting firewood, will lead to improved household hygienic conditions, and will also reduce environmental degradation – all of which are important target issues under other MDGs. Provision of new and renewable energy such as off-grid electricity based on solar and mini-hydro will serve both households and other institutions such as schools and health centres as well as addressing the issues of gender.

However, the MDGs cannot be achieved without provision of sustainable, affordable and appropriate energy at all times. Indeed, supply of adequate and affordable types of energy for growth and development is the central theme of the Government's energy policy. The proposed interventions include biomass

energy (fuel wood supply strategies, charcoal conservation strategies mainly through improved cook stoves), petroleum products, electricity, promoting mini-hydros, biogas, and institution strengthening to promote sustainable energy supply (coordination of different authorities on energy, energy research and development). However, the model presented for the MDGs is not adequate for analysing energy requirements as it is not responsive to key variables in assessing energy needs e.g. agro-ecological zones particularly in the use of biomass, the proportion of people using particular energy, and the mix of energy used by households under varying income levels and season of the year. It is therefore recommended that a model capturing all the major energy types, biomass, and electricity and petroleum products be developed urgently for local use and applied for future planning.

Renewable energy projects developed in scores of developing countries—many with international donor assistance—have demonstrated that renewable energy can contribute to poverty alleviation directly by providing the energy needed for creating businesses and jobs, turning locally available resources into productive economic assets.

By developing energy sources such as large hydro power, wind power, geothermal power, and liquid biofuels, developing countries can reduce their dependence on oil and natural gas, creating energy portfolios that are less vulnerable to price fluctuations. In many circumstances, these investments can be economically justified as less expensive than a narrower, fossil fuel dominated energy system.

Most poor countries have abundant renewable resources, including varying combinations of solar, wind, geothermal, and biomass, as well as the ability to manufacture the relatively labor-intensive systems that harness these. However, only a few developing countries have adopted the policies needed to spur the development of renewable energy technologies and markets, which have been dominated by Europe, Japan, and North America. The exceptions include Brazil, which has built the world's leading biofuels industry, and China and India, which are leaders in developing decentralized renewable sources such as small hydro, small wind, biogas, and solar water heating. Renewable energy technologies face a number of barriers that have delayed scaling-up their production and use in developing countries. Unlike conventional energy sources, which have benefited from decades of research and development, an established industrial base, and government-subsidized infrastructure support, renewable energy options are just becoming known in many regions. Government policies and support systems are frequently biased in favor of conventional energy sources. New policies can have a dramatic impact on the pace of introduction of

renewable energy, as several developing countries have demonstrated. Most renewable energy sources require a significant up front investment, as has been the case for most of the conventional energy sources that dominate today's energy system. This means that in the early years of development, renewable energy options are typically more expensive than the conventional alternative. Government intervention to level the playing field is therefore needed to start the development process.

Experience shows that as the scale of use increases, costs decline significantly in the early years. A growing number of developing country governments have recognized the essential role that renewable energy technologies can play in meeting basic energy needs and achieving the MDGs. Well-designed policies will allow the cost of the renewable options to fall rapidly in the first several years. It is through the combined efforts of governments and the private sector that strong, sustained markets for renewable energy are most likely to develop.

Table 1 below illustrates the contribution of renewable energy to the achievement of MDGs.

Table 1 Contribution of renewable energy to meeting of MDGs

| <b>S/No.</b> | <b>MDG</b>                         | <b>Steps Toward Goal</b>                                                                                                                                                                            | <b>Modern Energy Contributes by</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.           | Cutting Extreme Poverty and Hunger | <ul style="list-style-type: none"> <li>• Reduce by half the proportion of people living on less than \$1 a day</li> <li>• Reduce by half the proportion of people who suffer from hunger</li> </ul> | <ul style="list-style-type: none"> <li>• Reducing share of household income spent on cooking, lighting, and space heating.</li> <li>• Improving ability to cook staple foods.</li> <li>• Reducing post-harvest losses through better preservation.</li> <li>• Enabling irrigation to increase food production, access to nutrition and income-generation to communities</li> <li>• Enabling enterprise development, utilizing locally available resources, and creating jobs.</li> <li>• Generating light to permit income generation beyond daylight.</li> <li>• Powering machinery to increase productivity.</li> </ul> |
| 2.           | Universal Primary Education        | <ul style="list-style-type: none"> <li>• Ensure that all boys and girls complete a full course of primary Schooling</li> </ul>                                                                      | <ul style="list-style-type: none"> <li>• Providing light for reading or studying beyond daylight.</li> <li>• Creating a more child-friendly environment (access to clean piped water, sanitation, lighting, and space heating/cooling), which can improve attendance in school and reduce drop-</li> </ul>                                                                                                                                                                                                                                                                                                                |

|    |                                         |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                         |                                                                                                                                                                                                                                                                                                                                           | <p>out rates.</p> <ul style="list-style-type: none"> <li>• Providing lighting in schools which can help retain teachers.</li> <li>• Enabling access to media and communications that increase educational opportunities.</li> <li>• Providing efficient and fast energy for cooking and water heating in primary schools that benefit from feeding programs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 3. | Gender Equality and Women's Empowerment | <ul style="list-style-type: none"> <li>• Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015</li> </ul>                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Freeing women's time from survival activities, allowing opportunities for income generation and recreation.</li> <li>• Reducing exposure to indoor air pollution and improving health.</li> <li>• Lighting streets to improve women's safety.</li> <li>• Providing lighting for home study and the Possibility of holding evening classes therefore empowering women through education advancement</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| 4. | Health                                  | <ul style="list-style-type: none"> <li>• Reduce by two-thirds the mortality rate among children under five</li> <li>• Reduce by three-quarters the maternal mortality ratio</li> <li>• Halt and begin to reverse the spread of HIV/AIDS</li> <li>• Halt and begin to reverse the incidence of malaria and other major diseases</li> </ul> | <ul style="list-style-type: none"> <li>• Providing access to better medical facilities for maternal care.</li> <li>• Allowing for medicine refrigeration, equipment sterilization, and safe disposal by incineration.</li> <li>• Allowing women to pursue further education, as some studies have shown that there is inverse correlation between a mother's level of education and child mortality</li> <li>• Facilitating development, manufacture, and distribution of drugs.</li> <li>• Allowing mothers to spend more time with their children which is very important</li> <li>• Providing access to health education media.</li> <li>• Reducing exposure to indoor air pollution and improving health.</li> <li>• Enabling access to the latest medicines/expertise through renewable-energy based telemedicine systems.</li> </ul> |

| S/No. | MDG                          | Steps Toward Goal                                                                                                                                                                                                                                                                                                                                                                               | Modern Energy Contributes by                                                                                                                                                                                                                                                                                                                                          |
|-------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.    | Environmental Sustainability | <ul style="list-style-type: none"> <li>• Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources</li> <li>• Reduce by half the proportion of people without sustainable access to safe drinking water</li> <li>• Achieve significant improvement in the lives of at least 100 million slum dwellers, by 2020</li> </ul> | <ul style="list-style-type: none"> <li>• Boosting agricultural productivity, increasing quality instead of quantity of cultivated land.</li> <li>• Reducing deforestation for traditional fuels, and reducing erosion and desertification.</li> <li>• Reducing greenhouse gas emissions.</li> <li>• Restoring ecosystem integrity through land management.</li> </ul> |

## **3.0 SOCIO-ECONOMIC IMPACT ASSESSMENT METHODOLOGY**

### **3.1 Introduction**

Following is a review of some legislation relevant to the implementation of generation and transmission of electric power

### **3.2 Electric Power Act (Act No. 11 of 1997)**

This Act of Parliament has as its intention the amendment and consolidation of the law relating to the generation, transmission, transformation, distribution, supply and use of electrical energy for lighting and other purposes, and for connected purposes.

The provisions of this Act apply to every public or local authority company, person or body of persons generating, transmitting, distributing, supplying, or using electrical energy, and to all works or apparatus for any or all of these purposes.

The Kenya Gazette Supplement No.1 (Act No.1) of 9 January 1998 addresses issues related to supply of electric power, distributing mains and provision of licenses. Article 40 of the Kenya Gazette Supplement states that: Any new works, and any extension or amplification of any existing works, for any of the purposes of generating, transforming, converting, transmitting, distributing or supplying electrical energy under any license shall be carried out and performed in the mode and with the material or apparatus of the Kenya Bureau of Standards or where no such standards exist, to comply with the relevant International Standards approved by the Kenya Bureau of Standards.

The Act goes on to provide that for the purpose of the conveyance, transmission, or supply of electrical energy, the Minister may, upon recommendation by the Board, authorize any licensee to erect, fix, install or lay any poles, wires, electric supply lines, pipes or other apparatus in, upon, under, over or across any public streets, road, railways, tramways, rivers, canals, harbours or Government property in such manner and on such conditions as herein provided or as he may approve.

The contracts for the sale of power or transmission services between and among electric power producers, public electricity suppliers and large retail consumers shall be submitted to the Energy Regulatory Board for approval and provisions of any contract approved by the Board shall be legally binding on all parties.

### **3.3 Land (Group Representatives) Act (Chapter 287 of the Laws of Kenya)**

This is an Act of Parliament to provide for the incorporation of representatives of groups who have been recorded as owners of land under the Land Adjudication Act, and for purposes connected therewith and purposes incidental thereto.

### **3.4 Way leaves Act (Chapter 292 of the Laws of Kenya)**

This Act of Parliament provides that any person in the service of the government and any contractor executing any work for the Government, together with his agents and servants, may at any time enter upon any land for the purpose of surveying, setting out and marking the line of any intended sewer, drain or pipeline, or for the purpose of inspecting, repairing, removing, re-laying or cleansing any sewer, drain or pipeline the property of the Government, or for any other purpose under this Act.

### **3.5 Land Acquisition Act (Chapter 295 of the Laws of Kenya.)**

The Land Acquisition Act makes provisions for the compulsory acquisition of land for the public benefit. Under the Act the Commissioner of Lands may in writing authorize any person, together with servants and workmen, to enter upon any land specified in a notice and to survey the land and to do all things which may be reasonably necessary to ascertain whether the land is suitable for the purpose for which it may be required.

Where land is acquired compulsorily under this Act, full compensation shall be paid promptly to all persons interested in the land.

In Kenya we have a plethora of enactments all governing land and transactions in land. Thus the Substantive Land Law is to be found in two different statutes while the Adjectival Land Law is to be found in five different statutes not forgetting the Customary Land Law of the various tribes in Kenya.

### **Systems of Substantive Land Law**

There are two systems of Substantive Land Law in Kenya. These are:

- The Indian Transfer of Property Act 1882 as amended by the 1959 Amendment Act. This Act sought to amend the law relating to the transfer of property by act of parties, whereby the transfer of property

means an act by which a living person conveys property, in present or in future, to one or more other living persons, or to himself, or to himself and one or more other living persons.

- The Registered Land Act (Chapter 300 of the Laws of Kenya.) The intention of this Act of Parliament is to make further and better provisions for the registration of title to land, and for the regulation of dealings in land so registered, and for purposes connected therewith.

### **Conveyance systems**

There are three systems of conveyancing and these are those applicable to land registered under:

- ⊕ The Government Lands Act (Chapter 280 of the Laws of Kenya). This Act of Parliament seeks to make further and better provision for regulating the leasing and other disposal of Government lands. The Land Titles Act (Chapter 282 of the Laws of Kenya), this Act of Parliament seeks to make provision for the removal of doubts that have arisen in regard to titles to land and to establish a Land Registration Court.
- ⊕ Registration of Titles Act (Chapter 281 of the Laws of Kenya): This is an Act of Parliament to provide for the transfer of land by the registration of titles. Section 32 provides that no instrument, until registered in the manner prescribed in the Act shall be effectual to pass any land or any interest therein, or render the land liable as security for the payment of money, but upon the registration of an instrument in the manner prescribed the land specified in the instrument shall pass, or, as the case may be, shall become liable as security in the manner and subject to the agreements, conditions and contingencies set out and specified in the instrument, or declared by this Act.
- ⊕ Registered Land Act (Chapter 300 of the Laws of Kenya.) This is an Act of Parliament intended to make further and better provision for the registration of title to land, and for the regulation of dealings in land so registered, and for purposes connected therewith.

### **Registration Systems**

The five registration systems are those under: -

- ❖ The Government Lands Act (G.L.A.)
- ❖ The Registration of Titles Act (R.T.A)\
- ❖ The Land Titles Act (L.T.A)
- ❖ The Registration of Documents Act (Chapter 285 of the Laws of Kenya): This is an Act of Parliament to provide for the registration of documents. It states that: all documents conferring, or purporting to

confer, declare, limit or extinguish any right, title or interest, whether vested or contingent to, in or over immovable property (other than such documents as may be of a testamentary nature) and vakallas shall be registered. It should be noted that this Act isn't peculiar to Land Law, as documents completely unrelated to land can be registered under it.

- ❖ The Registered Land Act (R.L.A)

### **Land Ownership**

Absolute or complete ownership in land vests in the state. Under the Government Lands Act the Commissioner of Lands, on behalf of the Republic of Kenya grants leases of town plots for any term not exceeding ninety-nine(99) years and of agricultural land for a term not exceeding nine hundred and ninety-nine(999) years.

The grantee (the person receiving the land) becomes the owner and subject to the terms and conditions of the lease he possesses the bundle of the rights of ownership. The 999-year leases can be converted into freehold leases and the 99-year leases into 999-year leases.

On conversion or expiry of the Lease, a new grant may be issued under The R.L.A or the R.T.A. All unalienated land other than trust land and all reversion of Government leases are vested in the Government, other lands whether held on freehold or leasehold are vested in the grantees as owners having the rights over them.

The power of the State to qualify (extinguish) property rights in the public interest is embodied in section 75 of the Kenyan Constitution. The Section however makes the exercise of that power subject to due process (this includes the payment of prompt and adequate compensation). Section 117 of the Constitution further provides that an Act of Parliament may empower a county council to set apart trust land for the use and occupation of any person or persons for a purpose which is likely to benefit the residents of that area.

Section 117(4) stipulates that the setting apart of such land is void unless the law under which it is made makes provision for the prompt payment of full compensation. The Trust Land Act, in Sections 7 to 13, makes provisions for the setting apart of land and payment of compensation with regard thereto. All land in urban areas of Kenya and much of the land in rural areas has a registered title. The title to land is either

freehold or leasehold. The development and use of freehold title is controlled by land planning regulations which are administered by both the Central Government and the Local Authority in which the Land is situated. (A local Authority is either a County Council or a Municipal Council whose activities are established and controlled by the Local Government Legislation.)

Leasehold land is held on leases from the Central Government or, less frequently, from the Local Authority and such lease will contain provisions governing the development of the land and the use to which the land can be put. The leases frequently contain provisions against any dealing with the land without the consent of the landlord. The Central Government administers its land through a Department of Lands which is headed by a Commissioner of Lands.

### **3.6 The Trust Land Act (Chapter 288)**

This is an Act of Parliament which makes provision for Trust land. Section 38(1) of the Act provides that a way leave license may be granted to any person empowering him and his servants and agents to enter upon Trust land vested in the council and to lay pipes, make canals, aqueducts, weirs and dams and execute any other works required for the supply and use of water, to set up electric power or telephone lines, cables or aerial ropeways and erect poles and pylons therefore, and to make such excavations as may be necessary for the carrying out of any such purposes, and to maintain any such works as aforesaid.

Section 8 of the Act provides that where land is set apart, full compensation shall be promptly paid by the Government to any resident of the area of land set apart who -

- Under African customary law for the time being in force and applicable to the land has any right to occupy any part thereof; or
- Is, otherwise than in common with all other residents of the land, in some other way prejudicially affected by the setting apart.

Subsidiary legislation is to be found in the form of THE TRUST LAND (WAY LEAVES FOR ELECTRIC LINES) RULES. In these Rules a way leave license granted under Section 38 (of the Trust Land Act) for the purpose of erecting or laying an electric line over or under land shall be in the form in the Schedule to

these Rules, or as near thereto as possible, regard toing had to the circumstances and requirements of each case.

Before granting any such way leave license, the council shall satisfy itself that compensation in respect of disturbance or of any other loss or expenses likely to be caused by the erection or laying of the electric line has been or will be paid to those concerned in like manner and to the same extent as if the land had been set apart under the Act and as if the compensation were being paid under Section 8 of the Act.

No such way leave license shall be valid for a longer period than the period of validity of the relevant license issued under the Electric Power Act.

The annual fee to be paid for such a way leave license shall be assessed at 0.3 US cents per annum per pole or pylon, or, where the electric line is laid underground, \$ 0.06 per mile.

### **3.7 The Energy Act (Chapter 12)**

Section 27 of this Act provides that Subject to the provisions of this Act, a license or licenses as the case may be, shall be required for the generation, importation or exportation, transmission or distribution of electrical energy; or supply of electrical energy to consumers

The Act states that a Permit shall be required in respect of all undertakings –

- Intended for the supply of electrical energy to other persons or consumers; and
- With a generating plant of over 1000 kW intended for own use.

Further, any undertaking operating pursuant to a permit granted under this Act shall in any case where conveyance of electrical energy to or from any transmission or distribution network is possible, meet the minimum requirements of the owner or operator of the transmission or distribution network as approved by the Commission, and the owner or operator of any such undertaking shall inform the network or operator of all connected load and generation equipment that might have material effect on the network; and shall be subject to such conditions as may be specified by the Commission.

However, a permit shall not be required in the case of installations with a generating plant of a capacity not exceeding 1000 kW and connected within the premises of any person in such a manner that conveyance of electrical energy to a transmission system or a distribution system cannot occur.

Section 43 of the Act provides that all contracts for the sale of electrical energy, transmission or distribution services, between and among licensees, and between licensees and large retail consumers shall be submitted to the Commission for approval before execution.

An application for approval of such a contract shall be submitted to the Commission in such manner, as the Minister may, in regulations prescribe. In considering such a contract, the Commission shall:–

- Ensure that the rates or tariffs established in the contract are just and reasonable;
- Satisfy itself that the application meets the minimum requirements as prescribed by the Minister in the regulations under this Act; and
- Take into account any other issues which may have a bearing on the operations of the undertakings.

Section 46 of the Act states that no person shall enter upon any land, other than his own to lay or connect an electric supply line except with the prior permission of the owner of such land. Such permission shall be sought by way of notice which shall be accompanied by a statement of particulars of entry.

Section 53 of the Act states that for the purpose of the conveyance, transmission, or supply of electrical energy, a licensee may erect, fix, install or lay any poles, wires, electric supply lines, power or other apparatus in, upon, under, over or across any public streets, road, railways, tramways, rivers, canals, harbours or Government property, in the manner and on the conditions as provided in this Act.

Notwithstanding the provisions of any other written law, but subject to the provisions of this section, a licensee may break up any street within his area of supply, and may erect posts and lay or construct power lines or electric supply lines along, under or over any such street, and may, from time to time, repair, alter or remove any posts or lines so erected, laid or constructed. Provided that the person having the control of such street shall have a prior right to break up and repair such street with reasonable dispatch upon payment to him of a reasonable charge by the licensee.

A licensee shall, not less than thirty days before exercising this power, give notice in writing to the owner of his intention to do so, except in a case of emergency and in such case the licensee shall notify the owner as soon as possible after the emergency has arisen.

The powers conferred upon a licensee by this act shall, except in a case of emergency, be exercised only under the superintendence of the person concerned and according to a plan showing the route and in terms of specifications approved by that person, or, if any dispute arises in respect of such plan, route or specifications, as may be approved by the Commission:

Provided that if the said person fails to exercise the powers of superintendence conferred by this section the licensee may, after giving notice, exercise those powers without superintendence.

Whenever a licensee carries out any work authorized by this act, he shall comply with the by-laws, if any, of the local authority concerned and shall complete that work with reasonable dispatch and reinstate the street broken up and remove any debris or rubbish occasioned thereby and shall, while the street is broken up or obstructed, cause the works to be, at all times, fenced and guarded and during the night, adequately lit.

Section 56 of the Act provides that the licensee shall lay down or erect and keep in good state of repair suitable and sufficient electric supply lines for the purpose of enabling supply to be given in the area of supply specified in that behalf in the license.

### **3.8 KPLC Land Acquisition Procedure**

#### **Low Voltage Power Lines**

A reconnaissance survey is first done to search for the best possible route. It's KPLC policy to avoid existing structures as much as possible. Once the best route has been established, a meeting between the KPLC staff, the locals and the local administration is arranged. During this meeting KPLC formally requests for permission to survey the area. Once this is agreed upon, the surveyor moves to site and takes detailed profiles of the area and also places pegs where the poles are to be located. The surveyor then prepares a cadastral map of the area showing the plot numbers and the route of the power lines as well as the position of the poles.

The Way Leaves Department (Section) of the KPLC then prepares a Way Leaves agreement showing the affected plot and the proposed route. The individual owner is then approached with this proposal and his consent is requested. The owner is compensated for buildings or crops that are on the land. However, the owner is not allowed to grow anything higher than 3.6 meters within 5 meters of the poles or line.

KPLC also consults with other relevant institutions such as Telkom Kenya, County Councils, Airport Authorities, Kenya Pipeline Corporation, Kenya Ports Authority, Department of Defense, Kenya Wildlife Service, Conservatoire of Forests and Ministry of Public Works and Housing to ensure that their proposal is in harmony with other proposed developments.

### **High Voltage Lines**

A similar procedure is undertaken in assessing the best route as in the case for the low voltage lines. The land required is of 10 Meters width. Once the best route is established the landowner is approached and with his proposal and his consent is requested. The owner is compensated for the land through negotiations to agree on a compensation rate. The owner is also compensated for buildings or crops that are on the land. The way leave for the proposed 400kV line is about 80 metres. Thus a large track of land will be alienated.

### **3.9 Kenya Electricity Grid Code & Kenya Safety Code**

The Kenya Electricity Grid Code sets out detailed arrangements for the regulation of the Kenyan electricity supply industry and is enforceable under the Electric Power Act (No. 11 of 1997)

The Kenya Safety Code recognizes the Factories Act (1962) which requires an employee to use any means or appliance provided by the employer for securing safety and also willfully not to do anything to endanger himself or others.

## **4.0 THE SOCIO-ECONOMIC IMPACT METHODOLOGY**

### **4.1 Introduction**

Social impact assessment is the process of analyzing (predicting, evaluating and reflecting) and managing the intended and unintended consequences on the human environment of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions so as to bring about a more sustainable and equitable biophysical and human environment.”

A change process can be defined as change that takes place within the receiving environment as a result of an intervention. An impact follows as a result of the change process. However, a change process can only result in an impact once it is experienced as such by an individual/community on a physical and/or cognitive level.

One of the change processes and its potential impacts that the social specialist had to consider was land use change processes. One of the impacts of land use change processes is socio-economic. For example, LTWP secures a Right Of Way (ROW) for a Transmission power line within which no structures are allowed, no crops higher than 2-4 metres (depending on the voltage of the line), preferably no sugar cane and centre pivots, and no forestry. The LTWP compensates the land owner to mitigate (manage) the loss of income as a result of these land use changes. However, LTWP only compensates the land owner for the economic loss experienced as a result of what occurs in the servitude, e.g. loss of land for wheat farming/ commercial timber, etc.

### **4.2 Study Objectives**

The objective of the Socio-economic study was to provide information and data that would show the project's impact in the following:

- The amount of renewable energy to be supplied by the project
- The number of people that may benefit from the project – within the Wind Farm and the Transmission line corridor
- The socio-economic impacts to the people that may be supplied with power
- The impacts of the project on the Rural Electrification Program.

### **4.3 Study Approach**

The study methodology included the following:

- Study of the project reports that include the LTWP feasibility study
- The Environmental Impact Assessment reports of the Wind Farm and Transmission Line
- The in-depth description and analysis of the socio-economic profiles of the people and environment within and around the project area as it is now
- The projections of the socio-economic profiles of the people and the environment after the implementation of the project

### **4.4 Study tools and techniques**

During the field survey for the proposed transmission line route, public consultation formed an important component of the survey. This was done pursuant to the Environmental Management and Coordination Act (EMCA) of 1999. Various methods of data collection used in the survey include:

#### **4.4.1 Questionnaires**

The Consultant developed four different types of questionnaires which were administered to different stakeholders namely; individual members, community leaders, institutions such as schools local authorities and specific key informants such as Kenya Forest Services (KFS) and Kenya Wildlife Services (KWS). Questionnaires/interview schedules were randomly administered to the locals within the area to be traversed by the proposed line. Sample of these questionnaires used in the study are shown in Annexure 3 to 6

Data captured from individual members included family size, level of education, prevalence of diseases, house typology, economic activities, and sources of water and land tenure system. Individual members also provided data on the anticipated impacts of the proposed power line on the public health, agricultural production and livestock production.

By responding to the questionnaires administered, community leaders provided brief history on how the communities settled in specific areas and details on the organisation of the communities. Further, the

leaders highlighted key areas of interest to the communities that may be interfered with by the implementation of the project.

#### **4.4.2 Transect Walks**

To understand the biophysical nature of the project area the field teams had to walk through the proposed power line way leaves. In the walks the teams were able to identify the salient features of the project area and meet the stakeholders, identify sampling points and assess possible alternatives to the proposed power line.

#### **4.4.3 Public Consultations**

The Consultant organized forums for public participation to enable interested and affected parties to present their concerns and opinions regarding the proposed power project. The consultant shall identify social aspects and effects of the project to the neighbouring populace throughout the project cycle that include the construction, commissioning and operation phases.

Through the facilitation of the respective project area district officers, area chiefs, assistant chiefs, councilors and key community leaders the consultant organized for public meetings where the community members were briefed on the proposed project background, scope, design outline and the regulatory requirements for all the projects of lesser /similar/ higher magnitude whose implementation approval is vested on National Environmental Management Authority (NEMA).

The public was then invited to express their views given the background of the project. The views for each of the meetings were recorded. This was especially significant since the proposed project traverses a wide area of varying degree of cultural, economic, social and physical environments.

#### **4.4.4 Meetings with Provincial Administration and relevant authorities**

Meetings to brief the local provincial administration leaders on the projects background, scope, objective and the specific proposed routes within their area of jurisdiction were held. The leaders involved in this included;

- District Commissioners
- District Officers

- Chiefs
- Assistant chiefs
- Councilors
- Village elders
- Accounting officer of the County Councils
- The Kenya Wild Services officers
- The Kenya Forestry Service

#### **4.4.5 Focus Group Discussion (FGDs)**

The Consultant engaged groups such as ranch owners, school heads, teachers, and missionaries, health practitioners in discussion on the proposed power transmission line. Their observation and concerns were recorded. These groups seemed to be the most knowledgeable and were quick to grasp the wide range of issues relating the project implementation. They were specifically targeted with the hope that they propagate the technical issues in a language and style that can be understood by the wider community within their vicinity.

#### **4.4.6 Observations**

Observations of the biophysical, economic and social environment of the project areas were made. These informed the subsequent interviews that the consultant undertook and in the final analysis of the impacts of the project.

#### **4.4.7 Photography**

Photography was employed to record the public meeting attendance and the physical environment of the project area. A sample of photo gallery capturing key features along the proposed corridor is shown in Annexure 3.

#### **4.4.8 Public meetings (Barazas)**

The Consultant organized a number of public meetings in different areas along the proposed transmission line corridor. The public meetings were held between 11<sup>th</sup> June 2008 to 21<sup>st</sup> June 2008. Table 3 represent a schedule of the meetings held along the corridor. The meetings were organized in consultation with key leaders in the areas under consideration and conducted in line with the program shown in Annexure 5.

Table 3 Schedule of public meetings held for the proposed transmission line from Loyangalani to Suswa

| <b>S/No.</b> | <b>Date</b> | <b>Venue of Meeting</b>  |
|--------------|-------------|--------------------------|
| 1.           | 11/06/08    | Suswa Centre             |
| 2.           | 13/06/08    | Longewan Centre          |
| 3.           | 14/06/08    | Loosuk Centre            |
| 4.           | 14/06/08    | Poro Market              |
| 5.           | 14/06/08    | Longonot Chief's Camp    |
| 6.           | 14/06/08    | Lereshwa Shopping centre |
| 7.           | 14/06/08    | Kabati Shopping centre   |
| 8.           | 15/06/08    | Morijo Market            |
| 9.           | 16/06/08    | Baragoi Ngilai market    |
| 10.          | 17/06/08    | Warukira Market          |
| 11.          | 17/06/08    | South Horr               |
| 12.          | 18/06/08    | Mt Kulal Gatab           |
| 13.          | 20/06/08    | Kinaba Shopping centre   |
| 14.          | 21/06/08    | Matigari centre          |
| 15.          | 21/06/08    | Marti                    |

## 5.0 SOCIO-ECONOMIC PROFILE OF THE AREA

### 5.1 Introduction

The proposed project traverses five districts namely, Marsabit, Samburu, Laikipia, Nyandarua and Naivasha. These districts have extreme variation in physiographic, climatic, demographic and socio-economic characteristics. Figure 2 shows variations in rural poverty of some of the divisions traversed by the project.

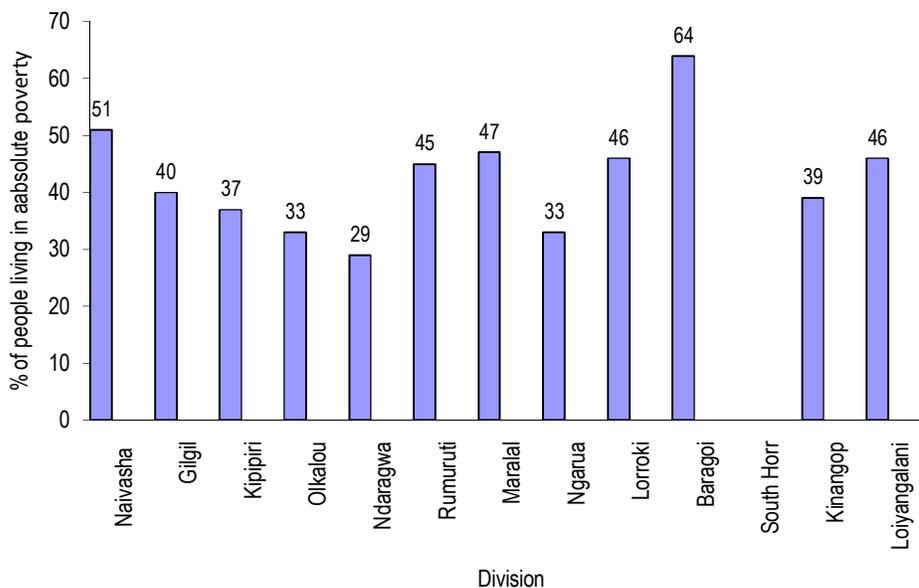


Figure 2: Rural poverty profiles in Divisions traversed by the power project

Figure 2 shows a wide variation in poverty level in the area traversed by the proposed power project. Indicating an average of 44 % showing that the number of people in this area who are living on below a dollar a day is very high. This is the proportion of rural poor that the government through the implementation of the Millennium Development Goals (MDGs) projects to uplift.

There are two distinct identifiable zones based on the demography and settlement patterns viz a moderately highly populated area between Suswa and Rumuruti and a sparsely populated area between Rumuruti and Loiyangalani. Figure 3 shows the population density in divisions traversed by the power project.

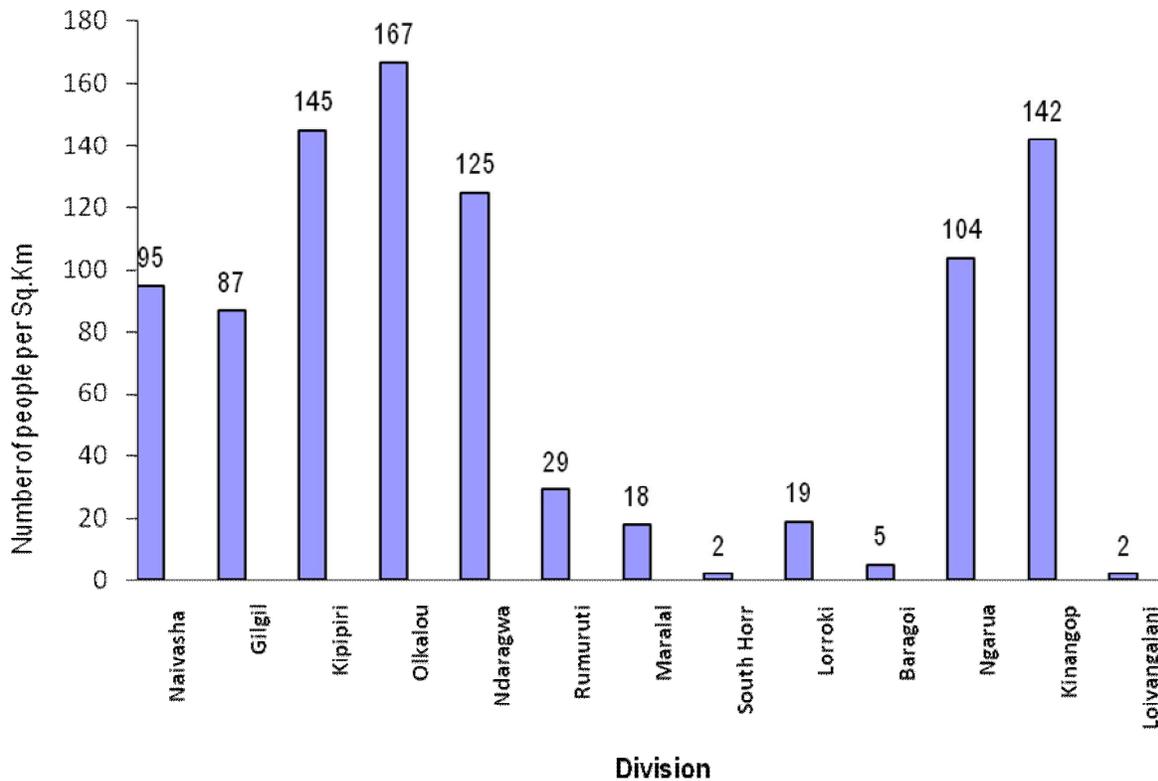


Figure 3: Population density profiles along Divisions the transmission line corridor

## 5.2 Suswa -Rumuruti Section

Communities occupying this section include Maasai, Kikuyu and Samburu whose socio-economic orientations are greatly influenced by the climatic conditions of the areas they occupy. The section manifests a mix of economic activities ranging from cattle rearing and wheat farming at Suswa - Longonot area to small scale mixed farming in the section lying in Nyandarua District. The favourable climatic conditions in the area promote growth of food crops such as maize, beans, cabbages, peas, potatoes, carrots, onions, tomatoes and rearing of high quality grade cattle. In some area around Kipipiri and Ol Kalou settlements going up to Aberdare escarpment at Shamata, there are small scale commercial

Eucalyptus farming with most of the trees being sold to the power utility company. In this area, land is highly subdivided with many individuals holding freehold registered titles with most of the land parcels being less than 10 acres. From these activities, the average annual incomes for the families range from between Us 938 - \$ 4,375. A sizeable 75% of the population in this area depends on agriculture. There are few white owned flower farms in this area.

Figure 2 shows a section of people in this area are extremely poor. The causes of poverty in this areas include; poor road networks, lack of electricity, lack of water and telecommunication services, inadequate and lack of access to markets for farm produce and Jua kali products, exploitation by middlemen, collapse of cooperative societies, high cost of farm inputs, unemployment, consumption of illicit brews, laziness, social breakdown, HIV/AIDS pandemic, insecurity and ethnic clashes, drought and lack of water for irrigation and wildlife menace, among many others.

From sample survey on the area, it was observed that the average size of household is 6 persons housed in temporary manyattas, semi- permanent and a limited number in permanent houses. Residents of the area between Suswa and Longonot experience severe water shortage as there are no perennial surface water sources. The main sources of water in this area are boreholes drilled through government interventions and local Non-Governmental Organizations (NGOs). In contrast the section lying in Nyandarua District has a number of water sources including tributaries of the Wanjohi and Turasha Rivers and in part tributaries to the Malewa river system. In addition, there are several springs that have been tapped by the local community. In this section, it was observed that the main public health concern is the threat of occasional malaria, typhoid and eye infections.

In this section, more women participate in self-help movements than men. Women groups are a formidable force in social mobilisation and provide an entry point to community development.

Inheritance of property and wealth in these areas is still reserved for the male gender and not wives and daughters of the deceased. This reduces the chances of women getting credit for investment using land and other fixed assets as collateral. It also discourages the morale to produce as majority of the women work on farms but the proceeds go to men.

### **5.3 Rumuruti- Loyangalani section**

The area between Rumuruti and Loyangalani occupies a total of 250km of the proposed transmission line. The area is inhabited by communities Samburu, Turkana, Pokot and Rendille. In some areas between Rumuruti and Maralal, there are a number of white ranchers. The population densities are low as shown in Figure 3 and the area is characterized by large parcel of land occupied by large-scale beef ranchers and local communities engaging in pastoral nomadism. While the few ranchers in the area live in permanent structures, the locals dwell in temporary clustered manyattas due to insecurity. The average household sizes vary from 6 to 10 persons.

School enrolment in this section is quite low, mainly because of poverty but more so, because of the nature of the community whereby most parents prefer using their children as herders instead of sending them to school. In these areas, boys lead in enrolment because parents prefer educating boys to girls. Health facilities in these areas are inadequate; they also lack senior medical staff and equipment especially in the very remote places.

There are numerous wildlife conservancies in the area. Land ownership in this area falls into four different categories trust land under the county councils, leasehold and communal ownership and a few individuals holding registered titles. Individual household incomes vary from between \$ 563 - \$ 25,000. This amount mainly comes from the sale of livestock. Wage earners are however very few. They mostly constitute government and parastatal employees who are concentrated mainly in the towns and divisional headquarters. Informal sector wage earners are also few and constitute the jua kali operators that includes watch repairers, shoe makers and repairers, tailors and hawkers. The main water sources in the area include rivers, small dams, pans and boreholes. The diseases prevalent in the area include malaria, typhoid, eye infections are the common diseases affecting communities living in this area. The diseases are caused by various factors chief among them poor living conditions, contaminated water and poor sanitation. The nutritional status of most children in these areas is also very poor as a result of inadequate food and unbalanced diets.

## **6.0 POTENTIAL SOCIO-ECONOMIC IMPACTS**

### **6.1 Overview**

Complete implementation of the proposed Wind Farm and Transmission Line power project will have far reaching implications nationally and in the project area. The magnitudes of the envisaged environmental and socio-economic impacts have been dealt with at various stages of the project planning.

### **6.2 Socio- Economic impacts at the National level**

Arising from an analysis of the power situation in the country, it is apparent that the implementation of the Lake Turkana Wind Power Project will have positive impact on the Country's long term development agenda as laid out in vision 2030. These include:-

1. At its completion, the project is expected to add an extra 300MW into the country's national grid which is equivalent to 25% of the current installed power capacity. This will go along way in enabling the country achieve the planned incremental power supply in the country for the 2008-2012 period set at 325 MW. In essence this will bolster country's plan to expedite rural electrification programmes in the different parts of the County. The end result is an attendant multiplier effect on socio- economic benefit likely to arise from power supply.
2. Stabilizing the existing power supply network. The current power supply network in the country suffers frequent outages occasioned by insufficient capacity from the other sources. The addition of 25% power will translate into a stable power supply network.
3. Reduced cost of power. The proponent has conducted a feasibility study on the project and developed a bulk tariff for the power to be generated from the project. Indications are that the power will cost far less than from any of the other existing sources in the long-term as its production costs will not increase thereafter. In effect this implies that the project has the potential to usher the country into a low- power tariff regime in the long run. This not only has an effect on the cost of production which will lead to economic gains.
4. Implementation of the project presents the country with an opportunity to rely less on the expensive diesel-powered alternatives and ushering in an era of green energy.
5. Kenya has a high potential of generating power from other sources notably geothermal source in Rift valley. These sources have high capital outlay especially in the drilling and installation of the turbines. Construction of the power transmission line from Loiyangalani to Suswa will create

capacity/necessary infrastructure in proximity to the potential source can be used to transmit power generated from these sources to the national grid.

### **6.3 Anticipated Socio-Economic Impacts in the Project Area**

The proposed project has more immediate socio-economic impacts in the areas on which the various infrastructures such as turbines, substations and transmission towers will be constructed. These impacts have been classified in different categories depending on the phase of the project implementation. These are;-

- Socio-economic impact at construction Phase
- Socio-economic impact at operational Phase
- Socio-economic impact at decommissioning Phase

During the field survey, the consultant identified some of the anticipated socio-economic and environmental impacts relating to the proposed project. They were obtained by making physical observations, interview with key stakeholder such as Project Affected Persons (PAPs), key institutions and community leaders along the proposed transmission line corridor and proposed site for the terminal substation as well as information obtained from stakeholders during consultative meetings.

The magnitude of each impact is described as significant (major), moderate (minor) or insignificant. Insignificant impacts have no long-term consequences (positive or negative), and are regarded as being minor. But those with long-term repercussions are classified as significant. For each of the significant impact anticipated, proper mitigation measures and monitoring mechanism have been proposed. Using an impact matrix; the anticipated socio-economic impacts for the project have been presented in Table 4.

#### **6.3.1 Positive Impacts during Construction Process**

As highlighted in the previous section the proposed project will comprise construction of three important components namely the Wind Farm at Loiyangalani, 400km of 400kV power transmission line from Loiyangalani to Suswa and strengthening of approximately 270km road from Laisamis to Loiyangalani. The

project is expected to cost approximately Kshs 70 billion. Potential positive benefits likely to arise during the implementation of each of the components include:-

### **Construction of the power transmission line**

This component is expected to cost approximately \$150 million. Approximately 5% (\$7.5 million) this money will be used directly in improving access roads along the proposed corridor, provision of essential services such as boreholes required for water supply for construction work and human consumption. These facilities will of course benefit the persons living along the proposed as they will end up in the hands of the communities. Further, the worker who will be employed in the construction works will require basic commodities and services such as food and accommodation. This increased demand will spur local market prices of available good and services eventually translating to improved business earning in the project area. The project will be anticipated to take two years to completion. Hence there will be economic boom in the area for the two years of the project implementation.

### **Construction of Wind Farm at Loiyangalani**

Initial estimates place the cost of this component at approximately \$800 million. One can assume that approximately 5% this money will be used in improving the existing infrastructure mainly the access roads and drilling bore holes or constructing water desalination plant within Loiyangalani, provision of accommodation facilities for the contractors and other project staff. Part of the earnings of the project staff will be spent within Loiyangalani by way of goods and services to be procured directly. As a direct consequence of the project activities it is estimated that approximately \$100 – 125 million will be spent in the project area in cash and in kind. This will be anticipated to take place for a period of one to two years the project's implementation period.

### **Strengthening of Laisamis -Loiyangalani Road**

The project proponent estimates to utilize approximately \$ 25 million for strengthening the access road from Laisamis to Loiyangalani. For the envisaged construction period of one year this component is expected to gainfully employ approximately 300 employees of different cadres ranging from casual labourers who will be drawn from the local communities. The completion of this project will improve accessibility of the key market centres such as Illaut, Korr and Kargi among others. These market centres and the entire 270 km

stretch are set to benefit from water from borehole expected to be drilled by the proponent during the road construction.

### **Creation of professional jobs**

A proportion of the project cost will be reflected in employment of professional services such as detailed engineering survey and detailed design of the project components. Construction work of the wind mills, transmission line and the appurtenant substations is expected to generate numerous jobs for different cadres ranging from supervision Engineers to manual workers.

From the sheer size of the project, and project components, a large volume of cargo is to be moved from the Port of Mombasa to the project area. These include wind turbines and blades and, steel tower sections and other materials. This component will generate a lot of work for hauling companies ferrying material from the port to the project area. Local transport will also be required in the transport of the construction materials as well as workers to and from the project area.

### **6.3.2 Positive impacts during Operational Phase**

The project area will realize positive impacts at the operational stage. Considering a project implementation set up that chooses to generate and distribute some power to the locals at the Wind Farm site and step down power from the main line along the transmission corridor, a number of areas are set to directly benefit. These include ; - Loiyangalani , Suguta Marmar, Longewani, Poro, Morinjo, Marti, Baragoi, Mararal, Rumuruti, Suswa, South Horr, Gatab/Mt Kulal, Longonot, Lereshwa, Kabati, Shamata ,Kinaba, Matigari, Maraigishu centre, etc.

### **Enhancement of quality of life within Loiyangalani**

LTWP will set up living quarters and offices for the project at Loiyangalani for the company staff working in the Wind Farm for which power will be supplied. This will provide a window for the supply of the locals with power. The town and the surrounding areas have an estimated population of 21,700 and an estimated 3700 households. These areas include Loiyangalani, Arapal, Mt. Kulal, South Horr, and Kurungu. Supplying power to will enhance the quality of life in a number of ways including:-

- Potable water supply – possibility of desalinating the saline Lake Turkana water and sinking of boreholes using wind power

- The presence of the company activities in the area facilitate construction of more durable road infrastructure
- The local economy will benefit from the presence of migrant workers who will seek services and goods that can be availed locally
- Fishing industry will be enhance by possible construction of cooling plant and benefit from a ready market as a result of the project activities – currently this industry fetches \$ 4 million per annum and estimated to reach a turnover of \$200 million per annum at full potential which would be realized through availability of electricity.
- Livestock industry will benefit through the construction of slaughter houses and refrigeration facilities
- The area will be open up as a tourist destination with the attendant benefits of developing tourist related activities such as sport fishing, yachting, jet skiing etc. This will go a long way in alleviating poverty since most of the youth will be gainfully employed in productive economic activities.
- Power supply will improve the education and health standard since primary, secondary and health facilities will be able to attract and retain qualified personnel. In the same vein, students will be able to devote more time to study at night as opposed to when they have to study during the day light
- Improvement of maternal health as a result of development of up to date health facilities and reduced work load on the women folk who bear the burden as “hewers of wood and fetchers of water”.
- Open up the area since locals will have access to information from a variety of electronic media including television
- Upgrading of the airstrip at Loiyangalani to an airport to target the tourism and fishing industry.

### **Promotion of Education in the areas along the corridor traversed by the proposed line**

With the introduction of Free Primary Education (FPE) in Kenya and a high primary school enrolment of about 7 million children in 19,000 primary schools, the goal of education for all is now in sight.

The proposed project will enable power supply connected to the primary and secondary schools along the corridor. The power will for example provide lighting for reading or studying beyond daylight especially in the boarding secondary schools and at individual homes. Schools will also have access to media and communications that increase educational opportunities.

Connection of power to both primary and secondary schools along the corridor will create a more child-friendly environment. This is because of the new improved access to clean water, sanitation, lighting, space heating/cooling among many others. Also, by providing lighting in schools, teachers will be retained because of the improved amenities in their homes. All these will contribute to education promotion in the area that has recorded very low school turn-out in the past.

### **Tackling the problem of poverty and hunger in the project areas**

The project area is generally an arid and semi arid area. In addition the area around Lake Turkana is wasteland with no possibility of transforming it to agriculture area—the soils are alkaline with high salinity levels in the soils. There are no noticeable surface water sources apart from the salty Lake Turkana.

The availability of electrical power will enable development of ground water which will be needed for the improvement of people's welfare and also for development of economic activities particularly on small-scale industries mainly in rural areas. Energy is therefore essential for any meaningful economic activity and must be provided to eradicate poverty.

The proposed project will provide electrical power to the small towns and growth centres along the corridor traversed by the power lines opening it up for possible business activities, utilizing locally available resources and hence generating income to the local communities. Possible industries will include slaughter houses, fishing, agribusiness and tourism and jua kali business activities. The lighting will permit income generation beyond daylight and the energy tapped will power machinery to increase productivity, hence alleviating poverty in the area.

Energy will also enable irrigation in most of the areas along the corridor which are classified as ASALs (Arid and Semi-arid lands). Irrigation in these areas will boost food production and access to good nutrition for the local communities who are mostly pastoralists sometimes depending on relief food. In areas such as Nyandarua where locals practice small scale mixed farming, energy will be very useful in reducing post-harvest losses through better preservation. It will also improve their ability to cook staple foods. All these efforts will tackle the ever prevailing problem of hunger.

### **Promotion of Health of the locals in the areas along the corridor**

Disease prevention which is a better and cost-effective strategy than treatment is indeed dependent on adequate provision of electric power. This is because power is needed for lighting, cooking and driving a number of life support systems and other relevant electronic gadgets in hospitals, health centres and dispensaries. The proposed project will provide electricity to hospitals, health centres, dispensaries, private clinics and nursing homes along the corridor traversed by the power lines. This will allow for medicine refrigeration, equipment sterilization, and safe disposal through incineration. It is also going to enable access to the latest medicines/expertise through renewable-energy based telemedicine systems. The local communities will therefore be able to access better medical facilities for maternal care as well as the treatment of other diseases which afflict children and adults in the concerned areas, which were found to include malaria, typhoid and eye infections. Also, provision of energy for cooking and heating and the use of efficient cook stoves will not only free women and girls from the drudgery of collecting firewood, but is also going to reduce their exposure to indoor air pollution thereby improving their overall health.

### **Promotion of gender equality and empowerment of women in the areas along the corridor**

Provision of appropriate and adequate energy is one of the best strategies of promoting gender and empowering women. Women and girls in the areas along the corridor traversed by the power lines are inordinately burdened by collection and use of biomass energy leaving them exhausted and with little time for other activities. Provision of cleaner energy by the proposed project to their homes will drastically reduce their burden including household activities such as cooking and washing clothes. They will in turn have more time to spend with their children, engage in income-generation activities and other recreational activities. School drop-outs will also reduce as girls will

have more time to study both at school and home. The power will also light up the streets in the small towns and growth centres thereby improving women's safety.

In addition, the use of clean energy will reduce women's exposure to indoor air pollution thereby improving health.

### **Employment Generation**

The project will result in the generation of employment opportunities during operational phase. These will involve security personnel, Line patrol teams and operation and maintenance team among others. Availability of more and cheaper power is a catalyst of development of small and medium enterprises which as a result generate employment opportunities at different levels.

### **Individual Investment**

Economically, the project will be an investment to the proponent. The proposed project once complete and operational will earn the proponent income from sale of power to KPLC.

### **Reduction of human/ Wildlife conflict**

Part of the area traversed by the transmission line has a long history of human wild life conflict. Availability of power will facilitate erection of electric fences in some areas where the problem is rampant and specifically in Laikipia District.

### **Opening up of the area**

The availability of power will promote development of ICT facilities such as internet services. This will ensure the area will be connected to the rest of the country and world at large

### **Improvement in Security**

The area Lake Turkana and Loiyangalani is prone to banditry attack and rivalry between the communities. Livestock rustling is also rampant. The opening up of the area will reduce the insecurity as the locals will be introduced to modern ways of living with alternative socio and economic opportunities

## **6.3.3 Negative Impacts during construction**

### **Workers Accidents during Construction**

There is possibility of workers' accident during the construction phase arising from the activities and machinery involved. This could be fatal or lead to serious injuries if the proponent has not developed a

comprehensive accident control and management plan prior to commencement of the next phase of construction.

### **Displacement of individuals (Demolition of houses)**

This is an inevitable impact given that there is no clearly unoccupied land between the generation point and terminal point of the proposed power transmission line. Individual households will be displaced to give way to construction of the transmission line in areas where the line traverses the entire 400Km way-leave trace. This in essence could lead to weakening of the social fabric in areas where people living together for a long time may relocate to restart again in a different area.

### **Socio- Cultural conflict**

The project will rely mainly on imported labour from other parts of the country. In this regard therefore, migrant workers from different cultural backgrounds will be hired to perform specialized works whose skills are not available in the local pool. With the presence of migrant workers from different cultural backgrounds, there could arise conflicts with the local cultures. The lifestyles of the migrants may also not be compatible with those of the hosts and these could cause frictions.

### **Power supply interruptions**

There are a number of areas where the proposed power transmission line will cross over existing HV transmission lines to key towns such as Maralal. The proposed 400KV line will be strung above these lines. During the construction phase, the existing power line will have to be switched off for some time to allow stringing of the proposed line. This in effect will lead to power supply interruptions in the towns occasioning economic loss for businesses depending on electric power.

### **Increased cases of Sexually Transmitted Infections (STIs)**

Due to the influx of migrant workers and the resulting changes in sexual behaviors, there is a chance of escalation of STI's including the deadly HIV/AIDS. There could also be cases of unwanted pregnancies as the migrant workers interact and get into relationships with the local communities.

**Table 4 Detailed Socio-economic Impact Matrix for the proposed Wind Farm and High Voltage transmission line during construction phases**

| S/No. | Potential Impacts                                                                                      | Positive Impacts      |          |                     | Negative Impacts      |          |                     |
|-------|--------------------------------------------------------------------------------------------------------|-----------------------|----------|---------------------|-----------------------|----------|---------------------|
|       |                                                                                                        | Insignificant (Minor) | Moderate | Significant (Major) | Insignificant (Minor) | Moderate | Significant (Major) |
| 1.    | Displacement of locals                                                                                 |                       |          |                     |                       |          | =====               |
| 2.    | Social cultural Conflicts                                                                              |                       |          |                     |                       | =====    |                     |
| 3.    | Increase in sexually transmitted Infections                                                            |                       |          |                     |                       | =====    |                     |
| 4.    | Disruption of economic activities due to power disruption and relocation of business premises          |                       |          |                     |                       | =====    |                     |
| 5.    | Loss of standing crops during construction                                                             |                       |          |                     |                       | =====    |                     |
| 6.    | Loss of productive land in areas where transmission towers and substations will be constructed/erected |                       |          |                     |                       | =====    |                     |
| 1.    | Creation of employment Opportunities                                                                   |                       |          | =====               |                       |          |                     |
| 2.    | Increase business activities in market centres along the proposed transmission line                    |                       |          | =====               |                       |          |                     |
| 3.    | Opening up of the remote areas through enhanced access roads                                           |                       |          | =====               |                       |          |                     |

### **6.3.4 Negative Impacts during operation phase**

#### **Possibility of fatal accidents through electrocution**

It was established that in some of the areas traversed by the proposed power line which experience intercommunity rivalry manifested in periodic cattle raids and other attacks, locals use high points as observatory points to monitor movement of their adversaries. Past experience indicate that in absence of hills and tall trees in the vicinity, power line poles are used as observatories oblivious of the danger they pose. This has had fatal consequences in most of the cases. Thus this is a possible impact in the areas in question. There has also been an increase in cases of transformer oil and Aluminum conductor theft in various parts of the country and this has resulted into a number of fatal electrocution accidents. This could happen in the proposed project.

### **6.3.5 Impacts during Decommissioning Phase**

#### **End of the Project Construction**

Some of the impacts will be experienced immediately after the completion of the project construction phase where the contractor's plant and equipment and sites will be decommissioned.

#### **Decommissioning of transmission lines and substations**

During the decommissioning phase, the wastes that were used in construction process, if not collected and safely disposed off are likely to pose environmental problems. In the same breath, key equipment used along the transmission line and the substations including transformers, circuit breakers, current and voltage transformers will be put out of service. It is of essence that precaution be taken to avoid spillage of oil from electrical appurtenances during this phase.

#### **Decommissioning at the end of Project Lifespan**

If at the end of the project life span the power transmission line and the attendant substations are to be removed from service by way of demolition, then decommissioning stage will have to address two primary issues related to environmental impacts of disassembly, dismantling and demolishing of all the components of the wind farm, transmission line and substations. These include:

- ⊖ Prevention of accidents during the decommissioning phase
- ⊖ Minimizing waste disposal through reuse and recycling and
- ⊖ Properly handling hazardous and regulated materials.

Deconstruction is the manual dismantling of a building so materials can be salvaged for reuse.

In addressing the first issue during deconstruction of the power line and of substation, the following is usually undertaken.

- ✚ Mitigating against noise and dust by either manually disassembling the major portions of the existing structures, as discussed above
- ✚ All demolition debris will be handled with care to avoid material being blown by the wind from the proposed site of development to the surrounding environment. All debris should be packaged and transported to appropriate disposal site following established county council and NEMA waste management procedures.
- ✚ All demolition work shall be carefully executed with the particular aim of preserving the items being removed. All materials, components and fittings arising from the demolitions shall become the property of the contractor as a way of reducing the disposal cost of existing old buildings.
- ✚ The method of demolition used shall be in line with all laws and by-laws governing such activities. In particular, the contractor will be required to protect the adjacent properties, users / workers and the public from any nuisance in form of noise and dust, and from falling objects. The contractor shall also take all necessary measures to prevent any damage or loss to third party.
- ✚ Before embarking on demolition, the contractor shall give all the necessary notices as required by law.
- ✚ An attempt shall be made to limit the quantity of materials removed from site or sent to landfill through reuse of the debris in the construction and landscaping stage.

- 🗑️ Re-sell or reuse reclaimed materials to reduce the cost of new materials and where possible minimize the projects overall environmental impact through reuse and recycling.

Table 5 presents the anticipated environmental and social impacts during the decommissioning of the proposed wind farm and power transmission line and substations after the expiry of the project's lifespan

**Table 5 Anticipated Environmental and Social Impacts and Mitigation Measures at Decommissioning of project**

| Undesirable Impacts                                                  | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Responsibility for Mitigation |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1. Air pollution during demolition process.                          | <ul style="list-style-type: none"> <li>✓ The demolition exercise will be limited at day time only</li> <li>✓ All personnel working on the project will be trained prior to commencing the demolition exercise on methods for minimizing negative impacts on air quality.</li> <li>✓ Construction vehicle drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon and minimize idling of engines.</li> <li>✓ All active demolition areas will be watered at least twice a day to reduce dust.</li> <li>✓ All trucks hauling demolition debris/wastes shall be covered.</li> <li>✓ Careful screening to contain and arrest demolition related dust will be adopted</li> <li>✓ Exposed demolition debris of e.g. dust and sand, will be enclosed, covered, and watered daily before transported to disposal site.</li> <li>✓ All workers on the site will be required to wear protective clothing while on duty</li> </ul> | ✓ Project proponent           |
| 2. Noise pollution by disassembly activities.                        | <ul style="list-style-type: none"> <li>✓ Portable barriers will be installed to shield compressors and other small stationery equipment where applicable.</li> <li>✓ Use of equipment designed with noise control elements will be adopted where necessary.</li> <li>✓ Trucks used during demolition exercise on site shall be routed away from noise sensitive areas in the neighborhood, where feasible.</li> <li>✓ Sound barriers are to be installed for pile driving activities.</li> <li>✓ Idling time for pick up trucks and other small equipment will be minimized to limited time.</li> <li>✓ Use of very noisy equipment will be limited to daytime only.</li> <li>✓ All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.</li> <li>✓ The demolition exercise will be limited at day time only</li> </ul>                                                                                 | ✓ Project proponent           |
| 3. Proliferation of uncollected demolition debris and related wastes | <ul style="list-style-type: none"> <li>✓ Private contractor will be engaged to collect demolition debris/wastes</li> <li>✓ All debris/wastes to be collected regularly to control air pollution and injury etc</li> <li>✓ A licensed operator to avoid illegal final dumping at unauthorized sites will collect demolition debris.</li> <li>✓ All persons involved in refuse collection shall be in full protective attire.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓ Project proponent           |

| <b>Undesirable Impacts</b>                      | <b>Mitigation Measures</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Responsibility for Mitigation</b>                                                                                                            |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 4. Workers accidents during demolition process. | <ul style="list-style-type: none"> <li>✓ All workers will be sensitized before the exercise begins, on how to control accidents related to the demolition exercise</li> <li>✓ A comprehensive contingency plan will be prepared before demolition begins, on accident response.</li> <li>✓ Adherence to safety procedures will be enforced at all stages of the exercise</li> <li>✓ All workers, pursuant to labour laws, shall be accordingly insured against accidents.</li> <li>✓ All workers will be instructed to wear protective clothing during demolition, including helmets.</li> <li>✓ Demolition work will be limited to daytime only avoid workers accidents due to poor visibility</li> <li>✓ Provision of mobile clinics</li> </ul> | <ul style="list-style-type: none"> <li>✓ Project proponent</li> <li>✓ Provincial Public Health Officer</li> <li>✓ Ministry of Labour</li> </ul> |

## **7.0 MITIGATION MEASURES**

### **7.1 Compensation for Land to be Acquired / Purchased**

Land that is permanently acquired from individuals along the transmission line corridor should be compensated according to the existing Government of Kenya compensation regulations and procedures. The compensation will be at the market value of land and property on it including livestock and buildings as well as relocation costs.

### **7.2 Disruption of Socio-economic Activities during Construction**

The local people should be properly compensated for income loss due to disrupted socioeconomic activities. This can be done by providing jobs during the construction of transmission lines and substations by the contractor.

### **7.3 Health Hazard**

Health hazards due to dust, noise and smoke will be minimized by daily water sprinkling on all dusty working areas and keeping machinery regularly and properly serviced / tuned by the contractor. The Project Engineer will make sure the observance of these actions by the contractor.

### **7.4 Infrastructure in Right Of Way (ROW)**

The owners of private infrastructure falling in the ROWs of transmission lines will be properly compensated. Only the business activities will be suspended temporarily during the construction stage. For this, the owners will be paid a compensation amount as specified in the Resettlement Policy Framework (RPF). Their livelihood will be restored with the completion of project construction.

### **7.5 Cutting of Trees**

Privately owned trees within the ROW of the transmission line will be affected. The owners will be compensated at prevailing market price. In addition, more trees will be planted to compensate for the trees lost on government land. The compensatory plantation will help mitigate the negative impacts of tree cutting in the long run.

## **7.6 Grievance Redressal Mechanism (GRM)**

The 6<sup>th</sup> EPFI principle requires that any category A or B proponent to receive and facilitate resolution of concerns and grievances about the social and environmental concerns raised by individuals or groups from the project affected communities. In the ESA Study the socio-environmental issues relating to the implementation of wind power project are identified and mitigation measures are suggested to address these issues in terms of Environmental Management and Monitoring Plan (EMMP) and Resettlement Policy Framework (RPF). However, in spite of best efforts, there is every chance that the individuals / communities affected by the project are dissatisfied with the measures adopted to address the adverse impacts of the project. Keeping in view the findings of the ESA study, it is anticipated that the nature of such complaints will relate to compensation matters by the project functionaries and within the communities. For example, non-judicious distribution of amount among the owners of jointly owned land and contractor's behaviour in executing the project works. In this situation addressing the grievances of the aggrieved at the root level will ensure the timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their objections and through conflict resolution, address these issues adequately.

The main functions of the GRM will be as follows:

- To provide a mechanism to the aggrieved persons on problems arising as a result of project activities,
- To facilitate the recording of the grievances of the PAPs, categorize and prioritize the grievances that need to be resolved,
- To ensure reporting to the aggrieved parties about the developments regarding their grievances and the decision of the project authorities.

To ensure that the GRM provide a solution of the grievances a Grievance Redressal Committee (GRC) will be formed to address the matters effectively at the root level. The Committee will be headed by the Project Engineer (or Project Director, whichever the designation may be) with Socio-economist and a representative of the Supervision Consultants as its official members and a person from the communities, as its non-official member. The non-project person should be a representative of the communities and should be regarded as impartial. The local administration,

district officers, chiefs and assistant chiefs, religious and community opinion leaders will form part of the GRC team.

## **7.7 Conclusion**

From the foregoing, it is noted that:

- No serious and adverse objections were received from the communities occupying the entire corridor. This confirms that the project is suitable for the local area.
- Consultation with KWS officials in the Mt Kenya and Central Rift Conservation areas indicated that the proposed line does not have negative impact on the wildlife, environment, dispersal areas, habitats and migratory route of wild animals. They however emphasized the need to have security provided to the teams to be charged with the implementation of the project.
- The proposed project has actively involved the key stakeholders who did not object the development.
- The proposed project does not pose adverse socio-economic impacts, and is an initiative towards increasing the overall national power capacity by 25% from renewable sources

In view of the foregoing, the study recommends timely implementation of the project with strict adherence to the proposed Environmental Management and Social Management Plans. The project benefits have been identified to far outweigh the negative impacts for which a mitigation plan has been prepared. Further, the proponent has carefully considered and applied acceptable local and international standard/regulations at all stage of project planning and would thus qualify for donor funding.

## **8.0 SOCIO MANAGEMENT AND MONITORING PLAN**

### **8.1 Introduction**

The social monitoring will be undertaken to ensure the implementation of the Resettlement Policy Framework (RPF) at different implementation stages of the project. It will be a continuous activity and will be managed by the Project Engineer through LTWP. The compliance monitoring and effects monitoring will be carried out regularly by LTWP in coordination with the supervision consultants and discussed in the fortnightly review meetings in accordance to Principle 9 of EPFI. The Project Engineer will ensure that the Project functionaries carry out the activities 1 – 5 transparently. Verification of project-affected persons, specifically squatters, on the basis of their national identity card numbers/ photographs, to ensure that only those PAPs recorded before cut-off date are allowed to claim entitlement benefits.

1. Identification of the public facilities and utilities needing relocation.
2. Identifying suitable relocation sites.
3. Signing leases and recording compensation payments in case of delays.
4. Verifying that the amount to be paid as compensation and the schedule of compensation is in conformity with the provisions of the RPF.
5. Recording and addressing the concerns of PAPs during and after resettlement.

The Project Engineer will provide the findings of monitoring activities in the Monthly Progress Report regularly, with details of the issues and the mitigation measures adopted under Grievance Redressal Mechanism (GRM).

The external monitoring will be carried out on quarterly basis. For external monitoring, LTWP will hire the services of independent Consultants for social monitoring. The social monitoring will focus the parameters, as provided in subsequent section. The Monitoring Consultant will present the findings of the study in the Quarterly Monitoring Report to the Client. The LTWP will submit this report to the Donor.

### **8.2 Monitoring Parameters / Indicators**

The following parameters will be considered in carrying out the social monitoring:-

- Number of Project Affected Persons (PAPs) to be resettled /relocated /provided livelihood assistance along the transmission lines routes.
- Number of owners compensated for land acquisition, amount of compensation and area of land acquired.
- Number of owners compensated for fruit / non fruit trees, amount of compensation and number of trees.
- Number of owners compensated for loss of standing crops, amount of compensation, area and type of crops.
- Inventory and valuation of PAPs' affected assets
- Notice period given to PAPs for their shifting from their original locations to new sites
- Number of vulnerable PAPs (if any), compensated under the RPF with details of affected source of livelihood.
- Verification of shifting assistance provided to displaced squatters.
- Number and nature of consultations carried out, as well as targeted stakeholders
- Record of any problems due to power shut downs and mobility of the people during construction, and whether the people of the area were informed about these shut downs when and where required.
- Number of grievances recorded and redressed
- Key issues of conflict between PAPs and the contractors during implementation of resettlement activities.
- Number of public facilities and utilities to be relocated
- Number of mosques/shrines/graves relocated (if any) and corresponding contribution of affected communities and LTWP
- Verification of whether relocation of mosques/shrines/graves was relocated as per the provisions of the RPF.

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# ANNEXURES

### Annexure 1- EMP for the Transmission line project

| Possible Impacts                                             | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Responsibility for Mitigation                                                                                                                                                                             | Means for Monitoring | Frequency for Monitoring     | Estimated Cost (Kshs)                          |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|------------------------------------------------|
| Air pollution by dust generated during construction process. | <ul style="list-style-type: none"> <li>⊕ All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction.</li> <li>⊕ Construction heavy earth moving vehicle drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon and minimize idling of engines.</li> <li>⊕ Careful screening of construction site to contain and arrest construction-related dust.</li> <li>⊕ Exposed stockpiles of e.g. dust and sand, will be enclosed, covered, and watered daily, or treated with non-toxic soil binders.</li> <li>⊕ All workers on the site will be required to wear protective clothing while on duty.</li> </ul> | <ul style="list-style-type: none"> <li>⊕ Project proponent/contractor</li> <li>⊕ Ministry of Health: provincial public health officer</li> <li>⊕ NEMA inspectors</li> <li>⊕ Ministry of Labour</li> </ul> | Periodic Activities  | Periodic and surprise checks | 100 000 per month over the construction period |
| Pollution from Hazardous waste                               | <ul style="list-style-type: none"> <li>⊕ Handling of the materials using the material safety data provided by the manufacturers</li> <li>⊕ Appoint a safety officer to ensure that proper disposal guideline are observed</li> <li>⊕ Ensuring that maintenance and/or piece of work carried out on any piece of equipment or construction work is undertaken by qualified personnel</li> <li>⊕ In case of spillage emergency spillage control measures to be instituted</li> <li>⊕ Containerization of any wastes and disposal through a licensed waste handler.</li> </ul>                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>⊕ proponent/contractor</li> <li>⊕ Ministry of Health: provincial public health officer</li> <li>⊕ NEMA inspectors</li> </ul>                                       | Periodic inspection  | Periodic and surprise checks | 100 000 per month                              |

| Possible Impacts                                              | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Responsibility for Mitigation                                                                                                                                                                            | Means for Monitoring | Frequency for Monitoring     | Estimated Cost (Kshs)                         |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|-----------------------------------------------|
| Noise pollution by construction activities.                   | <ul style="list-style-type: none"> <li>⊕ Use of equipment designed with noise control elements will be adopted where necessary.</li> <li>⊕ Trucks used at construction site shall be routed away from noise sensitive areas where feasible.</li> <li>⊕ Idling time for pick up trucks and other small equipment will be minimized to limited time.</li> <li>⊕ All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.</li> </ul> | <ul style="list-style-type: none"> <li>⊕ Project proponent/contractor</li> <li>⊕ Divisional Public Health Officer</li> <li>⊕ Ministry of Labour</li> <li>⊕ Workers</li> <li>⊕ NEMA inspectors</li> </ul> | Routine Activities   | Periodic and surprise checks | 40 000 per month over the construction period |
| Workers accidents and hazards when handling hazardous wastes. | <ul style="list-style-type: none"> <li>⊕ Adequate collection and storage of waste will be provided on site, and safe transportation to, and display methods at designated areas.</li> <li>⊕ All receptacles for storing hazardous wastes shall be adequately covered.</li> <li>⊕ All employees will be required to wear protective clothing when handling hazardous wastes.</li> <li>⊕ All workers will be adequately insured against unforeseen accidents.</li> </ul>                                       | <ul style="list-style-type: none"> <li>⊕ Project proponent/contractor</li> <li>⊕ Provincial Public Health Officer</li> <li>⊕ Ministry of Labour</li> <li>⊕ Workers</li> <li>⊕ NEMA inspectors</li> </ul> | Routine Activities   | Periodic and surprise checks | 50 000 per month                              |

| Possible Impacts                 | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Responsibility for Mitigation                                                                                                                                            | Means for Monitoring                   | Frequency for Monitoring                               | Estimated Cost (Kshs) |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------|-----------------------|
| Uncollected solid waste.         | <ul style="list-style-type: none"> <li>⊕ Wastes to be collected regularly to control air pollution and vermin/insects etc.</li> <li>⊕ Receptacles will be provided for waste storage prior to collection.</li> <li>⊕ Resource recovery will be encouraged once the project takes off so as to shrink waste stream and recover non-recyclables.</li> <li>⊕ Refuse collection vehicles will be covered to prevent scatter of wastes by wind.</li> <li>⊕ Wastes will be collected by a licensed operator to avoid illegal final dumping at unauthorized sites.</li> <li>⊕ All persons involved in refuse collection shall be in full protective attire.</li> </ul> | <ul style="list-style-type: none"> <li>⊕ Proponent</li> <li>⊕ Hired private contractor</li> <li>⊕ Provincial Public Health Officer</li> <li>⊕ NEMA inspectors</li> </ul> | Routine Activities                     | Periodic and surprise checks                           | 10 000 per month      |
| Visual Intrusion and obstruction | <ul style="list-style-type: none"> <li>⊕ Power transmission pylons to be erected away from residential areas</li> <li>⊕ Avoidance of numerous angle points during construction</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>⊕ Contractor</li> <li>⊕ Proponent</li> </ul>                                                                                      | Sound design with limited angle points | Quality control during design and implementation phase | Part of design cost   |

| Possible Impacts                               | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Responsibility for Mitigation                                                                                                                                                                            | Means for Monitoring               | Frequency for Monitoring | Estimated Cost (Kshs)          |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------|--------------------------------|
| Danger of accidents from electrocution         | <ul style="list-style-type: none"> <li>⊕ Sensitisation of the locals of the dangers of tampering or high voltage lines</li> <li>⊕ Provision of warning sign on the transmission towers</li> <li>⊕ Provision of cordoning of the pylon area</li> <li>⊕ Retain teams to monitor transmission line</li> </ul>                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>⊕ Contractor</li> <li>⊕ Proponent</li> <li>⊕ Provincial Administration</li> </ul>                                                                                 | Routine patrols and routine checks | Routine patrols          | Part of project cost           |
| Loss of vegetation cover during construction   | <ul style="list-style-type: none"> <li>⊕ Avoidance of unnecessary vegetation clearing and reinstating cleared vegetation</li> <li>⊕ Replanting of trees where possible</li> </ul>                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>⊕ Contractor</li> <li>⊕ Proponent</li> </ul>                                                                                                                      | Planting of more trees             | Periodic checks          | Part of project cost           |
| Demolition of houses                           | <ul style="list-style-type: none"> <li>⊕ Adequate and timely compensation for those to be displaced.</li> <li>⊕ Advance payment of residential property</li> </ul>                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>⊕ Contractor</li> <li>⊕ Proponent</li> </ul>                                                                                                                      | -                                  | Once off activity        | Provided in the project budget |
| Workers accidents during construction process. | <ul style="list-style-type: none"> <li>⊕ All workers will be sensitized before construction begins, on how to control accidents related to construction.</li> <li>⊕ A comprehensive contingency plan will be prepared before construction begins, on accident response.</li> <li>⊕ Accordingly, adherence to safety procedures will be enforced.</li> <li>⊕ All workers to wear protective clothing during construction, including helmets.</li> <li>⊕ Construction work will be limited to daytime only</li> </ul> | <ul style="list-style-type: none"> <li>⊕ Project proponent/contractor</li> <li>⊕ Divisional Public Health Officer</li> <li>⊕ Ministry of Labour</li> <li>⊕ Workers</li> <li>⊕ NEMA inspectors</li> </ul> | Routine Activities                 | Periodic checks          | 40 000 per month               |

| Possible Impacts                                                       | Proposed Mitigation Measures                                                                                                               | Responsibility for Mitigation                                                                           | Means for Monitoring                                                 | Frequency for Monitoring     | Estimated Cost (Kshs)  |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------|------------------------|
| Mushrooming of food kiosks                                             | ⊕ Eating places will be provided on site, with adequate wholesome water and waste disposal handling services, during construction process. | ⊕ Divisional Public Health Officers/Ministry of Health<br>⊕ NEMA inspectors                             | Periodic Activities                                                  | Periodic and surprise checks | 100,000 per annum      |
| Inadequate human waste disposal by workers during construction process | ⊕ As provided for by the Building Code, a temporary latrine will be provided on site to be used by construction workers                    | ⊕ Project proponent<br>⊕ Contractor<br>⊕ Ministry of Health<br>⊕ Ministry of Labor<br>⊕ NEMA inspectors | Periodic Activities                                                  | Periodic checks              | 5 000 at once          |
| Increase in STI infections                                             | ⊕ Sensitisation of local communities and staff working on the project on dangers of free lifestyle                                         | ⊕ Proponents<br>⊕ Ministry of Health                                                                    | Periodic random screening<br>Secondary data from health institutions | yearly                       | Part of project budget |

**Annexure 2- Photographic documentation of public consultations**



**Plate 1:** Public consultation meeting at Shamata chief's office- Nyandarua South



**Plate 2:** Public consultation- Matigari village Mutaara Location of Rumuruti Division



**Plate 3:** Lereshwa centre public consultation



**Plate 4:** Poro Centre public consultation



**Plate 5:** Public Consultation at Morijo centre



**Plate 6:** Consultation meeting with the Samburu County Council Officers

**Annexure 3- Sample of public consultation program**

**PROGRAM FOR PUBLIC CONSULTATIONS MEETING FOR THE PROPOSED 400 KV TRANSMISSION LINE AND SUBSTATION FROM LOYANGALANI TO SUSWA**

1. Introduction
  
2. Remarks by the Coordinator
  
3. Remarks by the Community leaders- chiefs, assistant chiefs, elders etc
  
4. Address by the Environmental Consultant on:
  - \* The specific purpose of the meeting.
  - \* Nature, purpose and scope of the project
  - \* NEMA Requirements
  - \* Invites comments from the public
  
1. Comments from the community
  
2. Closing Remarks

**Annexure 4- Questionnaire – Community members**

**QUESTIONNAIRE FOR THE PROPOSED 400 KV TRANSMISSION LINE AND SUBSTATION FROM LOYANGALANI TO SUSWA-COMMUNITY MEMBERS**

**Proposed Project**

Lake Turkana wind Power Limited is proposing to construct 400km of 400 KV transmission lines to transfer power from Lake Turkana Wind Power Project located at Loyangalani to Suswa in Rift Valley Province. The substation is to be located at Suswa.

This questionnaire is administered to collect and collate views of the community members to facilitate in the compilation of Environmental and Socio -Economic Impact Assessment report as required by EMCA (1999) and EIA /EA Rules and Regulations (2003).

**General Information**

- 1. Enumerator’s name -----
- 2. Respondent’s name -----
- 3. Date of interview -----
- 4. Location-----Division -----District-----

**Demographic data**

- 1. Head of Household’s Name:.....
- 2. Sex: Male:.....Female:.....
- 3. Tribe: .....
- 4. Occupation:.....
- 5. Religion:.....
- 6. Total Household members:.....

**Education level**

**number of members**

- a. Primary .....
- b. Secondary .....
- c. College/ University .....

**Public Health**

State the type of diseases experienced in your household and frequency of occurrence.

| <b>Disease</b> | <b>Monthly</b> | <b>Seasonally</b> | <b>Annually</b> |
|----------------|----------------|-------------------|-----------------|
| Malaria        | -----          | -----             | -----           |
| Bilharzia      | -----          | -----             | -----           |
| Typhoid        | -----          | -----             | -----           |
| Cholera        | -----          | -----             | -----           |
| Eye infection  | -----          | -----             | -----           |
| Anemia         | -----          | -----             | -----           |
| Skin Disease   | -----          | -----             | -----           |
| AIDS (HIV)     | -----          | -----             | -----           |
| Ulcers         | -----          | -----             | -----           |
| Measles        | -----          | -----             | -----           |
| Pneumonia      | -----          | -----             | -----           |
| Others/specify | -----          | -----             | -----           |

Where do you go for health assistance?

- Hospital (specify)
- Dispensary (specify)
- Clinic (specify)
- Traditional herbs (source)
- Others (specify)

What concerns do you anticipate from the construction 400 KV Transmission Line And Substation from Loyangalani to Suswa on community health?

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**Housing Typology (tick)**

- Permanent
- Semi-permanent
- Temporary

What concerns have you noted/anticipated from the proposed 400 KV Transmission Line and Substation from Loyangalani to Suswa on housing typology? -----

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**Agriculture Production**

| <b>Crop type</b> | <b>Subsistence/sale</b> | <b>Acreage</b> | <b>Production</b> | <b>Unit price</b> |
|------------------|-------------------------|----------------|-------------------|-------------------|
| Maize            | -----                   | -----          | -----             | -----             |
| Millet           | -----                   | -----          | -----             | -----             |
| Cassava          | -----                   | -----          | -----             | -----             |
| Beans            | -----                   | -----          | -----             | -----             |
| Groundnuts       | -----                   | -----          | -----             | -----             |
| Bananas          | -----                   | -----          | -----             | -----             |
| Vegetable        | -----                   | -----          | -----             | -----             |
| Fruits (specify) | -----                   | -----          | -----             | -----             |
| Potatoes         | -----                   | -----          | -----             | -----             |
| Peas             | -----                   | -----          | -----             | -----             |
| Onions           | -----                   | -----          | -----             | -----             |
| Wheat            | -----                   | -----          | -----             | -----             |
| Sorghum          | -----                   | -----          | -----             | -----             |
| Others (specify) | -----                   | -----          | -----             | -----             |
|                  | -----                   | -----          | -----             | -----             |

What concerns do you anticipate from the proposed 400 KV Transmission Line and Substation from Loyangalani to Suswa on agricultural production?

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 -----  
 -----  
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**Land Tenure System**

Under what type of tenure do you use this land?

- Freehold (registered)
- Freehold (unregistered)
- Leasehold
- Tenancy
- Customary/communal
- Do not know

What concerns do you anticipate from the 400 KV Transmission Line and Substation from Loyangalani to Suswa on land tenure system/prices

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 -----  
 -----  
 -----  
 -----  
 -----  
 -----

**Livestock Production and Composition**

| Type    | Number | Purpose (subsistence/sale) | Income (Kshs/year) |
|---------|--------|----------------------------|--------------------|
| Cows    | -----  | -----                      | -----              |
| Bull    | -----  | -----                      | -----              |
| Sheep   | -----  | -----                      | -----              |
| Goats   | -----  | -----                      | -----              |
| Donkeys | -----  | -----                      | -----              |
| Pigs    | -----  | -----                      | -----              |
| Camels  | -----  | -----                      | -----              |

|         |       |       |       |
|---------|-------|-------|-------|
| Rabbits | ----- | ----- | ----- |
| Poultry | ----- | ----- | ----- |
| Others  | ----- | ----- | ----- |

What impacts do you anticipate from the proposed 400 KV Transmission Line and Substation from Loyangalani to Suswa on local livestock?

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Date:.....Signature:.....

**Annexure 5- Questionnaire Institutions**

**QUESTIONNAIRE FOR THE PROPOSED 400 KV TRANSMISSION LINE AND SUBSTATION FROM LOYANGALANI TO SUSWA-INSTITUTIONS**

**Proposed Project**

Lake Turkana Wind Power Limited is proposing to construct 400km of 400 KV transmission lines to transfer power from Lake Turkana wind Power Project located at Loyangalani to Suswa in Rift Valley Province. The substation is to be located at Suswa

This questionnaire is administered to collect and collate views of the key stakeholders to facilitate in the compilation of Environmental and Social Impact Assessment report as required by EMCA (1999) and EIA /EA Rules and Regulations (2003).

**Target Group**

- Kenya Wildlife Service
- Kenya Forest Service
- Group ranches

**General Information**

- Enumerator's name -----
- Respondent's name -----
- Designation:-----
- Date of interview -----
- Location-----Division -----District-----

Do you have any information on the proposed power transmission project? (Yes/No)

If yes, Name the source-----

What are the issues s you may have on the implementation of the proposed power transmission project on the following

1. Land.....  
.....  
.....  
.....
2. Forest  
cover.....

- .....  
.....
- 3. Wildlife.....  
.....  
.....  
.....
- 4. Environment.....  
.....  
.....  
.....
- 5. Water  
Resources.....  
.....  
.....
- 6. Habitats.....  
.....  
.....  
.....
- 7. Dispersal  
areas.....
- 8. Others  
specify.....  
.....  
.....

Are there animals are likely to be affected by the proposed power transmission? (Yes/No)

If yes, Specify-----  
-----  
-----  
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-----

List the wildlife species occurring in the area surrounding the proposed power transmission line and substations.

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-----  
-----  
-----  
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Any suggestion on the project

- During construction
- Operation Phase

Date:.....Signature:.....

**Annexure 6- List of Members Present**

We the undersigned confirm participating in the said meeting and that the comments recorded and read out by the Environmental Consultant are a reflection of the opinion of this community in relation to the impacts of proposed power transmission line and associated substation.

| Number | Name | ID/No | Signature | Address |
|--------|------|-------|-----------|---------|
| 1      |      |       |           |         |
| 2      |      |       |           |         |
| 3      |      |       |           |         |
| 4      |      |       |           |         |
| 5      |      |       |           |         |
| 6      |      |       |           |         |
| 7      |      |       |           |         |
| 8      |      |       |           |         |
| 9      |      |       |           |         |
| 10     |      |       |           |         |
| 11     |      |       |           |         |
| 12     |      |       |           |         |
| 13     |      |       |           |         |
| 14     |      |       |           |         |
| 15     |      |       |           |         |
| 17     |      |       |           |         |
| 18     |      |       |           |         |
| 19     |      |       |           |         |

District:.....Division:.....Location:.....Sub location:.....Village:.....

The meeting ended, \_\_\_\_\_

Secretary \_\_\_\_\_

Community Representative \_\_\_\_\_

Environmental Consultant Representative \_\_\_\_\_

Date \_\_\_\_\_