

# **ENVIRONMENTAL AND SOCIAL SCREENING PROJECT REPORT FOR LAST MILE CONNECTIVITY PROJECT**



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**FINAL  
PROJECT  
REPORT**

The Environmental and Social Management Framework (ESMP) has been prepared by Environment and Social Unit, Safety, Health and Environment Department (SHE), Kenya Power, Nairobi. The ESMP has been prepared based on an overall environmental and social assessment, which includes (i) the general baseline information of project areas (ii) Evaluation of potential environmental and social impacts of different project components and subcomponents and (iii) Assessment of environmental practices in different ongoing and completed projects.

The ESMP provides a guideline for the implementation of all mitigation measures and actions to respond to any anticipated project impacts, once the LMCP project begins.

# CERTIFICATION:

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**Assignment:** To carry out an Environmental and social screening of the Proposed Last mile connectivity project

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## EXECUTIVE SUMMARY

This is an environmental screening report summarizes the 10Lots under the Last Mile Connectivity Project. The last mile connectivity project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project is supported through external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and will result into connection of more customers to the national grid. The last mile connectivity project phase one will involve maximizing existing transformers i.e connecting customers that are within 600m of transformer protection distance/radius. The project will also involve fitting of prepaid meters for customers. The project's benefits cannot be overemphasized and includes; provision of new supply, promotion of ICT, education, security, income generating activities access to information and direct employment to name but a few.

The last mile connectivity project is a national wide project and will cover all the 47 counties in Kenya ranging from Coast, North Eastern, Western, North Rift, Central Rift, Mt. Kenya and Nairobi regions where Kenya power has administrative structure. In order to ensure that the project is implemented in an Environmental and Social sustainable manner, the project was subjected to environmental screening. The objective of screening was undertaken to assess the potential environmental and social impacts of the project. During the screening exercise baseline information that could be observed around the project site was picked and documented including general information on the following; population density, vegetation distribution, climatic conditions of the project sites, topography and soils.

The proposed project areas have varied population except ranging from high density in the highlands and cities, medium density and low density especially in the northern frontier. The counties mainly have agriculture based economies mixed with urban centres and small towns where there is higher population density. Other economic activities include commercial activities in towns and urban centres. Most of the counties have good/plenty of vegetation cover comprising natural forests, planted forests, some medicinal plants, and exotic and indigenous tree species in different areas. The project areas have different cash crops such as tea, coffee, wheat, miraa, bananas, pineapples, coconuts, cashewnuts, and rice in othert counties. Other areas have large farms with wheat and flowers especially in Laikipia towards Timau. The project areas receive adequate rainfalls save for some dryland areas in the north part which receives low rainfall. Topography of the proposed project area is characterized by undulating hills, gentle slope to slopy areas and very flat areas in the rice fields and drylands. Most soils are rich and well drained except for Mwea area, Ahero and Bura where we have irrigation schemes.

As already noted the project presents various benefits but also will have some negative impacts that must be addressed/ mitigated. The potential negative environmental and social impacts during construction and implementation of the project include; transformer oil leakages, electric shocks, electrocution of people, social vices, vegetation disturbance, dehydration especially in coast and northern frontier and risk of sparks and fire from live conductors among others. To address the negative impacts, an Environmental and social management plan (ESMP) has been developed to guide in mitigating the said negative impacts. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified. The ESMP developed will ensure compliance with regulatory authority stipulations and the financier's guidelines.

In conclusion, the last mile connectivity project will accrue benefits that exceed the negative impacts. However, for the company to ensure sustainable development takes place, the implementation of the ESMP is vital and the management must see to it that the contractors follow suite by observing and implementing the ESMP to the letter. The project will result in great economic, environmental and social benefits both at individual level, communal level and the country at large.

## **PROJECT LOTS PER REGION**

1. LOT 1: NORTH RIFT
2. LOT2: WESTERN KENYA
3. LOT3: SOUTH NYANZA
4. LOT4: CENTRAL RIFT
5. LOT5: NAIROBI & MT. KENYA REGION
6. LOT6: NORTH EASTERN
7. LOT7: MOUNT KENYA
8. LOT8: NAIROBI WEST/SOUTH
9. LOT9: COAST
10. LOT10: NORTH EASTERN & COAST

# LEGAL FRAMEWORK

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

A detailed review of relevant institutional and legal as well as policy framework that bears significance or implication to this Last Mile Connectivity project is presented in this chapter. The African Development Bank Safeguard Operational Policies applicable to the project as well as the international laws and conventions that bear relevance to the implementation of this project have also been highlighted in this chapter.

## **The Environment Management and Co-ordination Act, 1999**

This is an Act of Parliament providing for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. This Act is divided into 13 Parts, covering main areas of environmental concern as follows: Preliminary (I); General principles (II); Administration (III); Environmental planning (IV); Protection and Conservation of the Environment (V), Environmental impact assessments (EIA), audits and monitoring (VI); Environmental audit and monitoring (VII); Environmental quality standards (VIII); Environmental Restoration orders, Environmental Easements (IX); Inspection, analysis and records (IX); Inspection Analysis and Records (X); International Treaties, Conventions and Agreements (XI) National Environment Tribunal (XII); Environmental Offences (XIII).

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

## **The Environmental (Impact Assessment and Audit) Regulations, 2003**

This regulation provides guidelines for conducting Environmental Impact Assessments and Audits. It offers guidance on the fundamental aspects on which emphasis must be laid during field study and outlines the nature and structure of Environmental Impact Assessments and Audit reports. The legislation further explains the legal consequences of partial or non-compliance to the provisions of the Act.

This regulation requires that project that are out of character undergo environmental impact assessment (EIA). However the LMCP was not subjected to EIA because it involved use of existing transformers and connections to the last customer using low voltage lines. To ensure the environment is protected, screening was done to find out potential impacts of the project and put measures to mitigate against them.

## **The Environmental Management Coordination (Waste Management) Regulations): Legal Notice 121**

The regulation provides that a waste generator shall use cleaner production methods, segregate waste generated and the waste transporter should be licensed. The notice further states no person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by the National Environment Management Authority. Hazardous waste will not be generated from this project.

## **The Environmental Management Coordination (Water Quality) Regulations): Legal Notice 120**

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

## **Environmental Management and Coordination (Noise and Excessive Vibration pollution) (Control) Regulations, 2009: Legal Notice 61**

This regulation prohibits any person to cause unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

## **Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006**

This legislation aims at enhancing preservation of biodiversity and safeguarding of endangered and rare plant and animal species within any human activity area. Section 4 of the legislation expressly prohibits any activity which may have adverse effects on any ecosystem, lead to introduction of alien species in a given area or result in unsustainable utilization of available ecosystem resources.

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

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

## **Public Health Act (Cap. 242)**

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

## **Energy Act of 2006**

The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution and supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes.

The Act also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006. The players are expected to operate their businesses in a manner that protects the environment and conserve natural resources. Further they must be in a position to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

## **Africa Development Bank Operational Safeguard Policies**

The AfDB is concerned about the environmental and social impacts of its activities and requires environmental assessments be done for all projects it finances. Its safeguard policies are aimed at preventing and mitigating undue harm to people and their environment in the development process also provide a platform for the participation of stakeholders in project design and implementation.

Environmental and social assessment. This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements. This overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements: the scope of application; categorization; use of a SESA and ESIA, where appropriate; Environmental and Social Management Plans; climate change vulnerability



assessment; public consultation; community impacts; appraisal and treatment of vulnerable groups; and grievance procedures.

Based on this legal assessment it was thought necessary that an Environmental and Social Management Framework (ESMF) be prepared to guide management of environmental and social impacts of the project. It was found that the negative impacts were not adverse and so screening was to be done to identify the impacts and an ESMP prepared to guide contractors.

## PROJECT OVERVIEW

This Environmental and Social Management Plan (ESMP) is a compliance tool for the works and activities under the Kenya Power's Last Mile Connectivity Project Grant which the Kenya Government has sought from the Africa Development Bank. The capital works will contribute to improving the reliability of power supplies by reducing the frequency and duration of power supply interruptions in the 47 Counties. KPLC plans to use the AfDB money to strengthen the power distribution network in the entire County, to improve the network efficiency and reliability, and to meet growing and new demands for electricity. Planning and design of the network upgrade is underway by KPLC and its Engineers which include upgrading and installing new transformers, up-rating and extending the existing distribution lines and installing a new dispatch /systems control room. The proposed works to be co-financed by the AfDB Credits include – maximum utilization of existing Transformers to improve electricity access to low end customers or households.

The objective of this Environmental and Social Screening Process (the screening process) is to ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

KPLC PIT - with help of regional staff - will be responsible for completing the Environmental and Social Screening Form, and based on the screening results, the appropriate level of environmental work will be determined by KPLC's Environment unit and carried out by qualified KPLC staff. The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are now known project, and therefore potential adverse localized environmental and social impacts can be precisely identified and described in an EMP. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects, whereas the EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The this screening report has covered the 10 lots in 47 counties with each having lot specific ESMP for its activities depending on the topographical, population, vegetation cover, solid waste, locational, accessibility and power network considerations.

Below find the LOT specific screening report and ESMP for each of the lots covered in the 47 counties.

## **1 LOT 1: NORTH RIFT**

## **EXECUTIVE SUMMARY**

The Last Mile Connectivity Project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project benefits from AfDB funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also maximizing on the existing infrastructure. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity thus ensuring connection of more customers to the national grid. The project's benefits include provision of new supply over a short period of time and accelerated access to electricity among others.

The Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at enabling customers in low income groups access electricity, enhanced security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

The company acknowledges that the Last Mile Connectivity Project has some negative impacts on the environment and social wellbeing of the people. As such, the Environmental Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impact of the project which include; oil leaks from transformers, shock and electrocution of people as well as noise from construction will be mitigated as outlined in the ESMP. On the basis of the above and taking cognizance that the company has proved to be environmentally and socially credible, it is important to have the project implemented to enhance economic wellbeing of the society.

## **1.1 Introduction and project brief**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation to improve the economic wellbeing of Kenyans. Among the many interventions to achieve this is expansion of the power distribution system to be within reach and thus enable more Kenyans connect to the grid at affordable cost and hence initiate economic activities at the micro-economic level. The current trend of network expansion driven by customer demand is approaching saturation. In the foreseeable future there is a likelihood of the annual connectivity stagnating at the 300,000-400,000 level. To jumpstart and accelerate connectivity, a new thinking is needed as happened in 2004.

To reduce the cost burden of increased connectivity on KPLC, as well as reduce the amount paid by the customer to connect to the grid, the strategy proposed is to extend the distribution network to as near the customer as possible using external or government funding. This can initially be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization). This model would involve building low voltage lines both single phase and three phase (to a small extent) along rural access roads.

KPLC has a total of 35,000 distribution transformers spread across the country. The transformers were installed for various reasons, i.e., for new customers, reinforcement of existing transformers due to load growth, reinforcement to reduce length of the low voltage lines hence improve transformer protected distances, etc. As such majority of the transformers will be having varied lengths of the low voltage network emanating from them, some of which will be passing in close proximity to ready and potential customers.

Data collected from KPLC regions indicates that the company has potential to connect approximately 472,002 households that are within 600 meters of the transformers through individual service lines. Of these households, some will be within developed areas, majority of who will be reached by a service cable drop or a pole or two, whereas in the expansive zones in the peri-urban and rural areas, construction of a 600m low voltage line for a single customer will not be an exception. Based on an average of two spans (@ 50m) single phase LV line, 30m service cable drop (10% of the service drops assumed to be three phase), 40km return transport and implementation by labour and transport contractors, the projected cost of connecting all these households is approximately USD 685million (KShs. 58.2Billion).

In the financial year 2011/2012, KPLC connected 307,000 customers to the grid after implementing 123,000 maximization projects. In effect each maximization project generated approximately 2.496 customers.

With data collected from the field showing that there exist approximately 472,002 households within reach of distribution transformers, implementation of the network to reach them will result in connection of approximately 1.2million customers.

The AfDB has proposed to fund the project to the tune of US\$ 153.4 million (exclusive of taxes, Levies and duties). With this in mind, a criterion has been proposed to define which parts of the country will benefit from the fund. The number of customers to be reached with the proposed funding is 200,000 at a total cost of USD 153.4million.

### **1.1.1 Importance of LMCP**

Last mile connectivity project is important in that it will ensure that the vast infrastructure that the company has invested in is fully utilized and that more customers are connected to the grid. It is important also because it will lead to improved standards of living as it will result in connection of 1.2 million people.

### **1.1.2 Justification of LMCP**

The Last Mile Connectivity Project is justified in that it will facilitate the government's vision of achieving universal power connection by the year 2030.

## **1.2 The Project Overview**

The Last Mile Connectivity Project for Lot 1 shall be undertaken in the North rift region which comprises the following counties; **Nandi, Uasin- Gishu, Trans- Nzoia, Baringo, Elgeyo Marakwet, West Pokot and Turkana**. The baseline information for the proposed project area considers population densities of project sites, vegetation distribution, climatic conditions, topography and soils. The proposed project area's population varies by county but notably the major urban areas like Eldoret and Kitale are densely populated. This is attributed to improved infrastructure, business opportunities among other factors.

The screening process also considered potential impacts of the connectivity project on Land value, job opportunities, income and economic activities. Findings reveal that implementation of the connectivity project within the Counties shall increase land value, create job opportunities and provide more income for persons opting for business ventures.

### **1.2.1 Location of the project**

The North Rift region is located to the northern part of the Rift Valley in Kenya and is made up of eight counties namely; Turkana, Baringo, Elgeyo Marakwet, Nandi, Uasin Gishu, West Pokot, and Trans-Nzoia.

The environmental and social screening was carried out in Elgeyo Marakwet, Nandi, Baringo, Transzoia, Uasin Gishu and West Pokot Counties. The Environmental and social characteristics of these areas were identified based on; population density, existing land uses, vegetation, topography, soil types, general ecological setting and public safety. These factors contributed to the settlement patterns and therefore the population densities varied with Turkana, West Pokot and Baringo having very low population densities whereas Nandi, Uasin Gishu and Transzoia had the highest population densities.

### **1.2.2 Baseline information of the project sites**

This gives background information of the project area in terms of its location, size, administrative and political units, physical features description, settlement patterns, demographic features and natural conditions

#### **1.2.2.1 Population**

The region has varying population densities in the different counties but it is estimated that the North Rift region has a population of 5.2 million people with the major towns like Eldoret and Kitale accounting for high population.

Nandi County occupies an area of 2,884.4 Km<sup>2</sup>. Geographically, the unique jug-shaped structure of Nandi County is bound by the Equator to the south and extends northwards to latitude 0°34'N. The Western boundary extends to Longitude 34°45'E, while the Eastern boundary reaches Longitude 35°25'E. According to a 2009 census, the county has a population of 752,965.

Uasin Gishu County is located on a plateau and has a cool and temperate climate. It lies between Longitudes 34° 50" East and 35° 37" West and Latitudes 0° 03" South and 0° 55" North. It covers an area of 3,345.2Km<sup>2</sup> with 476.3Km<sup>2</sup> under forest cover according to the 2009 Kenya Population and Housing Census. According to the 2009 Population and Housing Census, the total population of Uasin Gishu County stood at 894,179. With a population

growth rate of 3.8%, the total population is projected to grow to 1,211,853 by 2017. The population density is 267 persons per sq. Km. which is expected to increase to 362 persons per sq. km. by 2017. In 2012, the population age group between 0 to 14 years was 41.4%, while the economically active age group of between 15 and 64 years accounted for 55.7% and those above 64 years accounting for 2.9% of the total population.

Elgeyo Marakwet County is located in the Rift Valley and It covers an area of 3,029.8Km<sup>2</sup>. According to the 2009 Kenya Population and Housing Census the population is 369,998 with a population density of 122 people per Km<sup>2</sup> and an annual growth rate of 2.8%. Age Distribution is; 0-14 years 46.4%, 15-64 years 49.6 %, 65+ years 4.0 %.

West Pokot County is a county of Kenya. It lies between latitudes 24° 40'North, and 1° 7'North and longitudes 34° 37'East and 35° 49'East. It covers an area of 9,169.39 Sq. Km. The County has a total population of 512,690 persons, with male population constituting 49.7 percent while the female are at 50.3 percent female. The growth rate of the county stands at 3.1 percent per annum. The county has a total of 93,777 Households (HH) according to the 2009 population census. The population density is estimated at 56 people per Km<sup>2</sup> with 69 percent of the population living below the poverty line. The County is home to mainly the Pokot people, with the dominant community being the Kalenjin, speaking people. The county's population is expected to grow to 683,808 by 2017.

Baringo County covers an area of about 11,015 km<sup>2</sup>. The 2009 Kenya Population and Housing Census (KPHC) (GoK, 2010) put the county's population at 555,561 (279,081 males and 276,480 females). The county's intercensal growth rate is 3.3% per annum which is above the national average of 3%. The population of the county is projected to be 613,376 in 2012 consisting of 308,124 males and 305,252 females. This population is further projected to increase to 677,209 and 723,411 in 2015 and 2017 respectively. Out of the total labour force in the county, 68% are unemployed. The major sources of employment are: agriculture, rural self-employed, urban self-employed and wage employment. Wage employment is the main source of employment in the county, generating about 34 per cent of the total employment.

Trans Nzoia County covers an area of 2,495.6 km<sup>2</sup>. The county population as per the 2009 population census was 818,757 (407,172 males and 411,585 females). The 2012 projected population based on a growth rate of 3% was 912,134 (453,525 males and 458,525 females). By 2015, the population is projected to grow to 1,016,161 (505,342 males and 510,819 females) and to 1,092,023 (543,069 males and 548,955 females) by 2017. The increase in the overall population calls for more investment in economic and social facilities, education, agriculture, health as well as creating employment opportunities.

#### **1.2.2.2 Vegetation**

The area has vast vegetation cover comprising of planted forests, medicinal plants, exotic and indigenous tree species in different areas. The project area is also characterized by large maize farms as well as small agricultural fields especially in Uasin Gishu and Trans Nzoia counties.

#### **1.2.2.3 Topography**

Nandi County occupies 2,884.4 km<sup>2</sup> of land characterized by hilly topography that includes an outcrop of basement systems rocks. The dissected scarp at the Southern border of the Sub-County is another manifestation of rock exposure. The physiographic outlook of Nandi County is composed of five units with typical topography namely: *the rolling hills* to the West of the County, *the Kapsabet plateau* (part of Uasin Gishu plateau), *the wooded highlands* and *foothills* of Tinderet Volcanic mass in the South East, the Kingwal swamp in the centre (Baraton-Chepterit) and the dissected Nyando Escarpment at the Southern border (Nandi South Sub-County).

The Kerio River binds Elgeyo Marakwet County on the eastern side. From its alluvial plain the topography gradually rises towards the west. The Elgeyo Escarpment stands out distinctly and causes elevation differences of up to 1,500 m. In the northern and southern part of the county the topography is rugged, giving way to more subdued relief differences going westwards. The underlying geology mainly consists of gneisses from the Basement System. The Cherangany Hills rise gently to form the western half of the Great Rift Valley and extend northwest in a broken chain to Mount Moroto in Uganda. Non-volcanic in origin, the Cherangany Hills resulted from faulting in the Rift Valley. The range is approximately 30 miles (48 km) long and 25 miles (40 km) wide and averages 9,000 feet (2,700 metres) in height; its highest point reaches more than 11,000 feet (3,370 metres). Many of the summits are covered with huge groundsels and lobelias. Some of the hills include Kameleogon (3581 m), Chebon (3375 m), Chepkotet (3370 m), Alaleigelat (3350 m) and Sodang (3211 m).

#### **1.2.2.4 Climate**

Uasin Gishu County experiences high and reliable rainfall which is evenly distributed throughout the year. The average rainfall ranges between 624.9mm to 1,560.4mm with the wettest months occurring between the months of April and May and the driest months occurring between January and February. It has a cool and temperate climate, with annual temperatures ranging between 7°C and 29°C.

Situated in the slopes of the mountain, Trans Nzoia County has a cool and temperate climate with average annual temperatures ranging between a minimum of 10°C to a maximum of 27°C. The county receives annual precipitation ranging between 1000 and 1200mm, with the wettest months being experienced between April and October.

Elgeyo Marakwet County has temperatures ranging from a minimum of 14 °C to a maximum of 24 °C. Rainfall ranges from 400 to 1,400 mm annually.

Nandi County has a cool wet climate with two rainy seasons; the long rains between March and June, and the short rains between October and November. The rainfall varies between 1,200 mm and 2,000 mm annually, with temperatures of between 15°C and 25°C.

#### **1.2.2.5 Soils**

The dominant soil type in the proposed project area is loam soil (mixture of clay and sandy soil). The soil is ideal for farming since its very fertile, well drained and has moderate moisture retention capabilities. Other parts especially in Baringo County have sandy soils which support scanty vegetation.



## **1.3 Project screening**

### **1.3.1 Introduction of screening**

Environmental and social screening is a process carried out to determine whether a given project requires EIA or not. This is done through identifying the potential positive and negative impacts of the project. The table below shows the environmental and social characteristics of the proposed project sites.

### **1.3.2 Objective of screening**

The main objective of the screening process is to determine the potential adverse environmental and social impacts of the proposed project which in turn informs whether an Environmental Impact Assessment should be undertaken.

### **1.3.3 Importance of screening**

Environmental and social screening is undertaken to enhance environmental and social sustainability of the proposed projects. The screening process focuses on both environmental and social benefits of a project and the potential negative impact. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities, actions and mitigation measures for identified negative impacts.

**Table 3-1: ENVIRONMENTAL AND SOCIAL CHARACTERISTICS OF PROPOSED PROJECT SITES**

Environmental and social characteristics of the proposed project sites are as below:

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>BARINGO COUNTY</b>						
<b>BARINGO SOUTH CONSTITUENCY</b>						
Sparsely populated	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Natural vegetation acacia and shrubs</li> </ul>	Gently sloping	Sandy soil	Terrestrial birds	Public safety awareness be conducted to alleviate accidents especially on livestock.
<b>BARINGO CENTRAL CONSTITUENCY</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>Schools</li> </ul>	Trees and planted edges e.g. Cyprus, Shrubs, Acacia, Avocado, oranges and croton	Sloppy	Sandy soil	Terrestrial birds	Public safety awareness be conducted to alleviate accidents especially on livestock
<b>BARINGO NORTH CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium to high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Croton, Cyprus Eucalyptus, avocado, blue gum, Nandi flame and bananas.</li> <li>Natural vegetation Aloe Vera, Elgon teak, Oak, Lantana camara and wild berries</li> </ul>	Relatively flat	Loam soil	Terrestrial birds	Area connected to power and need for public safety awareness
<b>ELDAMA RAVINE CONSTITUENCY</b>						
High especially close to Ravine town and medium on other areas	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Informal settlements</li> </ul>	Natural vegetation like grass, herbs and shrubs. Planted vegetation like Croton, Cyprus, sisal, blue gum and gravellea	Relatively flat	Loam soil	Terrestrial birds	Area connected to power. Need for Public safety awareness
<b>MOGOTIO CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (shops)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> </ul> Agricultural -	<ul style="list-style-type: none"> <li>Natural vegetation: acacia, shrubs</li> <li>Planted vegetation: sisal, gravelia</li> </ul>	Flat	Loam soil	Terrestrial birds	Livestock rearing is dominant in the area therefore safety considerations for the same.
<b>UASIN GISHU COUNTY</b>						
<b>KAPSERET CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. wattle</li> </ul>	Relatively flat	Red soil	Terrestrial	The infrastructure in most

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
	(shops) <ul style="list-style-type: none"> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural -</li> </ul>	trees, blue gum and bananas, Cyprus, acacia <ul style="list-style-type: none"> <li>Natural vegetation grass</li> </ul>			birds	parts of Kapseret is well done. Public safety awareness should be undertaken to ensure proper use of the infrastructure
<b>TURBO CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – maize, bananas, Avocadoes, napier, livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Quavas, Acacia, Eucalyptus Wattle tree and Croton</li> <li>Natural vegetation dominated by grass scattered Lantana Camara</li> </ul>	Gentle sloping	Loam soil	Terrestrial birds	The project will benefit the community especially farmers in the area.
<b>SOY CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and high in some areas	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Sisal, acacia, wattle tree, Eucalyptus, Kay apples and Sodom apple.</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Relatively flat	Red soil	Terrestrial birds,	Most TXs are along the wayleaves therefore minimum safety concerns.
<b>AINABKOI CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, Napier grass, sunflower and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Cyprus, Avocado trees, bananas, wattle trees, sun flower, nappier grass, croton</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara, wild berries</li> </ul>	Relatively flat	Loam soils	Terrestrial birds	Way leaves will be maintained
<b>KESSES CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, Napier grass &amp; Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Wattle trees, Eucalyptus, Pine, Cyprus, Nandi flame, Bamboo, Kay apples, Bananas, Avocado trees,</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat,	Red soil	Terrestrial birds	
<b>MOIBEN CONSTITUENCY</b>						
Sparsely populated	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Croton, Grevillea, Mangoes, Eucalyptus, Cyprus, Avocado trees, bananas, Kay Apple, acacia , Nandi flame</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, Sodom apple</li> </ul>	Gently sloping and other places Relatively flat	Red soil	Terrestrial birds	Way leaves will be maintained
<b>WEST POKOT COUNTY</b>						
<b>KACHELIBA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Sparsely populated	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g Sisal</li> <li>Natural vegetation e.g shrubs, cactus and acacia</li> </ul>	Sloping	Sandy Soil	Terrestrial birds	Most TxS to be maximized are in schools hence need for safety awareness
<b>KAPENGURIA CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - Tea plantations, Bananas, maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g.avocado croton, gravellia, eucalyptus, pine, Nandi flame, macamia lutea and Cyprus.</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Loam soil	Terrestrial birds	Most of the TXs to be maximized are in schools therefore the need for safety awareness in these institutions.
<b>POKOT SOUTH CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, croton, avocado, sisal, Nandi flame and Kay apples</li> <li>Natural vegetation e.g cactus, acacia and shrubs</li> </ul>	Gently sloping	Sandy loam soil and black cotton soil	Terrestrial birds	Some parts have poor terrain hence caution should be taken during the project implementation
<b>ELGEYO MARAKWET COUNTY</b>						
<b>KEIYO NORTH CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Cyprus, eucalyptus, wattle trees, croton and Sodom apples, Kay apples, croton, maize, bananas</li> <li>Natural vegetation grass, herbs, shrubs, acacia.</li> </ul>	Relatively flat	Red soil	Terrestrial birds	There is a water pan close to TX no. 28066 but will not be affected during maximization.
<b>KEIYO SOUTH CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Dense to Medium population	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – bananas, maize, wheat and loquats</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Gravellia, Eucalyptus Cyprus, wheat, sun flowers</li> <li>Natural vegetation Guavas, grass, herbs, shrubs.</li> </ul>	Gently sloping with some parts having steep slopes	Loam Soil with some parts having red soil	Terrestrial birds	Some parts have poor terrain hence caution should be taken during the project implementation.
<b>TRANSOIA COUNTY</b>						
<b>KWANZA CONSTITUENCY</b>						
Medium to high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, maize, Bananas, Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Nandi flame, Cyprus, lantana camara, eucalyptus, sodom apples, avocados and bananas, nandi flame.</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red soil	Terrestrial birds	Way leaves to be maintained.
<b>ENDEBES CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – maize, , Bananas, Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Avocados, Croton, Quavas, bananas, Eucalyptus, Cyprus, Kay apples.</li> <li>Natural vegetation grass, herbs, shrubs, acacia.</li> </ul>	Gently sloping	Red soil	Terrestrial birds	The Tx in Mubere Primary (Kaibei) area is new and unmarked.
<b>SABOTI CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches, Mosque</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Avocados, Nandi flame, Croton, Grevillea, Mangoes, Nandi flames, Eucalyptus, Cyprus, bananas</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Relatively flat	Red soil	Terrestrial birds	Some immediate homes not connected to electricity.
<b>CHERANGANY CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. quavas, Cyprus, gravellia, croton, bananas, Kay apples.</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, acacia, wild berries, Sodom apple ,</li> </ul>	Relatively flat	Red soil	Terrestrial birds	The farmers in the region will benefit from this project. Especially dairy farmers
<b>KIMININI CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Cyprus, Avocado trees, sisal, Nappier grass</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara</li> </ul>	Relatively flat	Red soil	Terrestrial birds	There is a proposed school (Chris Wamalwa School) next to TX no. 23641 which will benefit from the project.
<b>NANDI COUNTY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>NANDI HILLS CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> </ul> Agricultural – Sugarcane and Dairy Livestock	Planted : wattle trees, eucalyptus, Cyprus, tea, Natural : Sodom apple	Slopping	Red soil	Terrestrial birds	The wayleaves are existing and should be maintained
<b>TINDIRET CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> </ul> Agricultural – Sugarcane and Dairy Livestock	Planted: croton, Cyprus, wattle trees, sugarcane Natural : Sodom apple,	Gentle sloping	Black cotton soil	Terrestrial birds	The sloppy nature of the terrain makes it hard to access.
<b>MOSOP CONSTITUENCY</b>						
Medium and high in some areas	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> </ul> Agricultural –maize, Livestock	Planted: Eucalyptus, Wattle trees, Cyprus and Nandi flame.	Relatively flat	Red soil	Terrestrial birds	Way leaves will be maintained

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>CHESUMEI CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> </ul> Agricultural – Tea, Livestock	Planted: Eucalyptus, wattle trees, Cyprus and croton, gravellia	Relatively flat	Red soil	Terrestrial birds	A big population will benefit from the project since most of them are in close proximity to the TXs
<b>EMGWEN CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> </ul> Agricultural – Tea, Livestock	Planted: Croton, tea, Cyprus, eucalyptus Natural: Sodom apple, acacia	Gentle sloping	Red soil	Terrestrial birds	Most TXs are in learning institutions hence need for Public safety awareness
<b>TURKANA COUNTY</b>						
<b>TURKANA SOUTH CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium in Kainuk and low at KWS TX	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Mosques</li> <li>• Administrative</li> <li>• Ranch land</li> </ul>	Planted trees e.g. Neam, Ornamental trees Natural vegetation dominated by Acacia and Prosopis	Relatively flat in town and gentle slope near Catholic	Sandy loam	Terrestrial animals and birds	TX 23518 at KWS is faulty, TX 22385 not marked on ground
<b>TURKANA CENTRAL CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Schools</li> <li>• Mosques</li> <li>• Administrative</li> <li>• Airstrip</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neam,</li> <li>• Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively flat and gentle slopy	Sandy and Sandy loam	Terrestrial animals and birds	TXs 100610, 100608, 100602, 100601 not marked on ground

## **1.4 Potential impacts of the project**

### **1.4.1 Positive impacts**

#### **4.1.1. Health benefit of the project**

Although access to electricity has improved a majority of Kenyans are still using kerosene for lighting. This poses health problems as reported by World Bank report 2008 on the Welfare of Rural Electrification. The report notes that kerosene lamps emit particles that cause air pollution; these are measured by the concentration of the smallest particles per cubic meter (PM10). Burning a liter of kerosene emits PM51 micrograms per hour, which is just above the World Health Organization 24-hour mean standard of PM10 of 50 micrograms per cubic meter. But these particles do not disperse, so burning a lamp for four hours can result in concentrations several times the World Health Organization standard. The health risks posed by this indoor air pollution mainly include acute lower respiratory infections, but also low birth weight, infant mortality, and pulmonary tuberculosis. Additionally available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

#### **4.1.2. Benefits to education**

Access to electricity at the household level and schools will create opportunities for children to study. For example children from households with electricity have an advantage because they have more time for study and doing homework in the evening as opposed to children from households without electricity. This benefit will in the end translate to better results. Additionally children in households with electricity can also access T.V. which gives them an advantage of benefiting from education programs being aired through such communication channels. Appropriate lighting through electricity will provide school going children in homes an opportunity to study after household chores especially girls who have to assist their mothers in preparing dinner.

#### **4.1.3. Improved standard of living**

The implementation of this project will result in connecting about 851,149 beneficiaries to the national grid. Access to electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridges, television sets, washing machines to mention but a few. Use of electricity for lighting implies that the people will not be exposed to smoke arising from use of kerosene lamps which predisposes people to respiratory diseases.

#### **4.1.4. Increase in Revenues**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

#### **4.1.5. Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

## **1.4.2 Negative impacts**

### **4.2.1 Occupation safety and health hazards**

During construction many people will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles etc.

### **4.2.2. Electric shocks and electrocution of people**

Electricity, though a good master and a bad servant, is a hazard and safety precautions must be adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

### **4.2.3. Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **4.2.4. Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **4.2.5. Noise during construction**

Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers



## **1.5 Environmental and Social Management Plan**

The Environmental and social management plan for the proposed development projects allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 5-1: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Minimize vegetation disturbance along construction site				
Vegetation Disturbance	1 Properly demarcate the project area to be cleared during installation of supply cables	Project Engineer and Contractor	1 Month	1) 3,000.00
	2 Designate parking lots within the project area to prevent vegetation disturbance			2) 0.00
	3 Introduction of trees within the project area in replacement of disturbed vegetation			3) 30,000.00
Reduce soil erosion and surface run off				
Increased soil erosion and surface run off	1) Ensure leveling of the project site to reduce run off velocity and increase infiltration of storm water	Project engineer and contractor	Throughout construction period	1) 0.00
	2) Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences			2) 2,000.00 per unit
Air Pollution				
Dust emission	1) Avoid excavation works in extremely dry seasons 2) Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites 3) Provide and ensure use of appropriate personal protective	Project engineer and contractor	Throughout project period	30,000.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	equipment by workers on site			
Exhaust emission	Minimize vehicle idling time Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible			0.00
Minimize occupational safety and health risks				
Open excavations	1) Barricade the proposed project area using high visibility tape to avoid falls into open excavations	Project engineer and contractor	Throughout project period	2,000.00
Working at height	1) Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level	Contractor and project engineer	Throughout project period	1) 50,000.00
	2) Whenever using scaffolds ensure workers maintain a secure clearance from power lines.			2) 0.00
	3) Test the power lines to ensure they are shut down before work			3) 0.00
	4) Provide storage bags for portable tools used while working at height.			4) 0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Safety And Health Awareness	1) Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements.	Contractor and project engineer	Throughout project period	0.00
Pricks and cuts	1) Ensure project area is kept free of sharp objects 2) Provide appropriate PPEs to workers within the site	Contractor and project engineer	Throughout project period	1) 0.00 2) 20,000.00
<b>Public Safety and Health</b>				
Shocks and electrocutions	1) Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards	Contractor and proponent	Before commencement of the project	5,000.00
Project infrastructure	1) Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards			
HIV/AIDS	1) Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide protection for use when necessary			
Social Vices	1) Awareness creation to the public and liaising with area administration to enhance			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	security			
<b>Damage to property</b>				
Damage to structures erected on the way leaves	Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures	Contractor and proponent	Before commencement of the project	<b>5,000.00</b>

## **1.6 Conclusion and recommendation**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improved security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## **2 LOT2: WESTERN KENYA**

## **2.1 INTRODUCTION AND PROJECT BRIEF**

### **2.1.1 Last Mile Connectivity Project**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households lying within transformer protection distance. The project involves building low voltage lines both single phase and three phase along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- i. Accelerated access to electricity;
- ii. Improved standards of construction hence improved quality of supply;
- iii. Provision of new supply in a shorter time;
- iv. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **2.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; it has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.



## 2.2 PROJECT OVERVIEW

The Last Mile Connectivity Project for LOT 2 shall be undertaken for identified transformers located within constituencies in **Kisumu County** (Kisumu Central, Kisumu East, Kisumu West, Seme, Muhoroni, Nyando and Nyakach); **Vihiga County** (Luanda, Emuhaya, Hamisi, Sabatia and Vihiga); **Bungoma County** (Bumula, Kanduyi, Kimilili, Sirisia, Kabuchai, Webuye West, Webuye East, Tongaren and Mt Elgon); **Kakamega County** (Lugari, Likayuni, Malava, Navakholo, Lurambi, Shinyalu, Ikolomani, Mumias West, Mumias East, Mutungu, Kwisero and Butere); **Busia County** (Budalangi, Teso South, Nambale, Matayos, Teso North, Butula and Funyula) and **Siaya County** (Ugenya, Ugunja, Alego Usonga, Gem, Bondo and Rarieda).

### 2.2.1 Baseline information of the project area

Some of the environmental and social aspects considered for Last Mile Connectivity Project include; population, vegetation distribution, topography, climate and soils.

### 2.2.2 Population

The project area is mainly characterized by High, medium and low population densities. High population densities mostly in urban and some peri-urban areas; medium population densities in peri-urban and some rural areas and Low population densities in rural areas. Some rural areas are also characterized by high population density. The main communities residing in the project area are sub groups of the Abaluhya and Luo communities. There are other communities who have settled in the project area because of employment, commercial activities or intermarriages. The communities mostly speak tribal languages and due to close interactions and education, Kiswahili and English are also widely spoken. Data collected over a period of time describe the area population as below:

The 2013 projected population for Bungoma County based on the growth rate of 3.1% is 1,557,236 (Male 760,564 Female 796,672). The projections for 2015 give the County a population of 1,655,281 (Male 808,449, Female 846,832) and by 2017 the population is projected to be 1,759,499 (Male 859,350 and Female 900,149). The Male to Female ratio is 1: 1.2. The county has a growing population with varying demographics, which include fertility, mortality, birth rates, migrations, immigrations among others.

According to the 2009 National Population and Housing Census, Vihiga County had a population of 554,622, with a population density of 1044 persons per square km, one of the highest in the country. 7.8 % of the population were male while 52.2% were female. The county population is estimated to have grown to 572,577 persons in 2012 and is projected to grow to 603,856 persons in 2017 (KNBS 2013).

The 2012 population of Busia was estimated to be 816,452 with females numbering 425,622 (53.13%) and the males 390,830 (47.87%) respectively. By the year 2017, the population is estimated to have grown to a total of 953,337 (456,356 males and 496,981 females). Out of the estimated total population in 2012, a total of 144,616 (17.71%) people were below the age of five years while in 2017 the number is expected to be 168,862.

The population of Kisumu County as at 2015 was a total of 1,098,560 (538,231 males and 560,329 female). The total population of the County is expected to increase to 1,145,747 (561,351 male and 584,396 female) by 2017. The population density of Kisumu County is influenced by climatic conditions, topography, soil composition, and infrastructure and land ownership in the County.

### **2.2.3 Vegetation Distribution**

The project site has some lowland and montane rainforest in the western highlands and on higher hills and mountains along the southern border. Highest diversities in vegetation within the area are in Kakamega forest which has indigenous species such as Elgon Teak, Red stinkwood and African satinwood. Other trees available in the project site include; woody trees, fruit trees, herbal plants and ornamental plants. The project area also has tree farms as well as planted forests to enhance tree cover within the area. Most of the planted forest comprise of exotic tree species such as eucalyptus, Grivellia, pine and cypress among others. Locally in tree coverage parts of the project area such as Siaya County has an average of 2.9%.

### **2.2.4 Topography**

Topographic information of the project area is discussed per county as below:

Kisumu County is divided into 3 topographical zones namely: the Kano Plains, the upland area of Nyabondo Plateau and the midland areas of Maseno. The Kano Plains lie on the floor of the Rift Valley, which is a flat stretch bordered to the North and East by the escarpment, while the upland area comprise ridges which rise gently to an altitude of 1,835m above sea level.

The altitude of Bungoma County ranges from over 4,321m (Mt. Elgon) to 1200m above sea level. Mount Elgon is a 4,321m high extinct volcano, Kenya's second highest mountain (after Mount Kenya). The County has only one gazetted forest, the Mt. Elgon forest reserve which measures 618.2Km<sup>2</sup>, and one National park, which measures 50.683 Km<sup>2</sup>. It is the source of major rivers including the Nile, Nzoia, Kuywa, sosio, Kibisi and Sio-Malaba/Malakisi.

Vihiga County has undulating hills and valleys with streams flowing from northeast to southwest and draining into Lake Victoria. There are two main rivers, Yala and Esalwa, which drain into Lake Victoria. The County experiences High River -line erosion. Consequently, the eroded soils are swept to Kisumu County where they are deposited mainly as building sand.

Most parts of Busia County fall within the Lake Victoria Basin. The altitude is undulating and rises from about 1,130m above sea level at the shores of Lake Victoria to a maximum of about 1,500m in the Samia and North Teso Hills. The central part of the county, especially Butula and Nambale Sub-counties, are occupied by a peneplain marked by low flat divides of approximately uniform height, often capped by lateritic and a shallowly incised swampy drainage system.

Siaya County has three major geomorphologic areas namely: Dissected Uplands, Moderate Lowlands and Yala Swamp. These have different relief, soils and land use patterns. The altitude of the County rises from 1,140m on the shores of Lake Victoria to 1,400m above sea level on the North. There are few hills found in the County namely; Mbagha, Odiado, Akala, Regea, Nyambare, Usenge, Ramogi hills, Rambugu, Abiero, Sirafuongo and Naya hills. River Nzoia and Yala traverse the County and enter Lake Victoria through the Yala Swamp.

### **2.2.5 Climate**

The project area records some of the highest amounts of rainfall in the country with parts of Vihiga, Bungoma, Busia and Kakamega Counties famed for their evergreen farms. Kisumu County, which is the heart of Lake Victoria exhibits the most unique climate in the area. It records temperatures as high as 35°C and despite the scorching sun, the county receives a lot of rainfall with weather analysts recording annual rainfall of 1200mm and above.

Vihiga County records an average annual rainfall of 1900mm with temperature ranging between 14°C – 32°C. Busia County also records high amounts of rainfall throughout the year; ranging from 760mm in to 2000mm and maximum temperatures between 26°C and 30°C. Minimum temperatures recorded in the county range between 14°C and 22°C.

Bungoma County experiences rainfall ranging between 400mm to 1800mm annually and temperatures ranging between 0°C at Mt Elgon Peak to the highest of 32°C at other altitudes of the County. Siaya County receives rainfall ranging from 800mm to 2000mm in the highlands while lowland areas receive rainfalls ranging from 800mm to highest of 1600mm.

All counties in the project area experience bi-modal rainfall with long rains falling between March- July and short rains falling between September-December.

### **2.2.6 Soils**

The project area lies on rich agricultural West Kenya counties that are characterized by fertile soils in most regions. Soils in Kisumu County are dominated by lake sediments commonly sand and clay soils. In Kano Plains the soils are dark brown and grey, poorly drained and are generally very deep and firm. In the western part of Kano Plains are dark cotton soils commonly associated with the swampy areas. These types constitute more than 70 per cent of all soil types found in Kisumu County.

Vihiga County is categorized into two main agro ecological zones, the upper and lower midlands. The upper midland zone comprising of Hamisi, Sabatia and parts of Vihiga Constituencies, is well drained with fertile soils. The lower midland zone comprising Emuhaya and Luanda constituencies, has mainly the red loamy sand soils derived from sedimentary and basalt rocks.

Bungoma County has fertile well drained loam soils suitable for agricultural activities. Busia County has sandy loam soils, dark clay soils covering the northern and central parts of the County. These parts of the county are suitable for food and cash crops growth. Other soil types are sandy clays and clay.

Soils in Kakamega County are generally Acrisols of low fertility, which are heavily leached, medium to heavy texture clay loams and clays. These soils are usually acidic with pH below 5.5. The bedrock substrate on which the forest sits consists of basalt, phenolites, and ancient gneisses. These rock formations are overlaid by a layer of clay-loam soils.

## **2.3 PROJECT SCREENING**

### **2.3.1 Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

#### **2.3.1.1 Environmental Screening for Last Mile Connectivity Project**

The Environmental Management Coordination Act of 1999 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. However, these instruments do not contain guidelines regarding the screening, identification, assessment and mitigation and monitoring of potential adverse, localized environmental and social impacts of small-scale investments, where the project details and specific project sites are not known at the time of appraisal of the parent project. Thus, the environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the donors i.e. AfDB.

The screening process has been developed based on identified Transformers that need to be maximized across the country. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

#### **2.3.1.2 Objective of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

#### **2.3.1.3 Findings from Environmental Screening**

The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project; the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

**Table 1: Environmental and Social Characteristics of Proposed Project Sites**

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
<b>MUHORONI CONSTITUENCY</b>						
Medium e.g. around Koru market and AIC Church, Low density around Koru Police Station and Koru Township	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural - Sugar</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Bananas, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine Makhamia Lutea.</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> </ul>	Sloping to the West	Loam	Terrestrial animals and birds	Area connected to transformer '9373 reported to have frequent power outages
<b>NYANDO CONSTITUENCY</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>• Commercial (Markets and Micro-enterprises)</li> <li>• Churches</li> <li>• Residential</li> <li>• Agricultural</li> <li>• Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted edges e.g. Euphorbia, Cyprus, Grevillea Robusta, Acacia, Lantana Camara, Croton</li> <li>• Maize and millet, Cassia spectabilis, Yellow oleander, Grass, Shrubs, Acacia, Euphorbia, Pine, Eucalyptus, cypress, Green houses</li> </ul>	Relatively Flat	Black cotton	Terrestrial animals and birds	Location of TX 40219 is Alendu mixed, not Alendu girls
<b>KISUMU EAST CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural - maize</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, Cassia spectabilis, Yellow Oleander</li> <li>• Natural vegetation Euphorbia, Cactus, Whistling thorn, grass, herbs</li> </ul>	Relatively flat	Black cotton	Terrestrial animals and birds	Area connected to power and need for public safety awareness

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
<b>KISUMU CENTRAL CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Informal settlements</li> </ul>	<ul style="list-style-type: none"> <li>Scarce</li> <li>Natural vegetation like grass, herbs and shrubs. planted like eucalyptus grevillea</li> </ul>	Relatively flat	Black cotton and other areas Loam	Terrestrial animals and birds	Area connected to power TX not marked. Need for Public awareness
<b>KISUMU WEST CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Jacaranda, Cassia spectabilis, Yellow Oleander, Euphorbia, Makhamia lutea</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Relatively flat	Black cotton & murram	Terrestrial animals and birds	TX Number on ground was 41732, on paper 54334, Chulaimbo Health centre TX Number on paper is 41228, on ground not legible. Poles burnt, slunting and need to be replaced.
<b>LUANDA CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – maize, bananas, Avocadoes, napier, livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Bananas, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine, Makhamia Lutea, Nandi flame, Mangoes, Croton</li> <li>Natural vegetation dominated by grass scattered Lantana Camara</li> </ul>	Slopy	Red	Terrestrial animals and birds	11 KV power line serving TX 40303 (ground) 4004 (paper) sagging and intertwining causing shortcircuiting and explosive sound on Transformer as screening continued
<b>VIHIGA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Yellow Oleander, Euphorbia, Makhamia lutea, maize, Roses,</li> <li>• Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red soil	Terrestrial animals and birds,	TX Number on ground was 9197, 24252 immediate houses not connected to electricity. TX Number 41794 not marked on ground and is next to Chezeywe Primary and not Lynaginga Church as indicated on paper is 41228, on ground not legible. Poles burnt, slanting and need to be replaced.
<b>SABATIA CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Tea, maize, Maize, Bananas, Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Tea plantations, Umbrella trees, Palm trees, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress,</li> <li>• Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red Soil	Terrestrial animals and birds	TX Number 40848, adjacent homes not connected. TX Number 54353 not marked on ground. Eucalypts and other trees sprouting below 11 KV line, some touching. It's next to Tsimbalu Primary not Visuru market.
<b>KHWISERO CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - Tea</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Pine, Cypress, tea, avocado trees,</li> <li>• Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red soil	Terrestrial animals and birds	TX Number 25346 not marked on ground, adjacent homes not connected to electricity. TX 25347 adjacent homes not connected.

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
	plantations, Bananas, maize & Livestock					
<b>BUTERE CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, maize, Eucalyptus, Pine, Cypress, Jacaranda, Napier grass Makhamia lutea</li> <li>• Natural vegetation Lantana camara, grass, herbs, shrubs</li> </ul>	Gently sloping	Red Soil	Terrestrial animals and birds	TX Number 38671 Poles slanting. Tree outgrowth/branches touching 11 KV line.
<b>MALAVA CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees</li> <li>• Natural vegetation grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places slopy, flowing rivers	Black sandy clay	Terrestrial animals and birds	TX Number 40178, 25411 7& 88228 adjacent homes not connected. TX Number at Lubao engraved similar to that on paper, Pinned number (new) different.
<b>SHINYALU CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Sugarcane, Cassava,</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus Cypress,</li> <li>• Natural vegetation Guavas, grass, herbs, shrubs, Shiyuma tree with medicinal value to be preserved.</li> </ul>	Gently sloping	Red Soil	Terrestrial animals and birds	TX Number 41296 Way leaves with trees outgrowth. Adjacent homes and school not connected to Electricity. Stalled water project next to TX.



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
	Livestock					
<b>LURAMBI CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Sugarcane, maize, Bananas, livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Bamboo, Croton, Grevillea, Jacaranda, Cypress, Palm trees, Mangoes, Eucalyptus, Pine, Cypress, sugarcane plantations</li> <li>• Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping and rivers	Sandy Clay	Terrestrial animals and birds	Way leaves to be maintained.
<b>MUMIAS EAST CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Sugarcane, maize, Bananas, Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Sugarcane plantations, Umbrella trees, Palm trees, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Jacaranda</li> <li>• Natural vegetation grass, herbs, shrubs, Bougainvillea</li> </ul>	Gently sloping, and sloppy towards rivers	Sandy clay	Terrestrial animals and birds	TX Number 40766 on paper different from what was observed on ground (40177), adjacent homes not connected.
<b>MUMIAS WEST CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches, Mosque</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. pawpaw, Nandi flame, Umbrella trees, Palm trees, Croton, Grevillea, Mangoes, Nandi flames, Eucalyptus, Pine, Cypress,</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping other areas relatively flat	Sandy Clay	Terrestrial animals and birds	TX Number not marked on ground. Some immediate homes not connected to electricity.
<b>MATUGU CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosque</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, Maize</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cassia spectabilis, Cypress, Avocado trees, Umbrella, bananas,</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara</li> </ul>	Relatively flat, flowing stream	Black sandy clay, Murram, red soil	Terrestrial animals and birds	TX Number 41988 was not found on ground, marking existing, TX38368& 40639 adjacent homes and shopping centre not connected. TX Number 40369 not marked on ground.
<b>WEBUYE WEST CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees, bananas, Napier grass</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, Makhamia Lutea</li> </ul>	Gently sloping and other places relatively flat,	Red soil	Terrestrial animals and birds	TX Number 41865 & 38489 adjacent homes and shops not connected. TX Number 41865 some home owners complain to be connected but not metered.
<b>WEBUYE EAST CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees, Bottle brush, Jacaranda, Pine,</li> <li>Natural vegetation Acacia, Makhamia Lutea, grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat	Red soil	Terrestrial animals and birds	TX Number 25396 school reported of regular arcing, TX25396& 25294 not marked on ground and some adjacent homes not connected to electricity.
<b>KIMILILI CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural – Sugarcane, Napier grass, sunflower and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees, bananas, sunflower</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat, Some springs	Red Soil	Terrestrial animals and birds	TX Number 38213 & 88413 not marked on ground. TX Number 88413 adjacent Friends Church Khamukuywa and homesteads not connected. Way leave needs clearance of undergrowth.
<b>KANDUYI CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, Napier grass &amp; Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Nandi flame, Bamboo, bottle brush, Kay apples, Bananas, palm trees, Avocado trees, Hibiscus</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat,	Red soil	Terrestrial animals and birds	TX Number 41871 11 KV Power Line has under growth. TX Numbers on paper and ground not the same

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
<b>KABUCHAI CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees, bananas, Kay Apple</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, Cassia spectabilis</li> </ul>	Gently sloping and other places Relatively flat	Red soil	Terrestrial birds	TX Number 41440 & 41827 adjacent homes not connected
<b>BUMULA CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Tobacco, palms, cassava, and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Palms, Tobacco, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress, Bougainvillea</li> <li>Natural vegetation Sycamore tree, Euphorbia, grass, herbs, shrubs, Lantana Camara, Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat, water wells	sandy clay	Terrestrial birds	TX Number 88377 not marked on ground. Way leaves with overgrown undergrowth. TX 41867 & 88377 some adjacent homes not connected
<b>TESO SOUTH CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Nandi flame, Croton, Grevillea, Yellow Oleander, Umbrella, bottle brush, Eucalyptus, Pine, Cypress, Avocado trees</li> </ul>	Gently sloping and other places are relatively flat,	Red soil & sandy clay	Terrestrial birds	TX Number 25022, 38843 not marked on ground. TX 41094 & 38843 & 25022 Some adjacent homes not

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
	<ul style="list-style-type: none"> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Maize, Napier grass</li> <li>Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Natural vegetation Sodom apple, grass, herbs, shrubs, Lantana Camara, Makhamia Lutea, Cassia Spectabilis</li> </ul>	Water wells and boreholes			connected.
<b>MATAYOS CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Cassava, maize and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Avocado trees, bananas, pawpaw trees, Bougainvillea</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, Makhamia Lutea, Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat,	Red soil	Terrestrial birds	TX Number 40980 not marked on ground, not. TX Number 38014 conflicting on ground and paper. TX lying on ground need to be recovered to stores. TX 41607 & 40980 some adjacent homes not connected to electricity
<b>BUTULA CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Police post</li> <li>Water points</li> <li>Agricultural – Cassava, Napier, and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Cassia spectabilis, Jacaranda, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress</li> <li>Natural vegetation Guavas, Euphorbia, grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat, Flowing river	Red Soil	Terrestrial birds	TX Number 54725 not marked on ground. Some adjacent homes not connected. TX 54845 not same as marked on ground, TX 54717 & 54845 adjacent homes not connected to electricity
<b>FUNYULA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Police post</li> <li>• Mosque</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural –Maize, cassava, and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Croton, Nandi flame Grevillea, Mangoes, Eucalyptus, Jacaranda, Umbrella, Kay apple, Pine, Cypress, Bougainvillea</li> <li>• Natural vegetation Euphorbia, grass, herbs, shrubs, Lantana Camara and cassia spectabilis</li> </ul>	sloping and other places relatively flat, water wells and borehole	Red Soil	Terrestrial birds	TX Number 38083 not marked on ground.. TX 41338 is approximately 80 meters from documented GPS coordinates. Some adjacent homes not connected.
<b>UGENYA CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Children homes</li> <li>• Agricultural –maize, vegetables, napier, cassava, and Dairy Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Croton, Grevillea, Mangoes, Eucalyptus, Bamboo, Umbrella, Kay apple, Pine, Cypress, Bougainvillea</li> <li>• Natural vegetation Makhamia lutea, Euphorbia, grass, herbs, shrubs, Lantana Camara and Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat,	Red Soil	Terrestrial birds	TX Number 9944 not found on ground, Way leaves with overgrown undergrowth. TX 25469 some adjacent homes not connected
<b>UGUNJA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Police post</li> <li>Water points</li> <li>Agricultural – Maize, Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Jacaranda, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress, Yellow Oleander, Nandi flame</li> <li>Natural vegetation Guavas, euphorbia, tree, grass, herbs, shrubs, Lantana Camara and Makhamia Lutea and Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat, Water points	Red Soil	Terrestrial birds	TX Number 24534 not marked on ground. Some adjacent homes not connected. TX 41006 not marked on ground and off documented GPS coordinates
ALEGO USONGA CONSTITUENCY						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
High	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Police post</li> <li>• Water points</li> <li>• Agricultural –Green houses, Maize, Cassava, Napier, and Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g., Nandi flame, Cassia spectabilis Jacaranda, Croton, Grevillea, Mangoes, Eucalptus, Umbrella, Kay apple, Pine, Cypress and Yellow Oleander</li> <li>• Natural vegetation Acacia, Guavas, euphorbia, tree, grass, herbs, shrubs, Lantana Camara</li> </ul>	Gently sloping and other places relatively flat,	Red Soil	Terrestrial birds	TX Number 54476 on paper is 54472 on ground. TX 41471 & 55062some adjacent homes not connected to electricity
RARIEDA CONSTITUENCY						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Police post</li> <li>• Water points</li> <li>• Agricultural –Maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Jacaranda, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress, Nandi flame, Yellow Oleander</li> <li>• Natural vegetation Guavas, euphorbia, tree, grass, herbs, shrubs, Lantana Camara, Makhamia Lutea and Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat, Water points	Red Soil	Terrestrial birds	TX Number 40606 not marked on ground. Some adjacent homes not connected.
BONDO CONSTITUENCY						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Police post</li> <li>• Water points</li> <li>• Agricultural –Maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Jacaranda, Croton, Grevillea, Mangoes, Eucalptus, Umbrella, Kay apple, Pine, Cypress, Yellow oleander</li> <li>• Natural vegetation Guavas, euphorbia, tree, grass, herbs, shrubs, Lantana Camara and cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat,	Red Soil	Terrestrial birds	TX Number 54883, 38673 & 38320 some adjacent homes not connected. TX 38320 complains of arcing
SEME CONSTITUENCY						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Police post</li> <li>• Water points</li> <li>• Agricultural – Subsistence crop farming &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Jacaranda, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress, Yellow Oleander, guavas, Casuarina, Pawpaws,</li> <li>• Natural vegetation Guavas, euphorbia tree, cassia spectabilis, grass, herbs, shrubs, Lantana Camara and sausage tree</li> </ul>	Sloppy, Gently sloping and other places relatively flat, Flowing river, boreholes	Black cotton, Sandy loam	Terrestrial birds	TX Number 8161 not same as on ground. TX 25418, 41004 not marked on ground, Some adjacent homes not connected to electricity
NYAKACH CONSTITUENCY						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
High	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Water points</li> <li>• Agricultural – Maize, beans and Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. Cassia spectabilis, Jacaranda, Croton, Grevillea, Mangoes, Eucalyptus, Umbrella, Kay apple, Pine, Cypress</li> <li>• Natural vegetation Guavas, Euphorbia, grass, herbs, shrubs, Lantana Camara, Acacia, Solana indica, “Muuku” (medicinal plant)</li> </ul>	Sloping and other places relatively flat, Flowing river	Black Cotton Soil	Terrestrial birds	TX Number 40092 and 40079 not marked on ground. TX 40079, 40092 and 25776 adjacent homes not connected to electricity

## **2.4 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **2.4.1 Positive Impacts**

#### **Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to work on the low voltage lines and those that will start businesses to satisfy the needs of the former respectively. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to persons within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global

opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

### **Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Information on HIV/AIDS will be disseminated via radio and televisions; a means that is quite reliable. In addition Kenya Power shall also disseminate information through awareness creation by the contractor and company Safety, Health & Environment Department.

### **Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risks posed by indoor air pollution from burning of kerosene mainly include acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

### **Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information as a result translating into better results and an informed society.

### **Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

### **Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

### **Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information which is useful for decision making. Some

information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

### **Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

## **2.5 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

### **Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

### **Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

### **Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

### **Electric shocks and electrocution of people**

Electricity, though a good master and a bad servant, is a hazard and safety precautions must be adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

### **Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **Noise during construction**

Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers

### **Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

### **Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among.

### **Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

### **Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.



## **2.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 2: Environmental and Social Management Plan**

<b>Expected Negative Impacts</b>	<b>Recommended Mitigation Measures</b>	<b>Responsible Party</b>	<b>Time frame</b>	<b>Cost (Ksh)</b>
<b>Minimize vegetation disturbance</b>				
Vegetation Disturbance	<b>4</b> Properly demarcate the project area to be cleared during installation of supply cables and erection of poles <b>5</b> Designate parking lots within the project area to prevent vegetation disturbance <b>6</b> Introduction of trees within the project area in replacement of disturbed vegetation <b>7</b> Select alternative alignments to avoid disturbance of sensitive natural vegetation	Project engineer and contractor	1 Month	<b>4) 3,000.00</b>  <b>5) 0.00</b>  <b>6) 30,000.00</b>
Local Sourcing of wooden poles	<b>1)</b> Plant more trees to compensate for the poles used <b>2)</b> Ensure accurate budgeting to only have necessary material is ordered <b>3)</b> Properly store the poles to minimize potential loss <b>4)</b> Supply seedlings to farmers to increase forest cover			<b>1) 100,000.00</b>  <b>2) 0.00</b>  <b>3) 0.00</b> <b>4) 100,000.00</b>
<b>Reduce soil erosion and surface run off</b>				
Increased soil erosion and surface run off	<b>3)</b> Ensure leveling of the project site to reduce run off velocity and increase infiltration of storm water <b>4)</b> Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences	Project engineer and contractor	Throughout construction period	<b>3) 0.00</b>  <b>4) 2,000.00 per unit</b>
<b>Air Pollution</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Dust emission	4) Avoid excavation works in extremely dry seasons 5) Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites 6) Provide and ensure use of appropriate personal protective equipment by workers on site	Project engineer and contractor	Throughout project period	30,000.00
Exhaust emission	3)Minimize vehicle idling time to lower amounts of exhaust fumes released 4)Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible 5)Maintain machinery and vehicle in good working conditions to ensure minimal emissions are produced			0.00
Generation of Wastes				
Solid waste e.g. conductor and tree cuttings.	1) All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal 2) Proper budgeting of materials to reduce wastage 3) Practice 3Rs of waste management: reduce, reuse, recycle of materials			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Waste oils from transformers	1) Properly Manage storage, transfer, and disposal of transformer oils according to industry standards			
<b>Minimize occupational safety and health risks</b>				
Open excavations	2) Barricade the proposed project area using high visibility tape to avoid falls into open excavations 3) Cover all open excavations immediately after erection of poles	Project engineer and contractor	Throughout project period	2,000.00
Working at height	5) Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level 6) Whenever using scaffolds ensure workers maintain a secure clearance from power lines. 7) Provide storage bags for portable tools used while working at height 8) Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements	Contractor and project engineer	Throughout project period	5) 50,000.00 6) 0.00 7) 0.00 8) 0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Shocks and Electrocutions	<b>1)</b> Only trained & certified workers to install, maintain or repair electrical equipment; <b>2)</b> Test the power lines to ensure they are shut down before work <b>3)</b> Whenever using scaffolds ensure workers maintain a secure clearance from power lines.	Contractor and Company Management	Throughout project period	<b>1) 0.00</b>
Pricks and cuts	<b>3)</b> Ensure project area is kept free of sharp objects <b>4)</b> Provide appropriate foot protection to workers within the site	Contractor and project engineer	Throughout project period	<b>3) 0.00</b> <b>4) 20,000.00</b>
<b>Public safety and health</b>				
Shocks and electrocutions	<b>2)</b> Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards <b>3)</b> Display appropriate signage for use during construction and implementation of the project to enhance awareness creation on the potential hazards of the project	Contractor and proponent	Before commencement and during implementation of the project	<b>5,000.00</b>
HIV/AIDS and Communicable Diseases	<b>2)</b> Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide protection for use when necessary <b>3)</b> Distribute HIV & AIDS awareness materials in collaboration NACC			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Social Vices	<p>2) Awareness creation to the public and liaising with area administration to enhance security</p> <p>2) Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards</p>			
<b>Damage to property</b>				
Damage to structures erected on the way leaves	2) Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures	Contractor and proponent	Before commencement of the project	5,000.00

## **2.7 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## 2.8 Photographic Presentation of Findings



Way leave maintenance required on 11 kV powerline from Nabola Transformer



Transformer not found on ground



Medicinal plants growing on way leave



Transformer at Mikayu Friends Primary School



Transformer number 41867 on ground



Transformer number not marked on ground



### **3 LOT3: SOUTH NYANZA**

## **EXECUTIVE SUMMARY**

The last mile connectivity project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and also accelerate connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accelerated access to electricity among others.

The last mile connectivity project for shall be undertaken countrywide. In south nyanza it shall be undertaken in the following counties; Kisii, Migori, Homa bay, Nyamira, Kericho and Bomet counties. Collection of baseline information for the proposed project area considered population densities of project sites, vegetation distribution, climatic conditions of the project sites, topography and soils. The proposed project area in most places is densely populated both in urban areas and agriculturally rich rural areas. The area has plenty of vegetation cover comprising natural forests, planted forests, some medicinal plants, exotic and indigenous tree species in different areas. The project area is also characterized by large sugarcane plantations, coffee plantations, tea plantations, maize farms as well as small agricultural fields. The area also receives bimodal rainfall throughout the year, with long rains falling between March-July and short rains between September and December. Topography of the proposed project area is characterized undulating hills and valleys especially in areas of Mbita, kisii and kericho. Most of the project area is characterized by rich well drained red loam soil.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution and transmission component for the projects are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like those on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures. The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration,

benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include; transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified. The company acknowledges that the Last Mile Connectivity Project has some negative impacts on the environment and social wellbeing of the people. As such, the Environmental Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impact of the project which include; oil leaks from transformers, shock and electrocution of people as well as noise from construction will be mitigated as outlined in the ESMP. On the basis of the above and taking cognizance that the company has proved to be environmentally and socially credible, it is important to have the project implemented to enhance economic wellbeing of the society

## **3.1 INTRODUCTION AND PROJECT BRIEF**

### **3.1.1 Last Mile Connectivity Project**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households lying within transformer protection distance. The project involves building low voltage lines both single phase and three phase along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- v. Accelerated access to electricity;
- vi. Improved standards of construction hence improved quality of supply;
- vii. Provision of new supply in a shorter time;
- viii. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **3.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; it has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## 3.2 PROJECT OVERVIEW

The Last Mile Connectivity Project for lot 3 shall be undertaken for identified transformers located within constituencies in **Homa bay County** (Homa bay township, Mbita, Kasipul, Kasipul Kabondo, Rangwe, Suba Nthiwa and Karachuonyo); **Migori County** (Rongo, Kuria East, Kuria West, Suna East, Suna West, Nyatike and Urii.); **Kisii County** ( South Mugirango, Nyaribari Masaba, Nyaribari Chache, Kitutu Chache South, Nyaribari Masaba, Bonchari, Bomachage Chache, Bomachage Borabu and Bobasi ); **Nyamira County** ( West Mugirango, North Mugirango, Kitutu Masaba, Borabu); **Kericho County** (Ainamoi, Belgut, Bureti, Kipkelion East, Kipkelion West, and Sigowet/soin ) and **Bomet County** ( Bomet Central, Bomet East, Chepalungu, Koinon and Sotik).

### 3.2.1 Baseline information of the project areas in Homa Bay County

Some of the environmental and social aspects considered for Last Mile Connectivity Project include; population, vegetation distribution, topography, climate and soils.

#### 3.2.1.1 Population

According to the Kenya Population and Housing Census conducted in 2009 (Gok, 2010), Homa bay County had an estimated population of 963,794 persons (462,454 males and 501,340 females). This population was projected to be 1,038,858 consisting of 498,472 males and 540,386 females in 2012. It is also expected to rise to 1,119,769 and 1,177,181 by 2015 and 2017, respectively.

#### 3.2.1.2 Physical & Topographic Features

The county is divided into two main relief regions namely the lakeshore lowlands and the upland plateau. The lakeshore lowlands lie between 1,163 – 1,219 m above the sea level and comprise a narrow stretch bordering the Lake Victoria especially in the northern parts of the county. The upland plateau starts at 1,219 m above the sea level and has an undulating surface which has resulted from erosion of an ancient plain. It is characterized by residual highlands such as Gwasssi and Ngorome hills in Suba, Gembe and Ruri Hills in Mbita, Wire Hills in Kasipul as well as Homa hills in Karachuonyo. Koder forest in Kasipul and the Kanyamwa escarpment that runs along the borders of Ndhwa and Mbita also form part of the upland plateau. To the west of the county lies the Lambwe Valley where Ruma National park is located. The county is dissected by a number of rivers namely Awach Kibun, Awach Tende, Maugo, Kuja, Rangwe and Riana rivers, most of which originates from Kisii and Nyamira counties. There are also several seasonal rivers and streams which originate from highlands within the county. The county has 16 islands, some with unique fauna and flora and an impressive array of physiographic features with great aesthetic value as well as breath-taking scenery and forested landscape particularly those around the islands and the coast of Lake Victoria and a peninsula like Sikri of Mbita sub-county.

#### 3.2.1.3 Climatic Conditions

Homa Bay County has an inland equatorial type of climate. The climate is however modified by the effects of altitude and nearness to the lake which makes temperatures lower than in equatorial climate. There are two rainy seasons namely the long rainy season from March to June and the short rainy season from August to November. The rainfall received in the long rainy season is 60 per cent reliable and ranges from 250 – 1000 mm while 500 – 700 mm is received in the short rainy season. The county receives an annual rainfall ranging from 700 to 800 mm.

Temperatures in the county ranges from 18.6°C to 17.1°C, with hot months being between December and March. February is usually the hottest month in the year. The temperatures are however lower in areas bordering Kisii and Nyamira highlands and higher in areas bordering the lake.

### **3.2.1.4 Geological and Soil characteristics**

#### **Rocks**

The county is underlain by various rock types, namely, agglomerates, conglomerates, tuff sandstone, granite and other deposits which are useful in the construction industry.

#### **Soils**

The soil is black cotton soil, which is difficult to work upon with simple hand implements. It is also difficult to work on during heavy rains, making farming difficult. The lake shore lowland is dominated by alluvial soils, mainly the sandy loam type which is well drained and suitable for cotton, sunflower, maize, beans, cow peas and vegetable production. Other crops with potential are sugar cane and potatoes.

### **3.2.2 Baseline information of the project areas in Migori County**

#### **3.2.2.1 Population**

The total population of Migori County according to the 2009 population census was 917,170 comprising of 444,357 male and 472,814 female or 48.6 per cent male and 51.4 per cent female. This was projected to increase to 1,028,028 persons in the year 2012 and with a population growth rate of 3.8 per cent per annum, the population is expected to stand at 1,152,165 persons in 2015 and 1,243,272 persons in the year 2017.

#### **3.2.2.2 Physical and Topographic Features**

The county has an altitude varying between 1140m at the shores of Lake Victoria in Nyatike Sub-county to 4625m in Uriki Sub-county. Undulating hills covers most of the county with a few stretches of flat land. Some of the hills found in the county include Nyakune (4625m), Ogengo (4300m) and God Sibwoche (1475m) in Uriki sub-county, God Kwer (1420m), Mukuro (1454m) and Nyabisawa (1489m) in Migori Sub-county, God Kwach (1340m) in Nyatike Sub-county, Renjoka (1592m) in Kuria West Sub-county, and Maeta (1733m) in Kuria East Sub-county. The main rivers in the county are Kuja, Migori and Riana all of which originate in the highland region of Kisii and Narok Counties. The other small rivers are Ongoche, Oyani and Sare. Migori and Ongoche rivers join Kuja River at different places within Nyatike Sub-county while river Oyani joins River Kuja around Gogo Market in Uriki Sub-county. River Sare also joins River Kuja around Pala Market in Ndhiwa Sub-county of Homa Bay County. Another spectacular feature found in the county is Gogo Falls found in River Kuja. Most parts of the county are underlain by relatively acid parent rock. Granite covers most parts of Kuria East, Kuria West, Nyatike, some parts of Rongo and Migori Sub-counties. The rest of the county is covered by the Nyanzian and Bukoban rocks. There is also presence of gold deposits in the county particularly in Macalder in Nyatike sub-county, Masara in Migori sub-county and some parts of Rongo, Kuria and Uriki sub-counties.

#### **3.2.2.3 Climatic Conditions**

The county has an inland equatorial climate modified by the effects of altitude, relief and the influence of the large body of water of Lake Victoria. The existence of favourable agricultural climate favours the cultivation of cotton, maize and a variety of other food crops. Rainfall is generally continuous with little distinction between first and second rains. Annual rainfall averages between 700 and 1,800 mm. Long rains are between March and May while the short rains are between September and November. Dry seasons are between December and February and June and September. Land preparation for the main food crops which include maize, cassava, sweet potatoes and pineapples falls between November-February and July-September. Harvesting is done between June-September and December-February. Nyatike, Karungu, Kegonga and Muhuru divisions have comparatively harsher climatic

conditions than other divisions. The lakeshore divisions experience unreliable and poorly distributed rainfall. Temperatures show mean minimum of 24°C and maximum of 31°C, with high humidity and a potential evaporation of 1800 to 2000 mm per year.

#### **3.2.2.4 Soils**

The soils are well-drained and tend to be loamy. This favors the cultivation of tobacco, sugarcane, maize, beans, coffee, groundnuts and vegetables. However, agricultural production is restricted by the drought periods if no irrigation water is available.

### **3.2.3 Baseline information of the project areas in Kisii County**

#### **3.2.3.1 Population**

The population of Kisii County was estimated at 1,226,873 in 2012 consisting of 586,062 males and 640,811 females. Based on a growth rate of 2.1 per cent, the population was projected to reach 1,306,652 in 2015 and 1,362,779 in 2017 (650,982 males and 711,797 females) respectively.

The county's population density in 2012 was 935 persons per square kilometre. The density ranged from 804 in Nyaribari Masaba to 1,348 in Kitutu Chache South. The high population density in Kitutu Chache South is attributed to its close proximity to Kisii town and high agricultural potential in Mosochi area.

The youthful population (15-30 years) was estimated at 385,143 in 2012 representing 31.4 per cent of the total county population. The youth constituted about 61 per cent of the unemployed population in the county. This population is expected to increase to 437,692 in 2015 and 518,775 in 2017. This emphasizes the need for the county government to implement projects and programmes that create employment including capacity building.

#### **3.2.3.2 Vegetation**

Even though the county does not have a gazetted forest, there are non-gazetted forests like Nyangweta, Ritumbe and Ndonyo in Gucha South sub-County, and Keboye Hills in Kisii South. Others are Sameta Hills in Sameta Sub-County, Nyacheki Hills in Nyamache Sub-County, Igorera and Ibencho Hills in Kenyeny, Taracha Hill in Kisii central, Intamocha Hill in Gucha sub-County and Emborogo forest in Masaba South. The total forest cover is approximated at 228.4 ha. Efforts to gazette the forests need to be made through the Forest Department in the county and sensitizations of the communities need to be enhanced on protection of forests.

#### **3.2.3.3 Climatic Conditions**

Kisii County exhibits a highland equatorial climate resulting into a bimodal rainfall pattern with average annual rainfall of 1,500mm. The long rains are between March and June while the short rains are received from September to November; with the months of January and July being relatively dry. The maximum temperatures in the County range between 21°C – 30°C, while the minimum temperatures range between 15°C and 20°C. The high and reliable rainfall coupled with moderate temperatures are suitable for growing crops like tea, coffee, pyrethrum, maize, beans and bananas as well dairy farming

#### **3.2.3.4 Physical and Topographic Features**

Kisii County is characterized by a hilly topography with several ridges and valleys. It can be divided into three main topographical zones. The first zone covers areas lying below 1,500m above sea level located on the western boundary and include parts of Suneka, Marani and Nyamarambe. The second zone covers 1500- 1800m. The third

zone covers areas lying above 1800m above sea level in parts of eastern and southern Keumbu, Masaba and Mosochi. The most notable features of these topographical zones are hills of Sameta (1970m), Nyamasibi (2170m), Kiong'anyo (1710m), Kiamwasi (1785m), Kiongongi, Kiombeta, Sombogo, Nyanchwa and Kegochi hills. The general slope of the land is from east to west. The county is dissected by permanent rivers which flow westwards into Lake Victoria. Among the notable ones are Kuja, Mogusii, and Riana and Lyabe rivers. There are also depressions and valleys.

### **3.2.4 Baseline information of the project areas in Nyamira County**

#### **3.2.4.1 Population**

According to the 2009 population census, the county had a population of 598,252 (287,048 male and 311,204 female) with an average population density of 656 persons per km<sup>2</sup>. The population was projected to increase to 692,641 persons by 2017 (male projected at 332,337 and female at 360,304). The inter census population growth rate for the County is 1.83 percent which is below the national growth rate of 3 percent. The projected average population density for the county in 2012 was 693 persons per km<sup>2</sup> and is expected to increase to 732 persons per km<sup>2</sup> and 770 persons per km<sup>2</sup> in 2015 and 2017 respectively.

The labour force population has been projected to increase from 313,712 in 2009 to 363,208 in 2017. This constitutes 52 percent of the total population with majority being engaged in the agricultural sector. In order to absorb the increasing labour force, investments in diverse sectors such as modern agriculture and agro-based industries is required.

#### **3.2.4.2 Physiographic and Natural Conditions.**

The county's topography is mostly hilly "Gusii highlands". The Kiabonyoru, Nyabisimba, Nkoora, Kemasare hills and the Manga ridge are the most predominant features in the county. The two topographic zones in the county lie between 1,250 m and 2,100 m above the sea level. The low zones comprise of swampy, wetlands and valley bottoms while the upper zones are dominated by the hills. The high altitude has enabled the growth of tea which is the major cash crop and income earner in the county. The permanent rivers and streams found in the county include Sondu, Eaka, Kijauri, Kemera, Charachani, Gucha (Kuja), Bisembe, Mogonga, Chirichiro, Ramacha and Egesagane. All these rivers and several streams found in the county drain their water into Lake Victoria. River Eaka is important to Nyamira residents as this is where the intake of Nyamira water supply is located. On the other hand river Sondu has a lot of potential for hydro-electricity power generation which if harnessed can greatly contribute towards the county's economic development and poverty reduction efforts. The levels of these rivers have been declining over years due to environmental degradation especially improper farming methods and planting of blue gum trees in the catchments areas and river banks. The major types of soil found in the county are red volcanic (Nitosols) which are deep, fertile and well-drained accounting for 75 per cent while the remaining 25 per cent are those found in the valley bottoms and swampy areas suitable for brick making. Though the red volcanic soils are good for farming, they make construction and road maintenance expensive. The county is divided into two major agro-ecological zones. The highlands cover 82 per cent of the county while the upper midland zone covers the remaining 18 per cent.

#### **3.2.4.3 Climatic Conditions**

The county has a bimodal pattern of annual rainfall that is well distributed, reliable and adequate for a wide range of crops. Annual rainfall ranges between 1200 mm-2100 mm per annum. The long and short rain seasons start from December to June and July to November respectively, with no distinct dry spell separating them. The maximum day and minimum night temperatures are normally between 28.7 C and 10.1 C respectively, resulting to an average



normal temperature of 19.4 C which is favourable for both agricultural and livestock production. Agriculture is the main economic contributor to the county. Main cash crops are tea and pyrethrum. Others include sugarcane, bananas maize, dairy and livestock products. The county experiences experience relatively good weather patterns with rainfall occurring regularly throughout the year. However opportunities exist for development of large-scale irrigation schemes.

### **3.2.5 Baseline information of the project areas in Bomet County**

#### **3.2.5.1 Population**

The population of Bomet County was estimated at 723,813 in 2009 Population and Housing Census. The population was estimated to be 782,531 in 2012 and projected to reach 846,012 in 2015 and 891,168 by 2017 at an estimated population growth rate of 2.7 per cent. The rapid population growth exerts pressure on the existing infrastructure and provision of services in the County, including pre-primary schools (ECD), primary, secondary and tertiary institutions. It requires greater investments in basic social services and hence exerts pressure on the economy thus limiting prospects of savings and production in a setting where a large population lives below poverty line. A large proportion of labor force are not in gainful employment.

#### **3.2.5.2 Physical and topographic features**

A large part of the County is characterized by undulating topography that gives way to flatter terrain in the south. The overall slope of the land is towards the south, except the north eastern part which rises eastwards towards the 3,000m high Mau Ridges. The land slopes gently from Kericho plateau to about 1,800m in the lower area where the land is generally flat with a few scattered hills in Chepalungu and Sigor plain

The County has several rivers: Kipsonoi river flows through Sotik to Lake Victoria, Chemosit flows through Kimulot in Konoin Sub-County, Nyongores flows from the Mau Forest southwards through Tenwek area, Amalo which originates in the Transmara Forest (Kimunchul) flows along south western boundary of the County, and Tebenik/Kiptiget Rivers which flow along the northern boundaries of the County. Dams are found in the drier zones of Chepalungu, parts of Sotik sub-County and Longisa in Bomet East sub-County. Bomet County is made up of volcanic as well as igneous and metamorphic rocks. In addition to tertiary lava (phonolites) and intermediate igneous rocks there are basement systems (granite), volcanic ash mixtures and other pyroclastic rocks. Also present are quaternary volcanoes to the south west parts and faults along the Mau escarpment bordering Narok County. The higher altitudes in the north eastern parts of the County are particularly suitable for tea and dairy farming. The middle part of the County which lies 2,300m above sea level is suitable for tea, maize, pyrethrum and coffee. In the southern parts of the County such as Sigor and parts of Longisa, the main economic activity is livestock production, while milk production is a major economic activity in Sotik sub-County. Areas between 1,800m and 2,300m above sea level are mostly suitable for maize, pyrethrum, vegetables and beef production.

#### **3.2.5.3 Climatic Conditions**

Rainfall in the County is highest in the lower highland zone with a recorded annual rainfall of between 1000 mm and 1400mm. The upper midland zone which lies west of the rift valley experiences uniform rainfall while in the upper midland zone on the southern part of the County, rainfall is low. Rainfall is evenly distributed except for the short dry season in January and February. The wettest months are April and May. Overall, there is little break between short and long rains in the whole County. In the extreme south, rains start in November and continue intermittently until June. June to November is the dry season. In the extreme north, rains start towards the end of March and continue intermittently up to the end of December. The temperature levels range from 16 0 C to 24 0 C with the coldest

months between February and April, while the hot seasons fall between December and January. There are abundant water. This explains why agriculture and livestock production are main economic activities of the County.

### **3.2.6 Baseline information of the project areas in Kericho County**

#### **3.2.6.1 Population**

The county's population was 758,339 in 2009 as per the national Population and Housing Census. The inter-censal growth rate between 1999 and 2009 was 2.5 per cent per annum. The 2012 population is projected to be 817,402 consisting of 411,730 males and 405,671 females. The male to female ratio is 1:1.01. This population is projected to increase further to 881,064 in 2015 and 926,237 by 2017. There is one town and three major urban centres with population of above 2000 but less than 10,000 namely Kericho, Kipkelion, Londiani and Litein respectively. According to the 2009 population and housing census, their respective populations were as follows: Kericho 42, 039 consisting of 22,199 males and 19,830 females; Kipkelion 3,629 comprising of 1,799 males and 1,830 females; Londiani 5,437 composed of 2,672 males and 2,765 females and Litein 6,061 consisting 2,990 and 3,071 females respectively. In 2012, the population is projected to be 45,302, 3,912, 5,860 and 6,533 for Kericho, Kipkelion, Londiani and Litein respectively. Bureti Constituency is the most populated in 2012 with a population of 180,706 followed by Ainamoi with a population of 155,553. Belgut has a population of 145,151 while Kipkelion East has a population of 126,272. Sigowet/Soin has a population of 113,312 while Kipkelion West is the least populated with a population of 96,408.

#### **3.2.6.2 Climatic conditions**

Kericho has a warm and temperate climate making it an ideal location for agriculture and in particular, the large scale cultivation of tea. Temperatures range from 16°C to 27°C. Average rainfall range between 1,400 mm and 2,000mm per annum

#### **3.2.6.3 Topography**

Topographically, Kericho is characterized by an undulating landscape. The north and central part of the district is well watered with major rivers such as Youth, Kiptaret, Tumbilil, Mara, Nyando, Kipchorian and Maraget. The rivers are characterized by falls and rapids which have made electricity generation possible. Indeed, most tea factories and installations generate their own electricity.

## **3.3 PROJECT SCREENING**

### **3.3.1 Introduction to Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

### **3.3.2 Environmental Screening for the last mile connectivity project**

The Environmental Management Coordination Act of 1999 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. However, these instruments do not contain guidelines regarding the screening, identification, assessment and mitigation and monitoring of potential adverse, localized environmental and social impacts of small-scale investments, where the project details and specific project sites are not known at the time of appraisal of the parent project. Thus, the environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the donors i.e. AfDB.

The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

### **3.3.3 Importance of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies. The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be

done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project; the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

### 3.4 ENVIRONMENTAL AND SOCIAL CHARACTERISTICS OF PROPOSED PROJECT SITES

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>MBITA CONSTITUENCY</b>						
Sparsely populated e.g around kirindo primary school, Temo village, St. Joseph girls school, Ramba market and St Margaret secondary school	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural (Food crops)</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees and naturally occurring trees e.g. Grevillea, Mangoes, Eucalyptus, acacia, mercamia lutea, Cypress.</li> <li>• Shrubs.</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> <li>• Food crops e.g millet and cashew nuts.</li> </ul>	Very hilly	Black cotton	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>RANGWE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Moderately populated e.g around Olare secondary school, Wikoteng health centre, Ogang'a primary school, Radung market and Koyoo primary school.	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees and naturally occurring trees e.g. Grevillea,, Guavas, Eucalyptus, Makhamia Lutea.</li> <li>• Coffee and tea farms</li> <li>• Food crops (maize and beans)</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> </ul>	hilly	Rich Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>NTHIWA CONSTITUENCY</b>						
Medium and other places low e.g in kojowi dispensary, obero market, aoro chuotho primary school, nyamanga secondary	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted hedges e.g. Euphorbia, Cypress, Grevillea, eucalyptus Acacia, guava, Croton</li> <li>• Sugar plantations</li> <li>• food crops (Maize and millet)</li> <li>• Shrubs and grass</li> </ul>	Gently sloping	Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
schoolpala secondary school and malele market						
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KASIPUL CONSTITUENCY</b>						
Medium e.g Around Kosele village, Nyatwere primary shool Karabok market, Ahiro Ombek primary school and Kwoyo primary school	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural -</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, avocado trees, lukewots Eucalyptus, marcamia lutea</li> <li>• Food crops. (cashew nuts, millet, maize)</li> <li>• Naturally occurring vegetation dominated by grass, shrubs and some indigenous trees</li> </ul>	Gently sloping	Loam	Terrestrial birds	Public awareness campaigns required on the use of electricity
<b>KARACHUONYO CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and sparsely populated e.g around Ongalo primary school, Nyaburi school of the blind, Simbi nyaima health centre and Oyombe primary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted hedges e.g. Cypress, Grevillea, Acacia, Croton, marcamia lutea, Pine, Eucalyptus, Acacia, cypress</li> <li>• Food crops(Maize and millet)</li> <li>• Grass and Shrubs.</li> <li>• Naturally occurring indigenous trees</li> </ul>	Relatively Flat	Red loam	Terrestrial birds	The network infrastructure on the ground needs to be maintained specially pruning of trees along the way leave

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KABONDO KASIPUL CONSTITUENCY</b>						
Sparsely populated e.g around Jwelu primary school, Owiro Secondary School, Nyasore primary	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, paw paw, guava, Eucalyptus, Sisal, marcamia lutea, pine</li> <li>• Food crops including maize and bananas</li> <li>• Fruit trees including mango and ovacado trees</li> </ul>	Relatively flat	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity is required in the area



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
school, Ongoro orphanage and Dudi girls secondary						
<b>Homa Bay Town CONSTITUENCY</b>						
Medium and other places Low e.g Kogwe village, Pedo school, Ngere primary, and Ramba primary school.	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted Hedges e.g. Euphorbia, Grevillea Acacia, Lantana Camara, Croton, Eucalyptus cypress.</li> <li>• Food crops e.g Maize and millet.</li> <li>• Natural vegetation dominated by grass and shrubs</li> </ul>	Relatively flat	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity is required in the area
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>WEST MUGIRANGO CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Densely populated e.g around Nyamira primary school, Masosa mixed secondary school, Kimori secondary school and Kenyambi health Centre	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural - Sugar</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine Makhamia Lutea.</li> <li>• Food crops e.g maize and beans</li> <li>• Small scale tea plantations</li> </ul>	hilly	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity is required in the area
<b>NORTH MURIRANGO CONSTITUENCY</b>						
Densely populated e.g around Nyamusi health centre, Matongo youth polytechnic, Nyabigine coffee factory and Ikamu secondary school	<ul style="list-style-type: none"> <li>• Commercial (Markets and Micro-enterprises)</li> <li>• Churches</li> <li>• Residential</li> <li>• Agricultural</li> <li>• Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Nandi flame, Cypress, Grevillea, Acacia, eucalyptus, marcamia lutea, pine and fruit trees</li> <li>• Coffee and tea</li> <li>• food crops (maize and beans)</li> </ul>	hilly	Red loam	Terrestrial birds	The network infrastructure on the ground needs to be maintained specially pruning of trees along the way leave

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KITUTU MASABA CONSTITUENCY</b>						
Densely populated e.g around Gesoso coffee factory, Geke primary school, Mosobeti DOK primary school, Nyabiosi and Gekano boys school	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> <li>• Health centres</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, Pine Makhamia Lutea, nandi flame, Cypress,</li> <li>• Food crops e.g maize and beans</li> <li>• Plenty of bananas</li> <li>• Coffee farms</li> </ul>	hilly	Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
<b>BORABU CONSTITUENCY</b>						
Densely populated e.g Riomanoti primary school, Magori bange, Metameyua primary school, Nemisi market and Saigaginya primary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Planted Trees e.g., Cypress, Grevillea carsitina, eucalyptus, pine, Cypress, Acacia, Lantana Camara, bananas</li> <li>• Small scale Tea farms</li> <li>• Food crops e.g maize and beans</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>SOUTH MUGIRANGO CONSTITUENCY</b>						
Medium e.g around Nyabiege market, Riosiri market, Nyachenge polytechnic, Orwaki primary school, Nyamue secondary, Mitembe, Riamichoki primary school and Banyakoni primary .	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Bananas, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine, Makhamia Lutea.</li> <li>• Food crops ( maize and beans)</li> <li>• Tea farms</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
<b>NYARIBARI CHACHE CONSTITUENCY</b>						
Moderately populated e.g Amariba market,, Mosocho primary school, Raganga Dispensary, Otamba school and	<ul style="list-style-type: none"> <li>•Commercial and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g jacaranda, Cypress, Grevillea, pine, Acacia, Lantana Camara, cypress, Eucalyptus</li> <li>• Tea farms</li> <li>• Food crops</li> <li>• Naturally occurring indigenous trees</li> </ul>	Gently sloping	Red loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Nyabisabo market						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KITUTU CHACHE SOUTH CONSTITUENCY</b>						
Dense and Medium e.g around Kiogi girls school, Nyabururu town centre, Riotero SDA primary school, Kimwasi dispensary, En gorwa primary school and Kiogongi village	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> <li>• Health Centers</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, Sisal, Cypress, Pine Makhamia Lutea.</li> <li>• tea farms</li> <li>• food crops (maize and beans)</li> <li>• Few naturally occurring indigenous trees</li> </ul>	hilly	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
<b>KITUTU CHACHE NORTH CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Densely populated e.g around Gesangero Village, Kegongi Market and Geturi Secondary Bobaracho market and Matembe secondary school.	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted Hedges e.g. Euphorbia, Cypress, Grevillea , Nandi flame, eucalyptus, pine, Cypress, Lantana Camara, Croton</li> <li>• Small scale Tea farms</li> <li>• Food crops.eg maize and beans</li> <li>• Plenty of bananas</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>SUNA WEST CONSTITUENCY</b>						
Sparsely populated e.g nyamome primary school, highway health centre, kowino school and nyamaranga hospital	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes,Eucalyptus, Pine and few naturally occurring indigenous trees e.g Makhamia Lutea.</li> <li>• Food crops (maize and beans)</li> <li>• Natural vegetation dominated by grass and shrubs</li> </ul>	hilly	Loam	Terrestrial birds	Electrical infrastructure is in good condition however public awareness campaigns in the area should continue
<b>SUNA EAST CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and other places Low e.g around Savo dispensary, Mwachi market, Keambo maranatha primary and Kona Kogwang market	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Planted Trees e.g. Euphorbia , , Grevillea , pine, Cypress, Lantana Camara, Eucalyptus, and few naturally naturally occurring indigenous trees</li> <li>• Food crops e.g Maize and millet,</li> <li>• Sugarcane farms</li> </ul>	hilly	Red loam soil	Terrestrial birds	Electrical infrastructure is in good condition however public awareness campaigns in the area should continue

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>RONGO CONSTITUENCY</b>						
Medium e.g around Kanga secondary, Nyarach primary,Obad o village Lwala community health centre and Nyamuga secondary school	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – (sugar cane and Food crops)</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, fruit trees, Pine Makhamia Lutea and few indigenous trees.</li> <li>• Sugar cane plantations</li> <li>• Food crops (maize and millet and cashew nuts)</li> </ul>	hilly	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity is required in the area
<b>NYATIKE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and other places Low e.g Muhuru health centres, St Camillus hospital, Wathonger, bande secondary school and Kibwon secondary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Cypress, Grevillea, Acacia, Lantana Camara, Eucalyptus marcamia lutea, eucalyptus, Nandi flame, pine</li> <li>• Food crops (maize,beans, millet, sorghum.</li> <li>• Sugar Plantations</li> </ul>	hilly	Loam	Terrestrial birds	Frequent outages experienced in the area especially around kibwon secondary school.
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KURIA WEST CONSTITUENCY</b>						
Medium e.g Igina primary school, Keburo school, Nyaigutu primary school, Warisa primary school and Kehancha junction	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Maize and beans</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Cypress, pine, Jacaranda, Nandi flame, Sisal, Pine Makhamia Lutea.</li> <li>• Food crops (maize and beans)</li> <li>• Natural vegetation dominated by grass and shrubs.</li> </ul>	Gently Sloping	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>KURIA EAST CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Dense and other places medium e.g around Kegonga market, Gokehera secondary school, Getonguroma primary school, China dispensary and Kebaroti hospital	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Cypress, Grevillea Lantana Camara, marcamia lutea, pine, and Eucalyptus, nandi flame, jacaranda</li> <li>• Naturally occurring indigenous trees and shrubs</li> <li>• Food crops (maize, beans, millet)</li> </ul>	Gently sloping	Rich red loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>URIRI CONSTITUENCY</b>						
Dense and other areas medium e.g around Oruba market, Uriri market, Mori primary school, Othoro secondary school and	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – sugarcane and Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, Pine, jacaranda, mercamia lutea</li> <li>• Sisal</li> <li>• Sugar plantations</li> <li>• Food crops e.g maize and cassava</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> </ul>	hilly	Lred loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Kajulu market						
<b>AWENDO CONSTITUENCY</b>						
Dense and other places Medium e.g Kuja school, Mahena market and school, Ombasa primary school, Otacho polytechnic and Siruti secondary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Euphorbia, eucalyptus, Cypress, Grevillea, Acacia, Lantana Camara, marcamia lutea, avocado trees.</li> <li>• Food crops (maize, beans, cashew nuts)</li> <li>• Sugar plantations</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> </ul>	Hilly and other areas gently sloping	Loam	Terrestrial birds	The network infrastructure on the ground needs to be maintained specially pruning of trees along the way leave
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>SUNA WEST CONSTITUENCY</b>						
Medium e.g around Koru market and AIC Church, Low density around Koru Police Station and Koru Township	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural - Sugar</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Bananas, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine MakhamiaLutea.</li> <li>• Natural vegetation dominated by grass and Lantana Camara</li> <li>• Food crops (maize and beans among others)</li> </ul>	Gently sloping	Loam	Terrestrial birds	The network infrastructure on the ground needs to be maintained specially pruning of trees along the way leave
<b>BOMACHAGE CHACHE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Densely populated e.g around Gitenyi primary school, Kenyena market, Ingorera secondary school, Magina secondary school and Muchorwa secondary school.	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Cypress, eucalyptus, pine, Grevillea, Lantana Camara, mango trees, avocado trees, paw paw, lukewots</li> <li>• Food crops (Maize bananas millet)</li> <li>• Small scale Tea and coffee farms</li> </ul>	hilly	Red loam soil	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>BOBASI CONSTITUENCY</b>						
Densely populated e.g around Raimbase secondary school, Naikururu primary school,	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Cash crops and Food crops</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Eucalyptus, Pine , Cypress, Makhamia Lutea.</li> <li>• Tea and coffee farms</li> <li>• Food crops (maize and beans)</li> <li>• Bananas farms</li> <li>• Fruit trees e.g mangoes and avocado</li> </ul>	hilly	Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
kenyerere primary school and Turwa secondary						
<b>BONCHARI CONSTITUENCY</b>						
Densely populated e.g around sisters convent Asumbi, Nyabieyo secondary school, Mwata primary school and Segera school.	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Grevillea fruit trees, Lantana Camara, , marcamia lutea, Nandi flame, pine, Cypress.</li> <li>• Food crops (maize and beans)</li> <li>• Small scale Coffee farms</li> <li>• Bananas</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>BOMACHOGHE CHACHE CONSTITUENCY</b>						
Dense e.g around Segera school, Imbecho market, Gekondo DEB school, Nyatara	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural -</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mango trees, Eucalyptus, cypress, pine, Jacaranda, Nandi flame, Sisal, Pine Makhamia Lutea.</li> <li>• Coffee farms</li> <li>• Food crops</li> <li>• Sisal</li> <li>• Bananas,</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
market and Maroba secondary						
<b>AINAMOI CONSTITUENCY</b>						
Densely populated e.g around Kaporuso market, Ketitui secondary school, Kiboybei market Maso primary and Chemobei primary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Euphorbia, Cypress, Grevillea Robusta, Lantana Camara, eucalyptus</li> <li>• Maize and other food crops</li> <li>• Planted forest of eucalyptus</li> <li>• Tea plantations</li> <li>• Natural vegetation of grass and shrubs,</li> </ul>	hilly	Red loam soil	Terrestrial birds	Public awareness on the safe cutting of trees especially along way leave required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>BURETI CONSTITUENCY</b>						
Dense and some areas medium e.g around Korongoi secondary school, Ngoina centre,	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Tea and Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Euphorbia, Cypress, Grevillea Lantana Camara, pine, Cypress, nandi flame.</li> <li>• Maize and other food crops</li> <li>• Planted forest of eucalyptus</li> <li>• Tea plantations</li> </ul>	hilly	Red Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Kipharin school, Tulwet market and Kapsieduk secondary school						
<b>KIPKELION WEST CONSTITUENCY</b>						
Dense and other places moderate e.g jogor primary school, kapsinende market, sirel market and lesirwo secondary school.	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Cypress, Grevillea, Lantana Camara, pine, nandi flame. fruit trees</li> <li>• Maize and other food crops</li> <li>• Planted forest of eucalyptus</li> <li>• Tea plantations</li> </ul>	Hilly terrain	Red Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KIPKELION EAST CONSTITUENCY</b>						
Dense and medium e.g Gatarakwa police post, Kipsogori market, Tendeno primary and Londiani	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural -</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Tea plantations</li> <li>• Food crops (maize and bean)</li> <li>• Eucalyptus plantations, grevillaea and croton species, acacia, pine, Cypress.</li> </ul>	hilly	Red Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>KONOIN CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and other places Low e.g around Kamongomoni school, Terek market, Kiptedet market and Michira health centre	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Tea plantations</li> <li>• Food crops (maize and other food crops)</li> <li>• Eucalyptus plantations, grevilaea and croton species, pine, Cypress</li> <li>• Natural vegetation dominated mostly by grass</li> </ul>	hilly	Red Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>SIGOWET CONSTITUENCY</b>						
Medium e.g around Kapelwa tea buying centre, Kebenet market, Taiywet primary school, and Singoronik market	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Tea plantations</li> <li>• Food crops (maize and beans)</li> <li>• Eucalyptus plantations, grevilaea and croton species, markamia lutea, pine, Cypress</li> <li>• Natural vegetation dominated by shrubs and grass</li> </ul>	hilly	Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>BELGUT CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Dense and medium e.g. in cheptit primary, kiptabo tea buying centre, taploti market and getumbe secondary school.	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Tea plantations</li> <li>• Food crops</li> <li>• Eucalyptus plantations, greivalea pine, nandi flame, neem tree and croton species</li> </ul>	hilly	Red Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>SOTIK CONSTITUENCY</b>						
Medium and other places Dense e.g. kamungei market, kipsaun market, kapcherire primary school and balleck primary school.	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Tea plantations</li> <li>• Food crops (maize and beans)</li> <li>• Eucalyptus plantations, greivalea nandi flame, pine, cypress and croton species</li> </ul>	Hilly	Red loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>BOMET CENTRAL CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium e.g Sachwagan market, Kapsebetet school, Kamusini market and Kipkoi school.	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g., Cypress, Grevillea Robusta, Acacia, Lantana, Croton, eucalyptus</li> <li>• Food crops (Maize and millet)</li> </ul>	Gently sloping	Red loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>BOMET EAST CONSTITUENCY</b>						
Medium e.g around kipyosit market, kiborlong polytechnic, kimuchul dispensary and kapkimolwa secondary school.	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – Food crops</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Euphorbia, Cypress, Grevillea Robusta, Acacia, Lantana Camara, Croton, pine, nandi flame, eucalyptus</li> <li>• Food crops e.g Maize and millet</li> <li>• Natural vegetation dominated by grass and shrubs</li> </ul>	Gently sloping	Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>CHEPALUNGU CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and other places Low e.g Chepkosa school, Tilangok dispensary, Bingwa secondary school and Chemengwa primary school	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. Cypress, Grevillea, Acacia, Croton, Eucalyptus, neem tree</li> <li>• Food crops (Maize and millet)</li> <li>• Natural vegetation dominated by Grass and shrubs</li> </ul>	Gently sloping	Poor Loam soil	Terrestrial birds	Public awareness campaigns on the safe use of electricity required

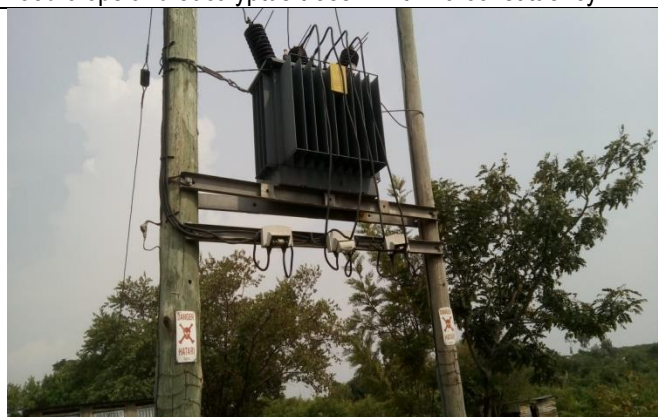
### 3.4.1 Picture gallery



Food crops and eucalyptus trees in Nthiwa constituency



Hilly terrain in Mbita constituency



A sample of the transformer to be maximized



Sisal and grevillea trees in Kasipul Kabondo



Some of the households to benefit from the project in Kisii



Vegetation along part of the project area in Migori

## **3.5 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **3.5.1 Positive Impacts**

#### **3.5.1.1 Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to work on the low voltage lines and those that will start businesses to satisfy the needs of the former respectively. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **3.5.1.2 Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to persons within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **3.5.1.3 Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **3.5.1.4 Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **3.5.1.5 Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **3.5.1.6 Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

#### **3.5.1.7 Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Information on HIV/AIDS will be disseminated via radio and televisions; a means that is quite reliable. In addition Kenya Power shall also disseminate information through awareness creation by the contractor and company Safety, Health & Environment Department.

#### **3.5.1.8 Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risk posed by indoor air pollution from burning of kerosene mainly include acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

#### **3.5.1.9 Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information resulting into better results and an informed society.

#### **3.5.1.10 Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

#### **3.5.1.11 Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

#### **3.5.1.12 Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information which is useful for decision making. Some information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

#### **3.5.1.13 Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity

across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

#### **3.5.1.14 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

#### **3.5.1.15 Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **3.5.1.16 Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **3.5.1.17 Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **3.5.1.18 Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **3.5.1.19 Electric shocks and electrocution of people**

Electricity, though a good master and a bad servant, is a hazard and safety precautions must be adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **3.5.1.20 Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

#### **3.5.1.21 Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

#### **3.5.1.22 Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

#### **3.5.1.23 Noise during construction**

Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers

#### **3.5.1.24 Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

#### **3.5.1.25 Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among others.

#### **3.5.1.26 Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

#### **3.5.1.27 Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.

### **3.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:



**Table 1: Environmental and Social Management Plan**

<b>Expected Negative Impacts</b>	<b>Recommended Mitigation Measures</b>	<b>Responsible Party</b>	<b>Time frame</b>	<b>Cost (Ksh)</b>
<b>Minimize vegetation disturbance</b>				
Vegetation Disturbance	<b>8</b> Properly demarcate the project area to be cleared during installation of supply cables and erection of poles <b>9</b> Designate parking lots within the project area to prevent vegetation disturbance <b>10</b> Introduction of trees within the project area in replacement of disturbed vegetation <b>11</b> Select alternative alignments to avoid disturbance of sensitive natural vegetation	Project engineer and contractor	1 Month	<b>7) 3,000.00</b>  <b>8) 0.00</b>  <b>9) 30,000.00</b>
Local Sourcing of wooden poles	<b>5)</b> Plant more trees to compensate for the poles used <b>6)</b> Ensure accurate budgeting to only have necessary material is ordered <b>7)</b> Properly store the poles to minimize potential loss <b>8)</b> Supply seedlings to farmers to increase forest cover			<b>5) 100,000.00</b>  <b>6) 0.00</b>  <b>7) 0.00</b> <b>8) 100,000.00</b>
<b>Reduce soil erosion and surface run off</b>				
Increased soil erosion and surface run off	<b>5)</b> Ensure leveling of the project site to reduce run off velocity and increase infiltration of storm water <b>6)</b> Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences	Project engineer and contractor	Throughout construction period	<b>5) 0.00</b>  <b>6) 2,000.00 per unit</b>
<b>Air Pollution</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Dust emission	<p>7) Avoid excavation works in extremely dry seasons</p> <p>8) Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</p> <p>9) Provide and ensure use of appropriate personal protective equipment by workers on site</p>	Project engineer and contractor	Throughout project period	30,000.00
Exhaust emission	<p>6)Minimize vehicle idling time to lower amounts of exhaust fumes released</p> <p>7)Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible</p> <p>8)Maintain machinery and vehicle in good working conditions to ensure minimal emissions are produced</p>			0.00
Generation of Wastes				
Solid waste e.g. conductor and tree cuttings.	<p>4) All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal</p> <p>5) Proper budgeting of materials to reduce wastage</p> <p>6) Practice 3Rs of waste management: reduce, reuse, recycle of materials</p>			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Waste oils from transformers	2) Properly Manage storage, transfer, and disposal of transformer oils according to industry standards			
<b>Minimize occupational safety and health risks</b>				
Open excavations	4) Barricade the proposed project area using high visibility tape to avoid falls into open excavations 5) Cover all open excavations immediately after erection of poles	Project engineer and contractor	Throughout project period	2,000.00
Working at height	9) Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level 10) Whenever using scaffolds ensure workers maintain a secure clearance from power lines. 11) Provide storage bags for portable tools used while working at height 12) Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements	Contractor and project engineer	Throughout project period	9) 50,000.00  10) 0.00  11) 0.00  12) 0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Shocks and Electrocutions	<b>4)</b> Only trained & certified workers to install, maintain or repair electrical equipment; <b>5)</b> Test the power lines to ensure they are shut down before work <b>6)</b> Whenever using scaffolds ensure workers maintain a secure clearance from power lines.	Contractor and Company Management	Throughout project period	<b>2) 0.00</b>
Pricks and cuts	<b>5)</b> Ensure project area is kept free of sharp objects <b>6)</b> Provide appropriate foot protection to workers within the site	Contractor and project engineer	Throughout project period	<b>5) 0.00</b> <b>6) 20,000.00</b>
<b>Public safety and health</b>				
Shocks and electrocutions	<b>4)</b> Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards <b>5)</b> Display appropriate signage for use during construction and implementation of the project to enhance awareness creation on the potential hazards of the project	Contractor and proponent	Before commencement and during implementation of the project	<b>5,000.00</b>

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
HIV/AIDS and Communicable Diseases	4) Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide protection for use when necessary 5) Distribute HIV & AIDS awareness materials in collaboration NACC			
Social Vices	3) Awareness creation to the public and liaising with area administration to enhance security 3) Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards			
Damage to property				
Damage to structures erected on the way leaves	3) Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures	Contractor and proponent	Before commencement of the project	5,000.00

### **3.7 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## **4 LOT4: CENTRAL RIFT**

## **EXECUTIVE SUMMARY**

The last mile connectivity project is an initiative to help achieve government of Kenya pledge of stimulating economic growth and accelerating job creation for the wellbeing of its citizens. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and accelerate connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accrued benefits of electricity access among others.

The last mile connectivity project for Lot 4 shall be undertaken in central rift region counties which include; Nyandarua, Nakuru, Narok and Samburu

Baseline information for the proposed project area analyzed during the screening exercise considered population density, vegetation distribution, climatic conditions, topography, Soils and Social set ups with a key focus on identifying sensitive ecosystems that could be affected by the LMCP. The project area is diverse with high to medium populations in urban areas and low populations in the rural areas. The area has diverse vegetation cover comprising of planted and natural species. The project area is also characterized by agricultural crops e.g. sugarcane plantations, maize farms, wheat species, potato farms etc. The project area experiences high to low temperatures ranging from 35°C to 12°C annually with high temperatures recorded in Samburu County and lowest temperatures in Nakuru County in Kuresoi and Molo. The area also receives bimodal rainfall throughout the year, with long rains falling between March-July and short rains between September and December. Topography of the proposed project area is characterized by Mau Escarpments, rift valley floor, Kinangop plateau, aberdare ranges and steep slopes

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution component for the projects has been pegged to identified transformers that will be maximized across the country with general droplines to connect customers and at other places extension of the Low voltage lines to a maximum of two poles in order to achieve accelerated connections. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and customer connections at the end user levels. The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance, risk of sparks and fire from live conductors, occupational health hazards among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

To mitigate the anticipated negative and social impacts, an Environmental and Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB



guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impacts of the project which include; oil leaks from transformers, shock and electrocution of people, noise from construction works, Occupations health and safety hazards among others will be mitigated as outlined in the ESMP. Diligence on the part of the contractor will be paramount to ensure minimization and where possible avoidance of anticipated negative impacts.

## **4.1 INTRODUCTION AND PROJECT BRIEF**

### **4.1.1 Last Mile Connectivity Project**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households located within transformer protection distance. The project involves building low voltage lines both single phase and three phase along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- ix. Accelerated access to electricity;
- x. Improved standards of construction hence improved quality of supply;
- xi. Provision of new supply in a shorter time;
- xii. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **4.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers, has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## 4.2 PROJECT OVERVIEW

The Last Mile Connectivity Project for LOT 4 shall be undertaken for identified transformers located within constituencies in **Central region covering Nyandarua County** (Kinangop, Ndaragua, Naivasha, Olnjoro orok, Ol karao); **Nakuru County** (Nakuru town East, Nakuru town West, Rongai, Subukia, Njoro, Kuresoi North, Kuresoi South, Gilgil); **Narok County** (Narok North, Narok East, Narok West Narok south); and **Samburu County** (Samburu North, Samburu West, Samburu East, Emurua Kidir).

### 4.2.1 Baseline information of the project area

Some of the environmental and social aspects considered for Last Mile Connectivity Project include; population, vegetation distribution, topography, climate, soils and the social setup especially settlement and road networks within the project area.

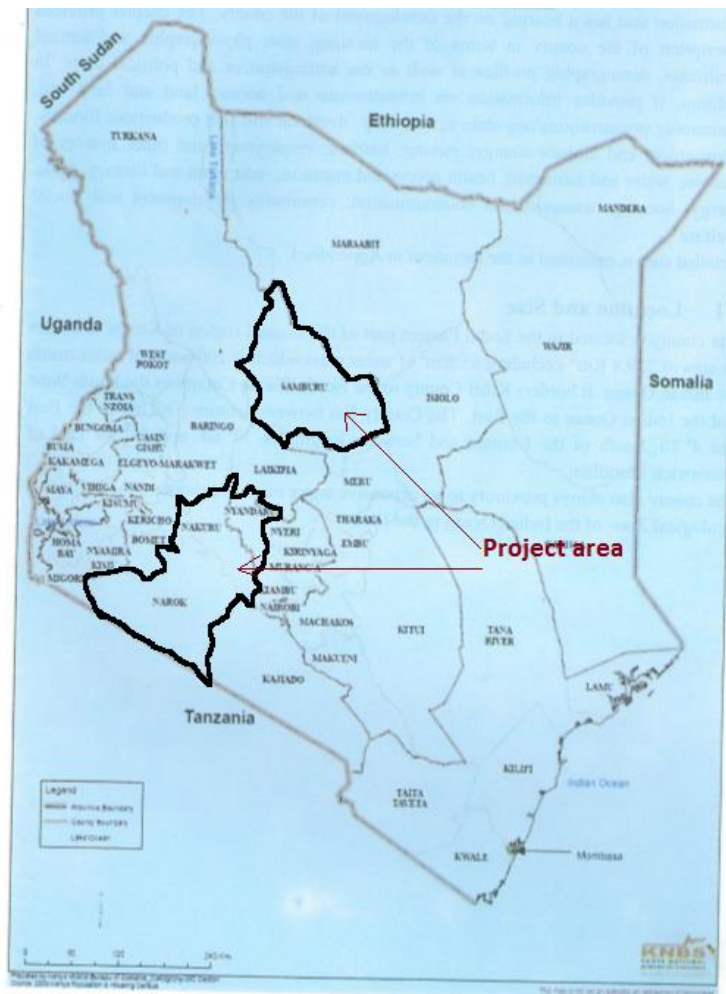
The county covers an area of 7,495.1 Km<sup>2</sup> and is located between Longitude 35 ° 28` and 35° 36` East and Latitude 0 ° 13 and 1° 10` South.

Nyandarua County has an area of 3245.2km<sup>2</sup> lying between latitude 0°8' to the North and 0°50' to South and between 35° 13' East and 36°42'West

Samburu County is located in the former Rift Valley Province of Kenya; about 300km north of Nairobi. The County covers an area of 21,022.27 sq km with a population of about 224,000 people.

Narok County is located to the south-western part of the country and in the southern part of Great Rift Valley. It covers an area of 17,944 sq km. Narok County constitutes of 4 sub-counties namely; Narok North, Narok South, Transmara East and Transmara West Sub-Counties. It lies between latitudes 0°50" and 2° 05" South and longitudes 35° 8" and 36° 00" East.

**Map showing general project area for LMC Lot 4**



Source: Kenya National Bureau of Statistic, 2013

#### 4.2.1.1 Population

The project area is mainly characterized by High, medium and low population densities. High population densities are mostly in urban and some peri-urban areas; medium population densities in peri-urban and some rural areas and medium to Low population densities in rural areas. The main communities residing in the rural areas of the project area are Kikuyus, Maasai, Karenjins and Samburus. However urban areas are cosmopolitan. There are other communities who have settled in the project area because of employment, commercial activities or intermarriages. The communities mostly speak tribal languages and due to close interactions and education, Kiswahili and English are also widely spoken.

#### **4.2.1.2 Vegetation Distribution**

The project area has diverse vegetative cover which includes planted and natural flora species. Some of the planted flora species includes: eucalyptus, gravellia, pine and agro-forestry trees while the natural species includes: acacia, wattle barks, baobab. Other vegetative cover includes agricultural crops e.g. wheat, maize, sugarcane etc.

#### **4.2.1.3 Topography**

The main topographic features in Nakuru County are the Mau Escarpment covering the Western part of the county, the Rift Valley floor, Ol Doinyo Eburru Volcano, Akira plains, Menengai Crater, elaborate drainage and relief system and the various inland lakes on the floor of the Rift Valley where nearly all the permanent rivers and streams in the county drain into. These rivers include river Njoro, Makalia which drain into Lake Nakuru, Malewa which drains into Lake Naivasha and Molo River which drains into Lake Baringo among others.

The main physical features of Nyandarua County include Kinangop Plateau and Ol'kalou/Ol'joroOrok plateau which have slopes that are interrupted by low undulating hills. The gentle slopes flatten to plain-like features encouraging formation of marshlands and swamps. The county was affected by volcanic and faulting which gave rise to major land forms, the Great Rift Valley to the west and Aberdare ranges to the east. There are steep slopes that have undergone great transformation through weathering creating shallow valleys and gorges. The ranges drop gradually in a series of faults giving way to an escarpment that has been broken into sharp valleys occasioned by change in levels of the river courses.

North, East and south parts of Narok County are relatively flat while Narok west is characterized by medium to steep slopes.

Samburu east is generally flat while Samburu North and West are mostly characterized by gentle and steep slopes.

#### **4.2.1.4 Climate**

The climate of the project area is strongly influenced by the altitude and physical features. Nakuru County experiences three broad climatic zones (II, III and IV). Zone II covers areas with an altitude between 1980 and 2700 m above the sea level and receives minimum rainfall of 1000mm per annum. This zone covers Upper Subukia, Rongai and Mau scarpment.

Zone III receives rainfall of between 950 and 1500 mm per annum and covers areas with an altitude of between 900-1800m above sea level. This zone covers most parts of the county and is the most significant for agricultural cultivation. Zone IV occupies more or less the same elevation (900-1800m) as Zone III. However, it has lower rainfall of about 500-1000mm per annum. This zone dominates Solai and Naivasha. The county has a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May.

Temperatures in the county ranges from a high of 29.3oC between the months of December, January, February, and part of early March to low temperatures of up to 12oC during the month of June and July. Molo and Kuresoi Sub-Counties are relatively cold while Naivasha, Gilgil and parts of Rongai Sub-County experience extreme hot weather.

Nyandarua county experiences moderate to low temperatures. The highest temperatures are recorded in the month of December, with a mean average of 25oC while the lowest is recorded in the month of July, with a mean average temperature of 12oC. The cold air rises during clear nights on the moor lands of the Aberdare Ranges flows down the Plateau, through the valleys west of the plateau. The temperatures in these valleys can fall to between 1.20 C and - 1.30C which last for few hours before sunrise. The County experiences two rainy seasons: Long rains from March to

May with a maximum rainfall of 1600 mm and short rains From September to December and with a maximum rainfall of 700mm. The rainfall intensity varies according to the location. Areas near the Aberdare slopes receive sufficient rainfall with the plateau receiving scanty and erratic rainfall.

Samburu is one of the driest counties in Kenya with temperatures ranging between 25°C during the coldest months (June and July) and 35°C during the hottest months (January to March). The county receives between 200mm and 250mm of rainfall annually. The rainfall pattern is unpredictable and at times the county receives no rain in a whole year.

Narok County temperature range is 12 to 28 °C and the average rainfall range of 500 to 1,800 mm per annum.

#### **4.2.1.5 Soils**

The soil pattern in Nakuru County presents a complex distribution with three main classifications that have been influenced by climatic conditions, volcanic activities and underlying rock type. These main soil classifications include: Latosolic soils; are the well-drained red volcanic soils (common in upper Subukia valley) and imperfectly drained loam with dark brown subsoil covers (common in Njoro, Nakuru Central Elementaita and Maai Mahiu in Naivasha areas) with fertility ranging from moderate to high. The main crops supported by these soils are wheat, Maize, pyrethrum, sunflower, finger millet potatoes, pigeon peas, vegetables and beans and peas. Planosolic Soils; these comprises of poorly drained dark brown clay soils with highly developed textured top soils as well as well drained humic lawns with dark brown sub soils.

These soils are classified as fertile. Areas covered under these soils range from Olenguruoni in Kuresoi, Molo, Rongai and parts of Njoro. The main agriculture activities in these areas include sheep rearing, dairy farming, wheat, barley, potatoes, pyrethrum and vegetables farming.

Alluvial and Lacustrine Deposits; these are shallow soils resulting from volcanic ash sediments as well as other sources. They occupy the Rift Valley bed in Lake Nakuru, Lake Naivasha, Lake Elementaita, Solai and the Menengai Crater as well as the adjacent areas to these features.

Generally the soils in Samburu are sandy and sandy loam, Narok is characterized by sandy and cotton loam soils while nyandarua soils are mostly loam and cotton loam.

## **4.3 PROJECT SCREENING**

### **4.3.1 Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

### **4.3.2 Environmental Screening for Last Mile Connectivity Project**

The Environmental Management and Coordination (Amendment) Act of 2015 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. The environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the Financiers i.e. Africa Development Bank (AfDB).

The screening process has been developed based on identified Transformers that need to be maximized across the country. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

### **4.3.3 Objective of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project; the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

#### 4.3.4 ENVIRONMENTAL AND SOCIAL CHARACTERISTICS OF PROPOSED PROJECT SITES

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
<b>KINANGOP CONSTITUENCY</b>						
Medium- in towns e.g Ndunyu Njeru, Engineer and medium low in the rural settings	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – e.g, potatoes, cabbages</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Trees e.g. wattle barks, Eucalyptus, cypress, pine.</li> <li>grass</li> <li>Agricultural crops e.g. maize. potatoes</li> </ul>	Relatively flat on the lower sides and sloppy towards the mountain(aberdares)	Cotton/Loam	Terrestrial; birds, domestic animals	Some TXs have no identification no. e.g, tx- 50367, 35104. <i>(public awareness on safety is needed)</i>
<b>NDARAGWA</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>Commercial</li> <li>(Markets and Micro-enterprises)</li> <li>Churches</li> <li>Residential</li> <li>Agricultural</li> <li>Health facilities</li> <li>Schools</li> </ul>	<ul style="list-style-type: none"> <li>Trees e.g. wattle barks, gravellia, croton, Eucalyptus, cypress, pine.</li> <li>grass and Shrubs</li> </ul>	gentle slope	Loam cotton	Domestic animals, birds	Some TXs have no identification no. e.g, tx- 35254. <i>(public awareness on safety is needed)</i>
<b>OLJORO-OROK</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Medium and other places Low	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. wattle barks, gravellia, croton, Eucalyptus, cypress, pine.</li> <li>• grass and Shrubs</li> </ul>	gentle slope	Loam/cotton	Domestic animals, birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>NAIVASHA</b>						
High, Medium and other places Low	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Schools</li> </ul>	gravellia, croton, Eucalyptus, acacia, shrubs	gentle slope and Relative flat	Cotton loam, sandy loam	Domestic animals, birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>NAKURU TOWN EAST</b>						
Medium	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g. gravellia, croton, Eucalyptus, pine.</li> </ul>	gentle slope and Relative flat	Loam/cotton	birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>NAKURU TOWN WEST</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Medium	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> <li>•Police station</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine.</li> </ul>	Relative flat	Sandy/loam	Domestic animals,  Birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>BAHATI</b>						
Medium low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•School</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton</li> <li>• Agricultural crops e.g. maize. bananas</li> </ul>	Gentle slope	Loam/cotton	Domestic animals,  Birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>SUBUKIA</b>						
Medium low and some areas low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton</li> <li>Agricultural crops e.g. maize</li> </ul>	Generally Gentle slope	Loam/cotton	Domestic animals,  Birds	<i>(public awareness on safety is needed)</i>
<b>RONGAI</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Generally low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton, acacia</li> </ul>	Relative flat	Loam/cotton	Domestic animals,  Birds	<i>(public awareness on safety is needed)</i>
<b>NJORO</b>						
Medium high in Njoro town and low in the rural areas	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton, acacia</li> <li>• Agricultural crops e.g. wheat, maize</li> </ul>	Relative flat and gentle slope	loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>MOLO</b>						
Medium high in Molo town and low in other areas	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton, acacia</li> </ul>	Generally sloppy	loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>KURESOI NORTH</b>						

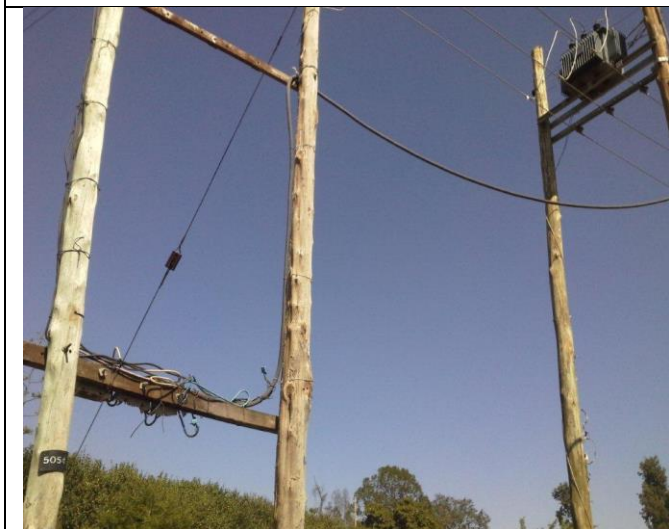
Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton, acacia</li> </ul>	Gentle slope	loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>KURESOI SOUTH</b>						
Low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, Eucalyptus, pine. Croton, acacia</li> <li>Agricultural crops e.g. wheat, potatoes</li> </ul>	sloppy	loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>GILGIL</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Schools</li> </ul>	gravellia, croton, Eucalyptus, acacia, shrubs	gentle slope and Relative flat	Cotton loam, sandy loam	Domestic animals, birds	Some TXs have no identification no.  <i>(public awareness on safety is needed)</i>
<b>NAROK NORTH</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Low and some areas very low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial(small scale)</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g gravellia, baobab</li> </ul> Eucalyptus, pine. Croton, acacia, shrubs Agricultural crops e.g. wheat, Maize	Relatively flat	Cotton loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>  <i>(Most sites lacking TXs)</i>
<b>NAROK EAST</b>						
Medium high in town and low outside town	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, pine.</li> </ul> Croton, acacia, shrubs Agricultural crops e.g. wheat, Maize	Gentle slope	Cotton loam	Terrestrial birds,  Domestic animals	<i>Some sites lacking TXs on the ground</i>  <i>(public awareness on safety is needed)</i>
<b>NAROK WEST</b>						
Medium low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus,gravellia, pine.</li> </ul> Croton, shrubs Agricultural crops e.g. Maize	Generally hilly	loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>NAROK SOUTH</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/ avi-fauna/ aquatic)	Public Safety
Generally low and medium low in centres	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, pine. Croton, shrubs, gravellia, Agricultural crops e.g. Wheat</li> </ul>	Gentle slope and relatively flat in the lower areas	Cotton loam	Terrestrial birds,  Domestic animals	Some txs not marked on ground  <i>(public awareness on safety is needed)</i>
<b>EMURUA DIKKIR</b>						
Generally low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, Croton, shrubs Agricultural crops e.g. maize</li> </ul>	Gentle slope	Sandy loam; rocky	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>KILLGORIS</b>						
Generally low But medium low in kilgoris town	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, glavellia, acacia ,Croton, shrubs Agricultural crops e.g. maize</li> </ul>	Gentle slope	Sandy loam; rocky	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>SAMBURU EAST</b>						
Generally low But medium low in Achers post and Wamba town	<ul style="list-style-type: none"> <li>•Pasture/ Grazing</li> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, acacia, shrubs Agricultural crops e.g. maize</li> </ul>	Gentle slope	Sandy loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>SAMBURU WEST</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna (terrestrial/avi-fauna/aquatic)	Public Safety
Generally low But medium in Mararal town	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> <li>•National museums(Kenyatta house)</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g Eucalyptus, acacia, glavellia, croton, shrubs</li> </ul>	Gentle slope and hilly	Sandy loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>
<b>SAMBURU NORTH</b>						
Generally low But medium low in Baragoi town	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> <li>•Kenya Power generation plant</li> </ul>	<ul style="list-style-type: none"> <li>• Trees e.g acacia, cactus, euphorbia, sisal shrubs</li> </ul>	Gentle slope	Sandy loam	Terrestrial birds,  Domestic animals	<i>(public awareness on safety is needed)</i>

## Photo gallery





## **4.4 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **4.4.1 Positive Impacts**

#### **Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to connect customers to the grid, artisan work in wiring premises, a wide range of businesses extending to service industry. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to persons within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global

opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

### **Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Kenya Power shall disseminate information through awareness creation through the contractor and company's Safety, Health & Environment Department.

### **Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risks posed by indoor air pollution from burning of kerosene mainly include acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

### **Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information as a result translating into better results and an informed society.

### **Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

### **Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

### **Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide

opportunity for the households to access a wide range of information which is useful for decision making. Some information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

### **Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

### **4.4.2 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

#### **Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **Electric shocks and electrocution of people**

Electricity is a hazard if safety precautions are not adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **Noise during construction**

Noise will be generated from the construction machines and construction workers during the construction phase and is expected to be minimal and spread.

### **Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

### **Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among.

### **Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

### **Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.

## **4.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

*The environmental and Social Management Plan is as shown below:*

**Table 4-1: Environmental and Social Management Plan**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
<b>Minimize vegetation disturbance along construction site</b>				
Vegetation Disturbance	<p><b>12</b> Choose routes that offer minimal disturbance to vegetation and where inevitable clear manually only necessary vegetation.</p> <p><b>13</b> Properly demarcate the project area to be cleared during installation of supply drop lines</p> <p><b>14</b> Designate parking lots within the project area to prevent vegetation disturbance</p> <p><b>15</b> Plant suitable trees within the project area to compensate for any damaged ones</p> <p><b>16</b> Compensate for any damaged trees and crops</p>	Project engineer and contractor	2 Months	<p><b>10) 150,000.00</b></p> <p>5) To be determined</p>
<b>Reduce soil erosion and surface run off</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Increased soil erosion and surface run off	<p>7) Use existing roads and avoid ground disturbance as much as possible</p> <p>8) Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</p>	Project engineer and contractor	Throughout construction period	<p>7) No Cost</p> <p>8) 200,000</p>
<b>Air Pollution</b>				
Dust emission	<p>10) Avoid excavation works in extremely dry seasons</p> <p>11) Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</p> <p>12) Provide and ensure use of appropriate personal protective equipment by workers on site</p>	Project engineer and contractor	Throughout project period	30,000.00
Exhaust emission	<p>9) Use well serviced vehicles and any other motorized equipment</p> <p>10) Sensitize truck drivers to avoid unnecessary running engines on</p>			No cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	stationery vehicles and switch off engines whenever possible			
<b>Minimize occupational safety and health risks</b>				
Open excavations	<p>6) Barricade the proposed project area using high visibility tape to avoid falls into open excavations</p> <p>7) Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents.</p> <p>8) Contractor to compensate any injuries to the public and animals arising from his negligence</p>	Contractor	Throughout project period	<b>To be determined</b>
Working at height	<p>13) Observe clearance from power lines and workers to be experienced with necessary qualifications</p> <p>14) Test power lines to ensure</p>		Throughout project period	<p><b>13) No cost</b></p> <p><b>14) No cost</b></p>



Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	<p>they are shut down before work</p> <p><b>15)</b> Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</p> <p><b>16)</b> Provide storage bags for portable tools used while working at height.</p>			<p><b>15) 300,000.00</b></p> <p><b>16) 20,000.00</b></p>
Safety and health awareness	<b>2)</b> Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements	Contractor and project engineer	Throughout project period	<b>No cost</b>
Pricks and cuts	<p><b>7)</b> Ensure project area is kept free of sharp objects</p> <p><b>8)</b> Provide appropriate foot protection to workers within the site</p>	Contractor and project engineer	Throughout project period	<p><b>No cost</b></p> <p><b>7) 100,000.00</b></p>
<b>Public safety and health</b>				
Shocks and electrocutions	<b>6)</b> Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards	Contractor and proponent	Before commencement of the project	<b>500,000.00</b>

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Project infrastructure	<p>4) Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards</p> <p>5) Install Txs at the sites earmarked (where no tx available)</p>			
HIV/AIDS	<p>6) Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide condom dispensers at all project worksites</p>			
Social Vices	<p>4) Awareness creation to the public and liaising with area administration to enhance security</p>			
Damage to property				
Damage to structures erected on the way leaves	<p>4) Ensure timely dissemination of information on the need to carry out works on occupied way leaves to</p>	Contractor and proponent	Before commencement of the project	To be determined



## **4.6 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others and shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## **5 LOT5: NAIROBI REGION**

## **EXECUTIVE SUMMARY**

The last mile connectivity project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and see into connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accelerated access to electricity among others.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

The company acknowledges that the Last Mile Connectivity Project has some negative impacts on the environment and social wellbeing of the people. As such, the Environmental Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impact of the project which include; oil leaks from transformers, shock and electrocution of people as well as noise from construction will be mitigated as outlined in the ESMP. On the basis of the above and taking cognizance that the company has proved to be environmentally and socially credible, it is important to have the project implemented to enhance economic wellbeing of the society.

## 5.1 Introduction and Project Brief

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation to improve the economic wellbeing of Kenyans. Among the many interventions to achieve this is expansion of the power distribution system to be within reach and thus enable more Kenyans connect to the grid at affordable cost and hence initiate economic activities at the micro-economic level. The current trend of network expansion driven by customer demand is approaching saturation. In the foreseeable future there is a likelihood of the annual connectivity stagnating at the 300,000-400,000 level. To jumpstart and accelerate connectivity, a new thinking is needed as happened in 2004.

To reduce the cost burden of increased connectivity on KPLC, as well as reduce the amount paid by the customer to connect to the grid, the strategy proposed is to extend the distribution network to as near the customer as possible using external or government funding. This can initially be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization). This model would involve building low voltage lines both single phase and three phase (to a small extent) along rural access roads.

KPLC has a total of 35,000 distribution transformers spread across the country. The transformers were installed for various reasons, i.e., for new customers, reinforcement of existing transformers due to load growth, reinforcement to reduce length of the low voltage lines hence improve transformer protected distances, etc. As such majority of the transformers will be having varied lengths of the low voltage network emanating from them, some of which will be passing in close proximity to ready and potential customers.

Data collected from KPLC regions indicates that the company has potential to connect approximately 472,002 households that are within 600 meters of the transformers through individual service lines. Of these households, some will be within developed areas, majority of who will be reached by a service cable drop or a pole or two, whereas in the expansive zones in the peri-urban and rural areas, construction of a 600m low voltage line for a single customer will not be an exception. Based on an average of two spans (@ 50m) single phase LV line, 30m service cable drop (10% of the service drops assumed to be three phase), 40km return transport and implementation by labour and transport contractors, the projected cost of connecting all these households is approximately USD 685million (KShs. 58.2Billion).

Benefits of Last Mile Connectivity project include:

- xiii. Accelerated access to electricity;
- xiv. Improved standards of construction hence improved quality of supply;
- xv. Provision of new supply in a shorter time;
- xvi. Opportunity for the company to develop long term network expansion plans.

Currently, only 35% of the households are connected to the national electricity grid. The Government plans to increase this to 65 % by 2020 and 100 % by 2030 and has put in place strategies to accelerate access to modern energy services through public and private initiatives. The government, with support from development partners, has allocated substantial resources for development of energy infrastructure including exploitation of renewable energy resources. This effort provides opportunities for collaboration with the private sector in renewable energy development and national electrification.



### **5.1.1 Importance of LMCP**

The Kenya Government, through the ministry of Energy & Petroleum, intends to increase electricity access in the country to 70% by 2017 and as part of the initiative to connect many households, has secured funding of US\$ 153.4 Million from the African Development Bank (AfDB) under the Last Mile Connectivity project (LMCP) which involves mostly electrification programs through maximizing existing transformers.

The Last Mile Connectivity project is aimed to support the Government's initiatives of ensuring increased electricity access to Kenyans, particularly among the low income groups. The existing distribution transformers shall be exploited to the maximum through extension of the low voltage network to reach households located in the vicinity of these transformers.

KPLC has a total of about 35,000 distribution transformers spread across the country. Within a 600 meter radius from these transformers, and the company has a potential to connect 472,002 households corresponding to approximately 1.2 million customers. The cost of connecting these households is estimated at about USD 685 Million (KShs 58.2 billion).

The project will involve connection of customers within 600m of existing transformers. Of these households, some will be within developed areas, majority of who will be reached by a drop or a pole or two. This can also be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization).

Consequently, the potential negative environmental and social impacts anticipated are negligible. The actual level of environmental assessment will range from; no environmental assessment being required, the application of simple mitigation measures (using the environmental and social screening) to the preparation of a simple EIA report if need be after screening has been done.

The project beneficiaries will include individuals at household level, commercial enterprises in market centres and public institutions such as learning institutions, health facilities and administrative offices.

### **5.1.2 Project component**

The project aims at extending the low voltage system so that counties with low penetration rate benefit the most from the project. The proposed project is expected to benefit 200,000 customers, equivalent to approximately 1, 000,000 people.

The main project component focuses on the expansion of the low voltage lines from the existing distribution transformers to customers as well as the installation of pre-paid energy meters.

The project consists of the following components:

- Construction of the low voltage network and installation of energy meters;
- Project supervision and management by a consultancy firm to assist KPLC during the project implementation;
- Financial audit of the project accounts carried out on an annual basis;
- Environmental and social costs of the project;

### **5.1.3 Justification of LMCP**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; it has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## **5.2 Project Overview**

### **5.2.1 Location of the project**

The environmental and social screening was undertaken within constituencies in Nairobi and Kiambu Counties, these include: Dagoretti North, Dagoretti South, Embakasi Central, Embakasi East, Embakasi North, Embakasi South, Embakasi West, Kamukunji, Kasarani, Kibra, Langata, Makandara, Viwandani and Mathare. Githunguri, Kiambaa, Kabete, Limuru, Lari, Gatundu North, Gatundu South, Ruiru, Kikuyu, Juja, Thika and Kiambu.

### **5.2.2 Baseline information of the project sites in Kiambu County**

#### **5.2.2.1 Population**

Kiambu County is one of the 47 counties in the Republic of Kenya. It is located in the central region and covers a total area of 2,543.5 Km<sup>2</sup> with 476.3 Km<sup>2</sup> under forest cover according to the 2009 Kenya Population and Housing Census. The county lies between latitudes 00 25' and 10 20' South of the Equator and Longitude 360 31' and 370 15' East.

According to the 2009 Census, Kiambu County population was projected to hit 2,032,464 people by the end of 2017. This is influenced by the county's high population growth rate, at 2.81 per cent and the influx of people working in the city who prefer to stay in Kiambu and its environs where there is less congestion and well developed infrastructure.

#### **5.2.2.2 Topography**

Kiambu county is divided into four broad topographical zones viz, Upper Highland, Lower Highland, Upper Midland and Lower Midland Zone. The Upper Highland Zone is found in Lari Constituency and it is an extension of the Aberdare ranges that lies at an altitude of 1,800-2,550 metres above sea level. It is dominated by highly dissected ranges and it is very wet, steep and important as a water catchment area. The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies. The area is characterised by hills, plateaus, and high-elevation plains. The area lies between 1,500-1,800 metres above sea level and is generally a tea and dairy zone though some activities like maize, horticultural crops and sheep farming are also practised.

The upper midland zone lies between 1,300-1,500 metres above sea level and it covers mostly parts of Juja and other constituencies with the exception of Lari. The landscape comprises of volcanic middle level uplands. The lower midland zone partly covers Thika Town (Gatanyaga), Limuru and Kikuyu constituencies. The area lies between 1,200-1,360 metres above sea level. The soils in the midland zone are dissected and are easily eroded. Other physical features include steep slopes and valleys, which are unsuitable for cultivation. Some parts are also covered by forest as shown in the photo below.

#### **5.2.2.3 Climate**

The County experiences long rains between Mid-March to May followed by a cold season usually with drizzles and frost during June to August and the short rains between Mid-October to November. The average rainfall received by the county is 1,200 mm.

The mean temperature in the county is 26°C with temperatures ranging from 7°C in the upper highlands to 34°C in the lower midlands. July and August are the months during which the lowest temperatures are experienced, whereas January to March are the hottest months.

#### **5.2.2.4 Soils**

The county is covered by three broad categories of soils which are: high level upland soils, plateau soils and volcanic footbridges soils. These soils are of varying fertility levels with soils from high-level uplands, which are from volcanic rocks, being very fertile. Their fertility is conducive for livestock keeping and growth of various cash and food crops such as tea, coffee, horticultural products, pyrethrum, vegetables, maize, beans, peas and potatoes. These soils are found in the highlands, mostly in Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Lari, Kikuyu, Kabete and Limuru Constituencies.

### **5.2.3 Baseline information of the project sites in Nairobi County**

#### **5.2.3.1 Population**

Nairobi is located at approximately 1° 9'S, 1° 28'S and 36° 4'E, 37° 10'E at the south-eastern end of Kenya's agricultural heartland. It occupies an area of about 696km<sup>2</sup> and the altitude varies between 1,600 and 1,850 metres above sea level

According to the 2009 national housing and population census, the county had 3,134,265 people which is projected to rise to 4,247,770 by year 2017.

#### **5.2.3.2 Topography**

The surrounding area is developed with Kenyatta University the surrounding area is sloppy with shallow red soils and prominent subsurface hard rock which may offer good foundation support for the proposed Substation.

The project site is currently undeveloped and one side of the site is used as a temporary dumping site for domestic/household rubbish, this dumping site has been relocated and rubbish cleared was already being cleared from the site at the time of site assessment. There is one three on site, some shrubs and grass. However the surrounding area is developed as it is within Kenyatta University. The proposed project site is surrounded immediately to the North, East and West by infrastructure and facilities belonging to Kenyatta University. These include a weather station, student hostels and the main administration block. To the south of the proposed site lies a residential area.

These developments include: Nairobi Aboretum, Nairobi river several buildings, road, electrical infrastructure, Base Transmission masts among others. Some distant physical features include Karura forest in the northern part of Nairobi city, Ngong River to the south, and the Ngong hills stand towards the west.

Some distant physical features include Karura forest in the northern part of Nairobi city, Ngong River to the south, and the Ngong Hills stand towards the west of Nairobi, Mount Kenya towards the north and Mount Kilimanjaro towards the south. As Nairobi is adjacent to the Rift Valley, minor earth tremors occasionally occur. The major River found in the County is Nairobi River but has been polluted with open sewers directed towards it, garages located in river banks and raw human waste being thrown in the river among others. Therefore its economic importance has been interfered with due to human activities.

#### **5.2.3.3 Climate**

The average daily temperature throughout the year (See table below) varies slightly from month to month with average temperatures of around 17 degrees Celsius during the months of July and August to about 20 degrees Celsius in March. But, the daily range is much higher, with the differences between maximum and minimum temperatures each day around 10 degrees in May and up to 15 degrees in February. Between the months of June to September, southeast winds prevail in the coastal parts of Kenya and last up to several days without a break. The clouds cause day temperatures to remain low and most times the maximum temperature stay below 18 degrees Celsius. The minimum temperatures also remain low during cloudy nights, usually hovering around 8 degrees Celsius and sometimes even reaching 6 degrees Celsius. Clear skies in January and February also bring colder nights. The highest temperature ever reached in Nairobi was 32.8 degrees Celsius and the lowest was 3.9 degrees Celsius.

#### **5.2.3.4 Soil**

The rocks in the Nairobi area mainly comprise a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 50 feet (15m) in thickness. A number of subdivisions are recognized in the Nairobi area according to drainage, climatic regions and slopes, and other categories have been introduced for lithosols and regosols

## **5.3 Project Screening**

### **5.3.1 Introduction of screening**

Many projects are considered by the public and private agencies every year. Development projects have biophysical as well as social and economic impacts. Sufficient understanding of these factors are necessary for the initial screening decision. It is therefore, important to establish mechanisms by identifying projects which requires EIA, and this process of selection of project is referred to as "Screening".

Screening process divides the project proposals within the following three categories

- project clearly requiring an EIA
- project not requiring an EIA
- project for which the need of application of an EIA is not clear

Environmental and social screening is undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

Environmental and social characteristics of the proposed project sites were identified based on; population density, existing land uses, vegetation, topography, soil types, general ecological setting and public safety.

The screening process also considered potential impacts of the connectivity project on Land value, job opportunities, income and economic activities. Findings reveal that implementation of the connectivity project within Kiambu and Nairobi County shall increase land value, create job opportunities and provide more income for persons opting for business ventures.

### **5.3.2 Objective of screening**

Determine the potential adverse environmental and social impacts of the proposed project;

Determine the appropriate environmental category as per OS 1 environmental assessment;

Based on the assigned environmental category, determine the appropriate level of environmental work required (i.e. whether an EIA is required or not (environmental category 1); whether the application of simple mitigation measures will suffice (environmental category 2); or whether the project has negligible adverse environmental and social risks. (Environmental category 3).

Determine appropriate mitigation measures for addressing adverse impacts

Determine the extent of potential solid and liquid waste generation, including hazardous wastes such as PCB and creosote, and appropriate mitigation measures;

Determine potential adverse impacts on physical cultural resources, and provide guidance to be applied in the case of chance finds;

Determine potential adverse social impacts due to land acquisition;

Determine whether indigenous peoples are likely to be affected by the project;

Facilitate the review and approval of the screening results and separate ESMP reports (the screening form would be looking at planned construction and rehabilitation activities); and

Provide environmental and social monitoring indicators to be followed during the construction, rehabilitation, operation and maintenance of the infrastructure service facilities and related project activities;

## **5.4 Potential impacts of the project**

### **5.4.1 Positive impacts**

The proposed last mile connectivity project will provide a milestone in spurring social and economic development in the country and will greatly help in achieving the objective of the Vision 2030 within the shortest time possible. Some of the socio economic benefits expected to accrue from the project includes but not limited to:-

#### **➤ Employment opportunities**

During implementation of the project various employment opportunities will be available. These include building of the service lines and wiring of individual houses. Given the magnitude of the project and number of connection envisaged, this project will create a considerable number of job opportunities across the country. This will go a long way in easing unemployment in the nation while the new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy.

#### **➤ Education**

Access to electricity at the household level and schools will lead to betterment of education services. Children will have opportunity to extend their study time because of better lighting system at home and in schools. Further, access to power will facilitate development and equipping of Laboratories in schools, promote use of laptops as well as introduction of ICT.

#### **➤ Reduction of pollution associated with use of thermal power, kerosene and wood fuel:**

Electricity supplied from National Grid would ensure less or no people use diesel generator sets for domestic power needs like pumping water, reduced reliance on kerosene both for lighting and cooking and will be an alternative to wood fuel and charcoal because of better and effective use of electrical appliances like cookers and electric irons. Consequently, this results in less carbon dioxide being released to the environment while less use of charcoal means reduced destruction of forests which will go a long way in conserving the environment.

#### **➤ Improved standard of living**

The implementation of this project will result in connecting about 1.2 million customers to the national grid. Access to electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridge, television sets, washing machines to mention but a few. Use of electricity for lighting implies that the people will not be exposed to smoke arising from use of tin lamps which predisposes people to respiratory diseases.

#### **➤ Opportunity for business development**

Availability of power for more customers provides opportunities to establish small micro enterprises such as salons, barber shops, charging of phones, welding, baking use of electric sewing machines, agribusiness like poultry farming among others. The incomes earned by these people will create demand for other goods and services hence promoting the economy.

➤ **Communications**

Improved communication amongst the communities and connectivity to global facilities through internet, mobile technology etc. all powered by electricity.

➤ **Increase in Revenues**

The implementation of the project will boost its income streams accrued from increased sales of electricity. These revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results to improvement in the economy.

➤ **Improved Security**

With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes while other people are able to use electric fences.

## **5.4.2 Negative impacts of the project and their mitigations**

➤ **Electric shocks and electrocution of people.**

Electricity like fire is a good master and a bad servant if safety precautions are not adhered to and if not used properly.

### **Mitigation**

- Proper public education to the people on safety of using electricity
- Proper wiring in the houses by qualified technicians
- Use of danger/hatari signs on the poles

➤ **Occupation safety and health hazards.**

During construction many people will be engaged in working. Such people are exposed to occupational risks like falling from heights, being pressed by poles e.t.c

### **Mitigation**

- The contractor must observe all the safety precautions to ensure workers work safely
- Safety awareness creation to the workers
- Use of personal protective equipment like gloves, helmet, climbing shoes etc.
- Staff Training and regular equipment service and testing
- Only trained & certified workers to install, maintain or repair electrical equipment;
- Use of signs, barriers and education/ public outreach to prevent public contact with potentially dangerous equipment;
- Community policing to be encouraged to reduce vandalism of transformers and distribution cables
- Follow safe work procedures
- Maintain a fully stocked and accessible first aid kit



- Observe OSHA 2007 regulations

➤ **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

**Mitigation**

Public awareness of the public health issues identified.

➤ **Impact on Natural Vegetation**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace.

Grass and short vegetation will be cleared to pave way for erection of poles.

**Mitigation**

- KPLC to plant trees as a way of compensation for the cleared ones
- Clear limited areas only where the pole will be erected

➤ **Construction material sourcing-wooden poles.**

Majority of these service lines are constructed using wooden poles. This would impact on the environment as close to a million poles will be needed according to the preliminary estimates

**Mitigation**

- Consider use of concrete poles to avoid deforestation
- Plant more trees to compensate for the poles used
- Ensure accurate budgeting to ensure only necessary material is ordered
- Proper storage to ensure minimal loss

➤ **Impacts on air quality from vehicle exhaust emissions**

Exhaust emissions are likely to be generated by the vehicles used to ferry materials during construction. These exhaust emissions can impact on the quality of air.

**Mitigation**

- Drivers shall not leave vehicles idling so that exhaust emissions are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions are produced.
- Keep stockpiles for the shortest possible time
- Minimise movement of construction traffic around site this can be achieved through better planning of vehicle movement

➤ **Solid waste**

Little if any solid waste will be generated which includes conductor and tree cuttings.

## **Mitigation**

- All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal
- Proper budgeting of materials to reduce wastage
- Re use of materials

### **➤ Risk of Fire from live conductors and Transformers-**

Potential adverse impacts related to fire hazards remain a main feature of this project. The Transformers will have combustible products like the transformer oil and the risks associated with fire hazards form a significant adverse impact on the human health and environment

## **Mitigation**

- No burning of vegetation along the distribution lines rights-of-way
- Timely maintenance of the right of way
- Time maintenance of transformers

### **➤ Oil Leaks**

The refilling and emptying of the transformer oil can lead to accidental oil spills. There is a possibility of oil leaking from the transformers can lead to oil spills. This may lead to potential contamination of surface and groundwater as well as soil.

## **Mitigation**

- Need to design appropriate protection devices against accidental discharge of transformer oil substances.
- Frequent inspection and maintenance of the transformers should be done to minimize spilling.

## 5.5 THE RESULTS OF THE SCREENING EXERCISE

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>NAIROBI COUNTY</b>						
<b>EMBAKASI EAST CONSTITUENCY</b>						
Medium -	<ul style="list-style-type: none"> <li>Commercial</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Natural vegetation dominated by grass</li> <li>Planted: gravellia</li> </ul>	Gentle sloping	Sandy Loam soil	Terrestrial birds	Mihango area has new flats are being built there great potential.
<b>EMBAKASI WEST CONSTITUENCY</b>						
High (both residential and commercial activities)	<ul style="list-style-type: none"> <li>Commercial (Markets and Micro-enterprises)</li> <li>Churches</li> <li>Residential</li> <li>Health facilities</li> <li>Schools</li> </ul>	None	Relatively Flat	Black cotton soil	Terrestrial birds	There are businesses under TX no. 30322 which poses a safety issue. Customers served by TX 46242 complained of frequent outages.
<b>KIBERA CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> </ul>	Planted : Avocado and croton inside the mosque	Relatively flat	Red soil	Terrestrial birds	Due to its high density there is need for public safety awareness and proper consultation for passage of lines. Most TXs not marked
<b>KAMUKUNJI CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> </ul>	None	Relatively flat	Red soil	Terrestrial birds	Businesses operate below TX 30322 which poses safety concerns. Public safety awareness necessary

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>EMBAKASI NORTH CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Petrol station)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Administrative (police station buruburu)</li> </ul>	<ul style="list-style-type: none"> <li>Acacia</li> </ul>	Gentle sloping	Clay soil	Terrestrial birds	Police quarters will benefit from the connections. There is need for public safety awareness
<b>MAKADARA CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Petrol stations</li> <li>Railway Station</li> <li>Health Centers</li> <li>Administrative purposes (Chief's office)</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea Robusta, Jacaranda, Cyprus, Acacia, Pine, Mango trees, Croton, Nandi flame and Bamboo</li> </ul>	Relatively Flat	Clay Loam -	Avi-fauna e.g. Marabou stocks, weaver birds	Transformer No. 14351 is not stable
<b>KAMUKUNJI CONSTITUENCY</b>						
High and Medium	<ul style="list-style-type: none"> <li>Commercial (Markets and Micro-enterprises)</li> <li>Church</li> <li>Residential</li> <li>Social Hall</li> <li>Banks</li> <li>Kenya Power substation</li> <li>Medium Industries</li> </ul>	Minimal vegetation cover	Relatively Flat	Clay-Loam	Avi fauna-e.g. weaver birds	Good
<b>MATHARE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
High density	<ul style="list-style-type: none"> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Commercial (Micro enterprises)</li> </ul>	No vegetation cover	Relatively Flat	Mostly hardscape s	Avi-fauna e.g. weaver birds	Repair the cut powered electrical cable of transformer No.44094
<b>ROYSAMBU CONSTITUENCY</b>						
Low and Medium	<ul style="list-style-type: none"> <li>Agriculture (Large and small scale)</li> <li>Residential</li> <li>Churches</li> <li>Commercial (Micro-enterprises)</li> <li>Health centers</li> </ul>	<ul style="list-style-type: none"> <li>Planted edges e.g. eucalyptus, lantana camara and euphorbia tirucalli</li> <li>Trees e.g. Makhamia Lutea, Jacaranda, pine, avocado trees, croton and mango trees</li> <li>Coffee plantation</li> </ul>	Relatively flat	Red soil	Avi fauna- e.g. Ibis Terrestrial fauna-e.g. cattle, sheep, goats Aqua-fauna e.g. frogs	Clear the bushes around and climbing plants on transformer No.567
<b>KASARANI CONSTITUENCY</b>						
Low and Medium	<ul style="list-style-type: none"> <li>Residential</li> <li>Agricultural (Livestock keeping and small scale agriculture)</li> <li>Schools</li> <li>Commercial (Micro-enterprises and banks)</li> <li>Recreational (Stadium)</li> </ul>	<ul style="list-style-type: none"> <li>Shrubs</li> <li>Edge plants e.g. Euphorbia tirucalli, Grevillea robusta and Lantana Camara</li> <li>Planted trees e.g. Pine and Avocado trees.</li> <li>Grass</li> </ul>	Relatively flat	Black Cotton	<ul style="list-style-type: none"> <li>Aqua-fauna e.g. frogs</li> <li>Avi-fauna e.g. weaver birds</li> <li>Terrestrial fauna e.g. chicken, goats, sheep</li> </ul>	Indicate TX No. on transformer 104059
<b>RUARAKA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
High and Medium	<ul style="list-style-type: none"> <li>Industrial</li> <li>Schools</li> <li>Residential</li> <li>Churches</li> <li>Commercial enterprises (Micro and Markets)</li> </ul>	<ul style="list-style-type: none"> <li>Planted Trees e.g. Makhamia Lutea, Eucalyptus, croton, umbrella and acacia.</li> <li>Shrubs</li> </ul>	<ul style="list-style-type: none"> <li>Gently sloping</li> <li>Relatively flat</li> </ul>	<ul style="list-style-type: none"> <li>Loam</li> <li>Clay-Loam</li> </ul>	<ul style="list-style-type: none"> <li>Avi-fauna e.g. doves</li> <li>Terrestrial fauna e.g. goats</li> </ul>	Good
<b>DAGORETI NORTH CONSTITUENCY</b>						
Dense e.g around nyakinywa, kinyanjui road, ndwaru and kangemi primary	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Administrative</li> <li>agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, , Eucalyptus, , cypress, pine, Jacaranda, Nandi flame, , Pine, MakhamiaLutea especially around ndwaru.</li> <li>Food crops e.g maize and beans especially around ndwaru</li> </ul>	The terrain is gently Sloping	Red loam soil	Terrestrial birds	Public awareness campaigns required especially around the slums in kawangware
<b>DAGORETI SOUTH CONSTITUENCY</b>						
Dense especially around kabiria, uthiru, riruta and waithaka. moderate in	<ul style="list-style-type: none"> <li>Commercial</li> <li>(Markets and Micro-enterprises)</li> <li>Churches</li> <li>Residential</li> <li>Agricultural</li> <li>Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, , Eucalyptus, , cypress, pine, Jacaranda, Nandi flame, , Pine, MakhamiaLutea especially around mutuini and waithaka.</li> <li>Food crops e.g maize and beans especially around mutuini and</li> </ul>	Gently sloping	Red loam soil	Terrestrial birds	Area around transformer 4493 (mutuini) experiences frequent outages

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
mutuini	• Schools	waithaka				
<b>WESTLANDS CONSTITUENCY</b>						
Dense e.g around kangemi and mountain view estate	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, , Eucalyptus, Jacaranda</li> <li>• Natural hedges especially around mountain view estate</li> <li>• Variety of flowers dot most estates</li> </ul>	Gently sloping	Loam		Prope care to be taken when pruning trees especially the ornamental trees
<b>LANGATA CONSTITUENCY</b>						
Sparsely populated especially around Karen and moderately populated around otiende	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted edges e.g. Euphorbia, Cyprus, Grevillea Robusta, marcamia lutea, fig trees, croton, jacaranda,nandi flame and a variety of indigenous trees especially around Karen area</li> </ul>	Gently sloping	Red loam soil	Terrestrial birds	Consult land owners before pruning trees especially around the Karen area
<b>KIAMBU COUNTY</b>						
<b>GATUNDU SOUTH CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and Low	<ul style="list-style-type: none"> <li>• Industrial (tea factories)</li> <li>• Schools</li> <li>• Residential</li> <li>• Churches</li> <li>• Commercial (Micro enterprises and Markets)</li> <li>• Administrative (Police post)</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Planted Trees e.g. tea plantations, pineapples, gravellia, avocado trees, Makhamia Lutea, Eucalyptus, bananas, coffee plantations, maize, croton, umbrella, mangoes and palm trees.</li> <li>• Shrubs, wattle bark</li> </ul>	<ul style="list-style-type: none"> <li>• Sloping and other places hilly with flowing streams</li> </ul>	<ul style="list-style-type: none"> <li>• Loam/Red soil</li> <li>• Black cotton</li> </ul>	<ul style="list-style-type: none"> <li>• Avi-fauna e.g. doves</li> <li>• Terrestrial fauna e.g. cattle</li> </ul>	Good
<b>GATUNDU NORTH CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Agricultural</li> <li>• Water treatment plant</li> <li>• Schools</li> <li>• Residential</li> <li>• Churches</li> <li>• Commercial (Micro enterprises and Markets)</li> <li>• Administrative (Police post)</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Planted Trees e.g. jacaranda, croton, grivellia, avocado trees, Makhamia Lutea, Eucalyptus, bananas, pineapples, macadamia, coffee plantations, maize, croton, umbrella and tea plantations.</li> <li>• Shrubs</li> </ul>	<ul style="list-style-type: none"> <li>• Sloping and other places hilly with flowing river</li> </ul>	<ul style="list-style-type: none"> <li>• Loam /Red soil</li> </ul>	<ul style="list-style-type: none"> <li>• Avi-fauna e.g. doves</li> <li>• Terrestrial fauna e.g. cattle</li> </ul>	Some TX not marked on ground.
<b>THIKA TOWN CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural (pineapple plantation)</li> <li>• Barracks</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea Robusta, Acacia, Eucalyptus, Sisal, Pine, Lantana Camara, Makhamia Lutea.</li> <li>• Grass</li> </ul>	Relatively Flat	Clay – Loam Murram	Avi-fauna e.g. weaver birds	Area connected to transformer 3026 is faced by frequent power outages
<b>JUJA CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
High and Medium	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Social Hall</li> <li>•Schools</li> <li>•Administrative police post</li> </ul>	<ul style="list-style-type: none"> <li>•Trees and planted edges e.g. Euphorbia, Cyprus, Grevillea Robusta, Acacia, Lantana Camara, Croton</li> <li>•Grass</li> <li>•Shrubs</li> </ul>	Relatively Flat Gently sloping	Clay-Loam Murram	Avi fauna- e.g. weaver birds	Indicate TX No. on transformer 85052
<b>RUIRU CONSTITUENCY</b>						
Medium and High	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Police post</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea Robusta, Jacaranda, Pine Eucalyptus, Lantana Camara, Croton</li> <li>• Grass</li> </ul>	Relatively Flat	Loam	Avi-fauna e.g. weaver birds	Good
<b>LARI CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural (maize and cabbages)</li> </ul>	<ul style="list-style-type: none"> <li>• Planted vegetation e.g. pine, eucalyptus, maize, Grevillea, Avocado trees, Eucalyptus, Pine and croton.</li> <li>• Grass and shrubs</li> </ul>	Gently sloping and other places Relatively Flat with flowing stream	Cotton Loam	Avi-fauna and Terrestrial fauna	Some TX not marked on ground.
<b>KIAMBU CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
High and Medium	<ul style="list-style-type: none"> <li>•Commercial (Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Social Hall</li> <li>•Schools</li> <li>•Administrative police post</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted edges e.g. Euphorbia, Cyprus, Grevillea Robusta, Acacia, Lantana Camara, Croton, Eucalyptus, Pine and ovacado trees</li> <li>• Grass</li> <li>• Shrubs</li> </ul>	Relatively Flat Gently sloping	Clay-Loam	Avi fauna- e.g. weaver birds, Terrestrial fauna e.g. cattle, sheep and goats	good
<b>KIAMBAA CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>•Agricultural</li> <li>•Water treatment plant</li> <li>•Residential</li> <li>• Churches</li> <li>•Schools</li> <li>• Commercial (Micro enterprises and Markets)</li> <li>• Administrative (Police post)</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Planted Trees e.g. avocado trees, mango trees Makhamia Lutea, Eucalyptus, bananas, , macadamia, coffee plantations, jacaranda, croton, grivellia, maize, croton, and umbrella</li> <li>• Shrubs</li> </ul>	• gently sloping	• Red soil	<ul style="list-style-type: none"> <li>• Avi-fauna e.g. doves</li> <li>• Terrestria l fauna e.g. cattle, sheep and goats</li> </ul>	Good
<b>KIKUYU CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Densely populated e.g around muguga, kikuyu town,gikambura, mutuini, kiroe and ndeiya	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – (food crops)</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, , cypress, pine, Jacaranda, Nandi flame, Pine Makhamia Lutea.</li> <li>• Planted natural hedges</li> </ul>	Gently sloping	Red Loam	Terrestrial birds	Public awareness campaigns on the safe use of electricity required
<b>LIMURU CONSTITUENCY</b>						
Medium e.g area like mirithu,rwambu, teikinu and low in places like ndeiya	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural (food crops)</li> <li>•Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted edges e.g., Cyprus, Grevillea Robusta, Acacia, , Croton, Eucalyptus and marcamia lutea</li> <li>• Food crops eg maize and beans.</li> <li>• Shrubs and grasslands</li> </ul>	Flat in some areas like ndeiya and hilly in areas like mirithu	Red loam soil	Terrestrial birds	Public safety awareness on the safe used of electricity required in the area.
<b>KABETE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Densely populated e.g around lower kabete, kingeero, and ndumboini. moderately populated around e.g around karura and mukui.	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural (food crops)</li> <li>• Administrative</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, ovacado, Eucalyptus, , cypress, pine, Jacaranda, Nandi flame and Pine</li> <li>• Food crops e.g maize and beans</li> <li>• Some areas have tea plantations</li> </ul>	The terrain is gently Sloping	Red Loam soil	Terrestrial birds	Way leave needs to be maintained e.g by frequent pruning of trees.

## **5.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development projects allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
<b>Minimize vegetation disturbance along construction site</b>				
Vegetation Disturbance	<p><b>17</b> Choose routes that offer minimal disturbance to vegetation and where inevitable clear manually only necessary vegetation.</p> <p><b>18</b> Properly demarcate the project area to be cleared during installation of supply droplines</p> <p><b>19</b> Designate parking lots within the project area to prevent vegetation disturbance</p> <p><b>20</b> Plant suitable trees within the project area to compensate for any damaged ones</p> <p><b>21</b> Compensate for any damaged trees and crops</p>	Project engineer and contractor	2 Months	<p>11) 200,000.00</p> <p>6) To be determined</p>
<b>Reduce soil erosion and surface run off</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Increased soil erosion and surface run off	<p>9) Use existing roads and avoid ground disturbance as much as possible</p> <p>10) Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</p>	Project engineer and contractor	Throughout construction period	9) 0.00
<b>Air Pollution</b>				
Dust emission	<p>13) Avoid excavation works in extremely dry seasons</p> <p>14) Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</p> <p>15) Provide and ensure use of appropriate personal protective equipment by workers on site</p>	Project engineer and contractor	Throughout project period	50,000.00
Exhaust emission	<p>Use wheel serviced vehicles and any other motorized equipment</p> <p>Sensitize truck drivers to avoid unnecessary running engines on</p>			0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	stationery vehicles and switch off engines whenever possible			
<b>Minimize occupational safety and health risks</b>				
Open excavations	<p><b>9)</b> Barricade the proposed project area using high visibility tape to avoid falls into open excavations</p> <p><b>10)</b> Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents.</p> <p><b>11)</b> Contractor to compensate any injuries to the public and animals arising from his negligence</p>	Contractor	Throughout project period	To be determined



Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Working at height	<p><b>17)</b> Observe clearance from power lines and workers to be experienced with necessary qualifications</p> <p><b>18)</b> Test power lines to ensure they are shut down before work</p> <p><b>19)</b> Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</p> <p><b>20)</b> Provide storage bags for portable tools used while working at height.</p>		Throughout project period	<b>17) 0.00</b>
Safety and health awareness	<p><b>3)</b> Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements</p>	Contractor and project engineer	Throughout project period	<b>0.00</b>

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Pricks and cuts	<p>9) Ensure project area is kept free of sharp objects</p> <p>10) Provide appropriate foot protection to workers within the site</p>	Contractor and project engineer	Throughout project period	
<b>Public safety and health</b>				
Shocks and electrocutions	7) Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards	Contractor and proponent	Before commencement of the project	200,000.00
Project infrastructure	6) Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards			
HIV/AIDS	7) Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide condom dispensers			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	at all project worksites			
Social Vices	5) Awareness creation to the public and liaising with area administration to enhance security			
Damage to property				
Damage to structures erected on the way leaves	Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures  Use existing wayleaves and road reserves to minimize disturbance and unnecessary compensations  Where it is inevitable, compensate for damaged property	Contractor and proponent	Before commencement of the project	To be determined
Risk of sparks/ fires from live conductors	•Contractor to ensure all fittings are tight and implemented using quality materials to prevent arcing and any loose connections.  •Contractor to ensure right tension	Contractor, Proponent	Implementation	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	<p>and spacing is well implemented for conductors.</p> <ul style="list-style-type: none"> <li>• Premises to be wired by qualified technicians and test certificates maintained</li> </ul>	Customers	Before connection	

## 5.7 Conclusion and Recommendation

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others and shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

### Recommendation

- The positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.
- KPLC to carry out adequate public/customer engagements must be carried out to ensure the potential customers understand the project and assess their eligibility in terms of willingness and ability to pay for power.
- All the customers under this project to be put on prepaid meters such that tokens bought may take into account the cost of connection and also to avoid bad debts as consumption will be paid up front.
- KPLC to have a dedicated team to follow up and monitor the project implementation and utilisation of electricity as well as the quality of service to the targeted customers and also to deal with any emerging challenges.

## 5.8 Photo Plates



TX 18421



TX 34656



TX 30870



TX 45670



TX 30717



4603

## **6 LOT6: NORTH EASTERN**

## EXECUTIVE SUMMARY

The last mile connectivity project is an initiative to help achieve government of Kenya pledge of stimulating economic growth and accelerating job creation for the wellbeing of its citizens. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and accelerate connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accrued benefits of electricity access among others.

The last mile connectivity project for Lot 1 shall be undertaken in Off grid region covering Mandera, Wajir and Marsabit Counties.

Baseline information for the proposed project area analyzed during the screening exercise considered population density, vegetation distribution, climatic conditions, topography, Soils and Social set ups with a key focus on identifying sensitive ecosystems that could be affected by the LMCP. The project area is diverse with medium populations in urban areas and medium to low in the rural places. The area has moderate vegetation cover comprising of planted neem trees in town centres, and the vast area is covered of semi-arid to arid vegetation dominated by scattered Acacia, and Prosopis. The project area is also characterized by small scale farming especially in Saku Sub county with maize farms, Miraa farming, and a mixture of agroforestry with mangoes, grivelia, guavas, some eucalypts among others. The project area experiences high temperatures ranging from 30°C to slightly over 40°C annually with dry winds. Except for Saku Subcounty all the other areas receive minimal rainfall and are characterized by long dry spells and save for the town centres a greater percentage of the population rely on pastoral nomadism for their livelihood.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at which level it could be carried out. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution component for the projects has been pegged to identified transformers that will be maximized across the country with general drop lines to connect customers and at other places extension of the Low voltage lines to a maximum of two poles in order to achieve accelerated connections. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and customer connections at the end user levels. The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance, risk of sparks and fire from live conductors, occupational health hazards among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

To mitigate the anticipated negative and social impacts, an Environmental and Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the



life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impacts of the project which include; oil leaks from transformers, shock and electrocution of people, noise from construction, Occupational health and safety hazards among others will be mitigated as outlined in the ESMP. Diligence on the part of the contractor will be paramount to ensure minimization and where possible avoidance of anticipated negative impacts.

## **6.1 INTRODUCTION AND PROJECT BRIEF**

### **6.1.1 Last Mile Connectivity Project**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households located within transformer protection distance. The project involves building low voltage lines both single phase and three phase along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- xvii. Accelerated access to electricity;
- xviii. Improved standards of construction hence improved quality of supply;
- xix. Provision of new supply in a shorter time;
- xx. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **6.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## 6.2 PROJECT OVERVIEW

The Last Mile Connectivity Project for LOT 1 shall be undertaken for identified transformers located within constituencies in **Offgrid region covering Marsabit County** (Saku and Moyale subcounties); **Wajir County** (Wajir East, Wajir South and Wajir North Sub- counties); and **Mandera County** (Mandera East, Mandera North, Mandera South and Mandera West).

### 6.2.1 Baseline information of the project area

Some of the environmental and social aspects considered for Last Mile Connectivity Project include; population, vegetation distribution, topography, climate, soils and the social setup especially settlement and road networks within the project area.

#### 6.2.1.1 Population

##### **Mandera County:**

Mandera East that hosts the County headquarters at Mandera Town is the most densely populated constituency with 72 persons per square Kilometre that is project to be 81 and 87 persons per square kilometre in 2015 and 2017 respectively. Mandera North is the least densely populated constituency with 35 persons per square kilometre that is projected to be 39 and 41 persons per square kilometre in 2015 and 2017 respectively. Population distribution in the county affects infrastructure development and provision of social amenities.

##### **Wajir County:**

Projections from the Kenya 2009 Population and Housing census indicate that the county has a total population of 727,965 which is projected to be 852,963 in 2017. Males comprise 55 per cent of the population whereas female population account for 45 per cent. The county has an inter-censual growth rate of 3.22 per cent which is higher than the national population growth rate of 3.0 per cent.

##### **Marsabit County:**

From the 2009 National Population and Housing Census, the county's projected population was 316,206 people in 2012. This comprised of 164,105 males and 152,101 females. The projections are based on annual growth rate of 2.75 per cent.

#### 6.2.1.2 .Ecological Conditons:

##### **Mandera County:**

There are two ecological zones in the county namely arid and semi-arid. 95% of the county is semi arid with dense vegetation mainly thorny shrubs and bushes along foots of isolated hills and *mathenge* trees along river banks and gullies. Temperatures are relatively very high with a minimum of 24°C in July and a maximum of 42°C in February. Variation in altitude brings differences in temperatures across the county where places near Banissa constituency experiences low temperatures due to neighbouring highlands in Ethiopia. Rainfall is scanty and unpredictable averaging 255mm. The long rains fall in the months of April and May while the short rains fall in October and November. Most parts of the county experiences long hours (approximately 11 hours) of sunshine in a day. This causes high evaporation rates thus causing withering to most of the vegetation before maturity. The continuous sunshine in the county has a potential for harvesting and utilization of solar energy.

**Wajir County:**

Wajir County is a semi-arid area falling in the ecological zone V-VI. Zone V receives rainfall between 300-600mm annually, has low trees, grass and shrubs. On the other hand zone VI receives an annual rainfall of 200-400mm. The county receives an average of 240 mm of rainfall per year. The rainfall is usually erratic and short making it unfavourable for vegetation growth. There are two rainy seasons i.e. short and long rains. The short rains are experienced between October to December and the long rains from March to May each year. Crop activity is carried out in the Lorian swamp and along the drainage lines in Bute. The crops grown in the area are sorghum, beans and vegetables.

The county experiences annual average relative humidity of 61.8 per cent which ranges from 56 per cent in February to 68 per cent in June. The county does not experience frost conditions.

The county receives an average of 240 mm precipitation annually or 20 mm each month. There are 24 days annually in which greater than 0.1 mm of precipitation (rain, sleet, snow or hail). June is the driest month with an average of 1 mm of rain across zero days while April is the wettest month with an average of 68 mm of rain, sleet, hail or snow across 6 days. The higher areas of Bute and Gurar receive higher rainfall of between 500mm and 700mm.

The average temperature is 27.9 °C. The range of average monthly temperatures is 3.5 °C. The warmest months are February & March with an average of 36°C while the coolest months are June, July, August & September with an average low of 21 °C.

**Marsabit County:**

Most parts of the county are arid, with the exception of high potential areas around Mt. Marsabit such as Kulal, Hurri Hills and the Moyale-Sololo escarpment. The county experiences extreme temperatures ranging from a minimum of 10.10 °C to a maximum of 30.20 °C, with an annual average of 20.10 °C. Rainfall ranges between 200mm and 1,000mm per annum and its duration, amount and reliability increases with increase in altitude. North Horr (550m) has a mean annual rainfall of 150mm; Mt. Marsabit and Mt. Kulal 800mm while Moyale receives a mean annual rainfall of 700mm.

Most of the county constitutes an extensive plain lying between 300m and 900m above the sea level, sloping gently towards the south east. The plain is bordered to the west and north by hills and mountain ranges and is broken by volcanic cones and calderas. The most notable topographical features of the county are: Ol Donyo Ranges (2066m above sea level) in the South West, Mt. Marsabit (1865m above sea level) in the Central part of the county, Hurri Hills (1685m above sea level) in the North Eastern part of the county, Mt. Kulal (2235m above sea level) in North West and the mountains around Sololo-Moyale escarpment (up to 1400m above sea level) in the North East.

The main physical feature is the Chalbi Desert which forms a large depression covering an area of 948 Km<sup>2</sup>. This depression lies between 435m and 500m elevation. The depression is separated from Lake Turkana, which is 65-100m lower in elevation, by a ridge that rises to 700m. There are no permanent rivers in the county, but four drainage systems exist, covering an area of 948 Km<sup>2</sup>. Chalbi Desert is the largest of these drainage systems. The depression receives run-off from the surrounding lava and basement surfaces of Mt. Marsabit, Hurri Hills, Mt. Kulal and the Ethiopian plateau. The seasonal rivers of Milgis and Merille to the extreme south flow eastward and drain into the Sori Adio Swamp. Other drainage systems include the Dida Galgallu plains which receive run-off from the eastern slopes of Hurri hills, and Lake Turkana into which drain seasonal rivers from Kulal and Nyiru Mountains.

## **6.3 PROJECT SCREENING**

### **6.3.1 Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

### **6.3.2 Environmental Screening for Last Mile Connectivity Project**

The Environmental Management and Coordination (Amendment) Act of 2015 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. The environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the Financiers i.e. Africa Development Bank (AfDB).

The screening process has been developed based on identified Transformers that need to be maximized across the country. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

### **6.3.3 Objective of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project, the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

### 6.3.4 Environmental and Social Characteristics of Proposed Project Sites

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
<b>WAJIR COUNTY</b>						
<b>WAJIR SOUTH SUB- COUNTY</b>						
Low and medium in towns	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Mosques</li> <li>Administrative</li> <li>Ranch land</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Neam, Ornamental trees</li> <li>Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively flat	Sandy and Sandy clay	Terrestrial animals and birds	TX 33760 not marked, TX 33763 on ground marked as 33767
<b>WAJIR WESTSUB- COUNTY</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Schools</li> <li>Mosques</li> <li>Administrative</li> <li>Ranch land</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Neam, Ornamental trees</li> <li>Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively Flat	Sandy and Sandy clay	Terrestrial animals and birds	All three TXs not marked on Paper and ground
<b>WAJIR EAST SUB- COUNTY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Mosques</li> <li>Administrative</li> <li>Health facilities</li> <li>Ranch land</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Neam, Ornamental trees</li> <li>Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively flat	Sandy	Terrestrial animals and birds	TXs 231132, 46223& 46177 not marked on ground
<b>WAJIR NORTH SUB- COUNTY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Neam, Euphobia</li> </ul>	Gentle slope	Sandy loam	Terrestrial birds	None

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
	(Markets) <ul style="list-style-type: none"> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Mosques</li> <li>• Administrative</li> <li>• Health facilities</li> <li>Ranch land</li> </ul>	<ul style="list-style-type: none"> <li>• Natural vegetation dominated by Acacia and Prosopis</li> </ul>				
<b>MANDERA COUNTY</b>						
<b>MANDERA SOUTH SUB- COUNTY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Mosques</li> <li>• Administrative</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neam, Ornamental trees</li> <li>• Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively flat	Sandy& Sandy rocky	Terrestrial animals and birds	TX 16126,16217, 16218 and 16215 on paper marked for Banisa are in Mandera South ( Elwak)
<b>MANDERA EAST SUB- COUNTY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Graveyard</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neam, Ornamental trees</li> <li>• Natural vegetation dominated by Acacia and Prosopis</li> </ul>	Relatively flat and other areas gently sloping	Sandy	Terrestrial animals and birds	TXs marked for West and North are in Mandera East.
<b>MARSABIT COUNTY</b>						
<b>SAKU SUB- COUNTY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – maize, Avocadoes, napier, livestock , Miraa</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Bananas, Jacaranda, Sisal, Croton</li> <li>• Natural vegetation dominated by grass Acacia, and Prosopis</li> </ul>	Slopy and relatively flat	Red Soils and Sandy loam	Terrestrial animals and birds	Most TXs not marked on ground
<b>MOYALE SUB- COUNTY</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Yellow Oleander, Euphorbia, Makhama lutea, maize, Roses,</li> <li>• Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red soil	Terrestrial animals and birds,	TX Number on ground was 9197, 24252 immediate houses not connected to electricity. TX Number 41794 not marked on ground and is next to Chezeywe Primary and not Lynaginga Church as indicated on paper is 41228, on ground not legible. Poles burnt, slanting and need to be replaced.



### 6.3.5 Photo gallery



## **6.4 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **6.4.1 Positive Impacts**

#### **Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to connect customers to the grid, artisan work in wiring premises, a wide range of businesses extending to service industry. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to households within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global

opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

### **Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Kenya Power shall disseminate information through awareness creation through the contractor and company's Safety, Health & Environment Department.

### **Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risks posed by indoor air pollution from burning of kerosene mainly include acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

### **Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information, as a result translating into better results and an informed society.

### **Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

### **Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

### **Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information which is useful for decision making. Some

information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

### **Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

### **6.4.2 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

#### **Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **Electric shocks and electrocution of people**

Electricity is a hazard if safety precautions are not adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **Noise during construction**

Noise will be generated from the construction machines and construction workers during the construction phase and is expected to be minimal and spread.

### **Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

### **Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among.

### **Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

### **Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.

## **6.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 1: Environmental and Social Management Plan**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
<b>Minimize vegetation disturbance along construction site</b>				
Vegetation Disturbance	<p><b>22</b> Choose routes that offer minimal disturbance to vegetation and where inevitable clear manually only necessary vegetation.</p> <p><b>23</b> Properly demarcate the project area to be cleared during installation of supply droplines</p> <p><b>24</b> Designate parking lots within the project area to prevent vegetation disturbance</p> <p><b>25</b> Plant suitable trees within the project area to compensate for any damaged ones</p> <p><b>26</b> Compensate for any damaged trees and crops</p>	Project engineer and contractor	2 Months	<p><b>12) 150,000.00</b></p> <p>7) To be determined</p>
<b>Reduce soil erosion and surface run off</b>				
Increased soil erosion and surface run off	<p><b>11)</b> Use existing roads and avoid ground disturbance as much as possible</p> <p><b>12)</b> Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</p>	Project engineer and contractor	Throughout construction period	<p><b>10) 0.00</b></p> <p><b>11) 200,000</b></p>
<b>Air Pollution</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Dust emission	<b>16)</b> Avoid excavation works in extremely dry seasons <b>17)</b> Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites <b>18)</b> Provide and ensure use of appropriate personal protective equipment by workers on site	Project engineer and contractor	Throughout project period	<b>30,000.00</b>
Exhaust emission	<b>13)</b> Use well serviced vehicles and any other motorized equipment <b>14)</b> Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible			<b>0.00</b>
<b>Minimize occupational safety and health risks</b>				
Open excavations	<b>12)</b> Barricade the proposed project area using high visibility tape to avoid falls into open excavations <b>13)</b> Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents. <b>14)</b> Contractor to compensate any injuries to the public and animals arising from his negligence	Contractor	Throughout project period	<b>To be determined</b>



Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Working at height	<p><b>21)</b> Observe clearance from power lines and workers to be experienced with necessary qualifications</p> <p><b>22)</b> Test power lines to ensure they are shut down before work</p> <p><b>23)</b> Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</p> <p><b>24)</b> Provide storage bags for portable tools used while working at height.</p>		Throughout project period	<p><b>18) 0.00</b></p> <p><b>19) 0.00</b></p> <p><b>20) 200,000.00</b></p> <p><b>21) 20,000.00</b></p>
Safety and health awareness	<b>4)</b> Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements	Contractor and project engineer	Throughout project period	<b>0.00</b>
Pricks and cuts	<p><b>11)</b> Ensure project area is kept free of sharp objects</p> <p><b>12)</b> Provide appropriate foot protection to workers within the site</p>	Contractor and project engineer	Throughout project period	<p><b>8) 0.00</b></p> <p><b>9) 100,000.00</b></p>
<b>Public safety and health</b>				
Shocks and electrocutions	<b>8)</b> Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards	Contractor and proponent	Before commencement of the project	<b>500,000.00</b>
Project infrastructure	<b>7)</b> Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
HIV/AIDS	8) Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide condom dispensers at all project worksites			
Social Vices	6) Awareness creation to the public and liaising with area administration to enhance security			
Damage to property				
Damage to structures erected on the way leaves	10)Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures 11)Use existing wayleaves and road reserves to minimize disturbance and unnecessary compensations 12)Where it is inevitable, compensate for damaged property	Contractor and proponent	Before commencement of the project	To be determined
Risk of sparks/ fires from live conductors	•Contractor to ensure all fittings are tight and implemented using quality materials to prevent arcing and any loose connections. •Contractor to ensure right tension and spacing is well implemented for conductors. •Premises to be wired by qualified technicians and test certificates maintained	Contractor, Proponent  <		

## **6.6 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others and shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## **7 LOT7: MOUNT KENYA**

## EXECUTIVE SUMMARY

This is an environmental screening report for Lot 7 under the Last Mile Connectivity Project. The last mile connectivity project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project is supported through external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and will result into connection of more customers to the national grid. The last mile connectivity project phase one will involve maximizing existing transformers i.e connecting customers that are within 600m of transformer protection distance/radius. The project will also involve fitting of prepaid meters for customers. The project's benefits cannot be overemphasized and includes; provision of new supply, promotion of ICT, education, security, income generating activities access to information and direct employment to name but a few.

The last mile connectivity project is a national wide project and Lot 7 will cover counties mainly in Mt Kenya region of Kenya Power's administrative structure. The counties include; Nyeri, Laikipia, Isiolo, Meru, Embu, Tharaka Nithi, Kirinyaga and Muranga. In order to ensure that the project is implemented in an Environmental and Social sustainable manner, the project was subjected to environmental screening. The objective of screening was undertaken to assess the potential environmental and social impacts of the project. During the screening exercise baseline information that could be observed around the project site was picked and documented including general information on the following; population density, vegetation distribution, climatic conditions of the project sites, topography and soils.

The proposed project area (lot 7) has high population except in Isiolo and some parts of Tharaka Nithi. The counties mainly have agriculture based economies mixed with urban centres and small towns where there is higher population density. Other economic activities include commercial activities in towns and urban centres. Most of the counties have good/plenty of vegetation cover comprising natural forests, planted forests, some medicinal plants, exotic and indigenous tree species in different areas. The project areas have different cash crops such as tea, coffee, wheat, miraa, bananas, pineapples and rice in Kirinyaga County. Other areas have large farms with wheat and flowers especially in Laikipia towards Timau. The project area receives adequate rainfalls save for Isiolo and some parts within the counties receive low rainfall. Topography of the proposed project area is characterized by undulating hills, gentle slope to slopy areas and very flat areas in the rice fields. Most soils are rich and well drained except for Mwea County.

As already noted the project presents various benefits but also will have some negative impacts that must be addressed/ mitigated. The potential negative environmental and social impacts during construction and implementation of the project include; transformer oil leakages, electric shocks, electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. To address the negative impacts, an Environmental and social management plan (ESMP) has been developed to guide in mitigating the said negative impacts. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified. The ESMP developed will ensure compliance with regulatory authority stipulations and the financier's guidelines.

In conclusion, the last mile connectivity project will accrue benefits that exceed the negative impacts. However, for the company to ensure sustainable development takes place, the implementation of the ESMP is vital and the management must see to it that the contractors follow suite by observing and implementing the ESMP to the letter. The project will result in great economic, environmental and social benefits both at individual level, communal level and the country at large.

## **7.1 ENVIRONMENTAL AND SOCIAL SCREENING REPORT FOR LAST MILE CONNECTIVITY PROJECT: LOT 7.**

### **7.2 INTRODUCTION AND PROJECT BRIEF**

Over the last 10 years the country has seen a steady growth in electricity connections both in urban and rural areas. This has been driven by a combination of various factors chief among them being the incoming of a new political dispensation in 2002. The new government demanded that the company accelerate connectivity. This called for a totally new approach in the connectivity model within KPLC. In 2004, a new connection policy was developed to address this new challenge. A new model geared at increasing electricity access was introduced and the cost of connection to customers on low voltage was standardized for single phase and three phase to a minimum of KShs. 32,480 and KShs. 44,080 respectively. This saw an unprecedented increase in connections.

The Government has pledged to stimulate economic growth and accelerate job creation to improve the economic wellbeing of Kenyans. Among the many interventions to achieve this is expansion of the power distribution system to be within reach and thus enable more Kenyans connect to the grid at affordable cost and hence initiate economic activities at the micro-economic level. In order to accelerate the connectivity rate and achieve annual connections in the range of 1.3 million, it was proposed that a new model be adopted that would help overcome bottlenecks in the connectivity pipeline.

The strategy proposed is to extend the distribution network to as near the customer as possible using external or government funding. This can initially be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization). The project is popular known as Last Mile Connectivity Project (LCMP).

#### **7.2.1 PROJECT DESCRIPTION**

Data collected from KPLC the company shown potential to connect approximately 472,002 households that are within 600 meters of the transformers through individual service lines. Of these households, some will be within developed areas, majority of who will be reached by a service cable drop or a pole or two, whereas in the expansive zones in the peri-urban and rural areas, construction of a 600m low voltage line for a single customer will not be an exception. The main project component focuses on the expansion of the low voltage lines from the existing distribution transformers to customers as well as the installation of pre-paid energy meters.

The project consists of the following components:

- ❖ Construction of the low voltage network and installation of energy meters;
- ❖ Project supervision and management during the project implementation;
- ❖ Environmental and social management to ensure the project is implemented in an environmental and social sustainable manner
- ❖ The project involves connection of customers within 600m of existing transformers.
- ❖ Of these households, some will be within developed areas, majority of who will be reached by a drop or a pole or two.
- ❖ The project beneficiaries will include individuals at household level, commercial enterprises in market centres and public institutions such as learning institutions, health facilities and administrative offices.

### **7.2.2 IMPORTANCE/BENEFITS OF LMCP**

The Last Mile Connectivity project is aimed to support the Government's initiatives of ensuring increased electricity access to Kenyans, particularly among the low income groups. The existing distribution transformers shall be exploited to the maximum through extension of the low voltage network to reach households located in the vicinity of these transformers.

The proposed Last Mile Connectivity Project will provide a milestone in spurring social and economic development in the country and will greatly help in achieving the objectives of the Vision 2030. Some of the socio-economic benefits expected to accrue from the project includes but not limited to:-

#### **Employment opportunities**

During implementation of the project various employment opportunities will be available. These include building of the service lines and wiring of individual houses. Given the magnitude of the project and number of connections envisaged, this project will create a considerable number of job opportunities across the country. This will go a long way in easing unemployment in the nation while the new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy.

#### **Education**

Access to electricity at the household level and schools will lead to betterment of education services. Children will have opportunity to extend their study time because of better lighting system at home and in schools. Further, access to power will facilitate development and equipping of Laboratories in schools, promote use of laptops as well as introduction of ICT.

#### **Reduction of pollution associated with use of thermal power, kerosene and wood fuel:**

Electricity supplied from National Grid would ensure less or no people use diesel generator sets for domestic power needs like pumping water, reduced reliance on kerosene both for lighting and cooking and will be an alternative to wood fuel and charcoal because of better and effective use of electrical appliances like cookers and electric irons. Consequently, this results in less carbon dioxide being released to the environment while less use of charcoal means reduced destruction of forests which will go a long way in conserving the environment.

#### **Improved standard of living**

The implementation of this project will result in connecting about 1.2 million customers to the national grid. Access to electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridges, television sets, washing machines to mention but a few. Use of electricity for lighting implies that the people will not be exposed to smoke arising from use of tin lamps which predisposes people to respiratory diseases.

#### **Opportunity for business development**

Availability of power for more customers provides opportunities to establish small micro enterprises such as salons, barber shops, charging of phones, welding, baking, use of electric sewing machines, agribusiness like poultry farming among others. The incomes earned by these people will create demand for other goods and services hence promoting accelerated growth in the economy.

#### **Increase in Revenues**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC. These revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results to improvement in service provision by the government to its citizens.

### **Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes while other people are able to use electric fences.

### **Communications**

Improved communication amongst the communities and connectivity to global facilities through internet, mobile technology etc All powered by electricity.

### **Urban-rural migration**

The expected convenient lifestyle created by this electrification project will facilitate urban-rural migration which may eventually contribute to more productivity in foodstuffs and poverty eradication/reduction and improved habitation in the rural areas rather than the slums in the urban areas

### **Improved gender relations at homes and communities**

Most tensions within families and communities revolve around resources, overwhelming tasks, time burdens and low quality of lives. With electricity, significant improvement of life will be evident – mechanized tasks and efficiency; time burdens will be significantly reduced – leading to investments in more income productive activities; leisure activities will be more readily available, e.g. television and radio. Women's access to information will be greatly enhanced and empowerment facilitated through increased media access.



## **7.3 BASELINE INFORMATION OF THE COUNTIES UNDER LOT 7**

Lot 7 consists of eight counties most of which are in mount Kenya region according to the company's administrative structure. The counties covered include; Nyeri, Laikipia, Isiolo, Meru, Tharaka Nthi, Embu, Kirinyaga and Muranga. This chapter describes in short baseline information of the counties.

### **7.3.1 Baseline Information of Muranga County**

#### **Location and size**

Murang'a County is one of the five counties in Central region of the Republic of Kenya. It is bordered to the North by Nyeri, to the South by Kiambu, to the West by Nyandarua and to the East by Kirinyaga, Embu and Machakos counties. It lies between latitudes 0o 34' South and 107' South and Longitudes 36o East and 37o 27' East. The county occupies a total area of 2,558.8Km<sup>2</sup>.

#### **Topography**

The county lies between 914m above sea level (ASL) in the East and 3,353m above sea level (ASL) along the slopes of the Aberdare Mountains in the West. The highest areas in the west have deeply dissected topography and are drained by several rivers. All the rivers flow from the Aberdare ranges to the West, South Eastward to join Tana River.

The geology of the County consists of volcanic rocks of the Pleistocene age and basement system rock of Achaean type. Volcanic rocks occupy the western part of the county bordering the Aberdare's while rocks of the basement system are in the eastern part. Porous beds and disconformities within the volcanic rock system form important aquifers, collecting and moving ground water, thus regulating water supply from wells and boreholes.

The topography and geology of the county is both an asset and liability to the county's development. The highest areas form the rain catchment areas from where most of rivers draining the county originate. The terrain is dissected creating the menace of landslides and gulley erosion. The numerous streams and valleys necessitate the construction of numerous bridges to connect one ridge to the other; construction and maintenance of roads are therefore made difficult and expensive.

#### **Climate**

The County is divided into three climatic regions: The western region with an equatorial type of climate, the central region with a sub-tropical climate and the eastern part with semi-arid conditions. The long rains fall in the months of March, April and May. The highest amount of rainfall is recorded in the month of April, and reliability of rainfall during this month is very high. The short rains are received during the months of October and November. The western region, Kangema, Gatanga, and higher parts of Kigumo and Kandara, is generally wet and humid due to the influence of the Aberdares and Mt. Kenya. The eastern region, lower parts of Kigumo, Kandara, Kiharu and Maragwa constituencies receive less rain and crop production requires irrigation.

#### **Soils**

Variations in altitude, rainfall and temperature between the highland and lowland coupled with the differences in the underlying geology of both volcanic and basement system rocks give rise to a variety of soil types. Highland areas

have rich brown loamy soils suitable especially for tea. Soils in the lower areas are predominantly black cotton clay soils with seasonal impeded drainage.

### **Population**

The 2009 Census recorded a population of 936,228 persons for Murang'a County consisting of 451,751 males and 484,477 females and a growth rate of 0.4 per cent per annum. This population is projected to rise to 966,672 persons in 2017. The male: female sex ratio for the county is 48:52. The higher female population in relation to male is attributed to high male emigration to other counties and towns in search of employment and business opportunities.

### **Vegetation**

The county has five indigenous gazetted forests covering a total area of 254.4 Km<sup>2</sup>. They are: Gatara, Karua, Kimakia, Kiambicho and Wanjerere forests. These forests are divided into two zones; the tropical montane forest zone located along the Aberdare ranges and the semi-arid forest zone located in the lower parts of the county. There are also exotic trees planted within the homesteads including gravelia, Kay apple, blue gum, Euphobia, Nandi flame, mango, avocado, croton, umbrella, nuts, cypress, jacaranda, lutea macamia, banana, Lantana camara and other shrubs.

## **7.3.2 Baseline Information of Meru County**

### **Physical and Topographic Features**

The county's position on the eastern slopes of Mt Kenya and the equator has highly influenced its natural conditions. Altitude ranges from 300m to 5,199m above sea level. This has influenced the atmospheric conditions leading to a wide variety of microclimates and agro-ecological zones.

The drainage pattern in the county is characterized by rivers and streams originating from catchment areas such as Mt. Kenya and Nyambene ranges in the North. The rivers cut through the hilly terrain on the upper zones to the lower zones and drain into the Tana and UasoNyiro Rivers.

The rivers form the main source of water for both domestic and agricultural use

### **Ecological Conditions**

The county has varied ecological zones ranging from upper highlands, lower highlands, upper midlands and lower midlands. This has greatly influenced the major economic activities. The upper highlands zones covers majority of the county's area ranging from Imenti South, Imenti Central, Imenti North, Tigania East, Tigania West, Igembe North, Igembe Central and Igembe South constituencies. The lower midland zones are only found in lower parts of Buuri and Tigania which borders Isiolo County.

### **Climatic conditions**

The county receives moderate amounts of rainfall except for the lower parts of Buuri area bordering Isiolo County which are arid. The distribution of rainfall ranges from 300mm per annum in the lower midlands in the North to 2500mm per annum in the South East. Other areas receive on average 1250mm of rainfall annually. There are two seasons with the long rains occurring from mid-March to May and short rains from October to December. Temperatures range from a low of 8°C to a high of 32°C during the cold and hot seasons respectively.

### **Population**

The county has a population growth rate of 2.1 per cent. The 2009 population census stood at 670,656 male and 685,645 female respectively totalling to 1,356,301 indicates that males s2012 projected population of the County

stood at 1,443,555, which consist of 713,801 males and 729,754 females. The county population is projected to be 1,536,422 in 2015 and 1,601,629 in 2017. The growth in population will strain the available resources such as land.

### **Energy Access**

The main source of energy for cooking by household is wood fuel and charcoal which accounts for 86.1 per cent and 6.6 per cent respectively. The number of household connected to electricity is 13.6 per cent; those using paraffin are 4.5 per cent, gas 2.4 per cent, biogas 0.1 per cent and solar 6.6 per cent. Major public and private institutions are connected to national grid but the major challenge for the county is how to connect the over 85 per cent households with electricity

### **Vegetation**

The county forest cover totals 1,776.1 km<sup>2</sup>, which is 25.6 per cent of the total county area. There are ten gazetted forest, with Mt Kenya and Imenti forest being the major ones and occupying 63,358 ha in the county. The ungazetted forests are 19 with 345 ha coverage. Encroachment of forested areas has resulted to major human wildlife conflicts in the region such as destruction of farm crops by elephants. The aspect of agro-forestry is highly practiced within the county, with the Forest department giving permits to farmers to ensure they get their livelihood as well as conserve the forest. The squatters in Timau area are major beneficiaries of agro-forestry activities in the Mt. Kenya forest. The two broad categories of forest are natural forest and manmade forests. The county has Mt Kenya and Imenti forests which are natural forests with rich biodiversity. Conventional tree planting is mainly incorporated in the farms and along the river banks.

## **7.3.3 Baseline Information of Kirinyaga County**

### **Administrative and Political Units**

The county borders Nyeri County to the North West, Murang'a County to the West and Embu County to the East and South. It covers an area of 1,478.1 square kilometres. Administratively, the county is divided into five sub countnamely; Kirinyaga East, Kirinyaga West, Mwea East, Mwea West and Kirinyaga Central.

The county has four constituencies namely Mwea, Ndia, Kirinyaga Central and Gichugu. Mwea Constituency comprises of two districts namely Mwea East and Mwea West Districts, while the other constituencies form Kirinyaga West, Kirinyaga Central and Kirinyaga East districts respectively. Kirinyaga County has twenty (20) county assembly wards.

### **Physical and Topographic Features**

The county lies between 1,158 metres and 5,380 metres above sea level in the South and at the Peak of Mt. Kenya respectively. Mt. Kenya which lies on the northern side greatly influences the landscape of the county as well as other topographical features.

The mountain area is characterized by prominent features from the peak, hanging and V-shaped valleys. The snow melting from the mountain forms the water tower for the rivers that drain in the county and other areas that lie south and west of the county. The Snow flows in natural streams that form a radial drainage system and drop to rivers with large water volumes downstream.

### **Ecological Conditions**

The county can be divided into three ecological zones; the lowland areas that fall between 1158 metres to 2000 metres above sea level, the midland areas that lie between 2000 metres to 3400 metres above sea level and the

highland comprising areas of falling between 3400 metres to 5380 metres above sea level. The lowland area is characterized by gentle rolling plains that cover most of Mwea constituency. The midland area includes Ndia, Gichugu and Kirinyaga Central constituencies. The highland area covers the upper areas of Ndia, Gichugu and Central constituencies and the whole of the mountain area.

The county is well endowed with a thick, indigenous forest with unique types of trees covering Mt. Kenya. Mt. Kenya Forest covers 350.7 Km<sup>2</sup> and is inhabited by a variety of wildlife including elephants, buffaloes, monkeys, bushbucks and colourful birds while the lower parts of the forest zone provides grazing land for livestock. The rich flora and fauna within the forest coupled with mountain climbing are a great potential for tourist activities.

The county has six major rivers namely; Sagana, Nyamindi, Rupingazi, Thiba, Rwamuthambi and Ragati, all of which drain into the Tana River. These rivers are the principal source of water in the county. The water from these rivers has been harnessed through canals to support irrigation at the lower zones of the county especially in Mwea. The rivers are also important sources of domestic water through various water supply schemes. The rapid populating increase is however constraining many of the schemes since the designs were meant to cater for a smaller population. There is therefore a dam being constructed in the county at Gichugu Constituency as well as rehabilitation and expansion of Mwea irrigation scheme which will address some of these problems. The water resources, if optimally harnessed, can boost agricultural production in the county and contribute to sustained economic development and poverty reduction.

The geology of the county consists of volcanic rocks, which influence formation of magnificent natural features such as “God’s bridge” along Nyamindi River, and the seven spectacular water falls within the county.

### **Climatic Conditions**

The county has a tropical climate and an equatorial rainfall pattern. The climatic condition is influenced by the county position along the equator and its position on the windward side of Mt Kenya. The county has two rainy seasons, the long rains which average 2,146 mm and occur between the months of March to May and the short rains which average 1,212 mm and occur between the months of October to November. The amount of rainfall declines from the high altitude slopes of Mt. Kenya towards the Semi-arid zones in the eastern part of Mwea constituency. The temperature ranges from a mean of 8.10C in the upper zones to 30.30C in the lower zones during the hot season.

### **Population density and distribution**

Generally, there are two types of settlements in the county namely; clustered settlement and scattered settlement. Clustered settlement patterns are primarily found around towns and irrigation schemes where those who work in the rice fields have settled. Scattered settlement patterns are found mostly in the lower zones of the county where land sizes are large. Ecological and climatic factors influence settlement in upper zones where land is fertile and receives more rainfall. Another factor that influences settlement is the type of farming practiced in the upper zone where cash crops such as tea and coffee attract a high population because residents have a higher preference for cash crops farming compared to food crops. Another reason for clustered settlement is the growth of towns such as Kerugoya, Sagana and Wang’uru where there are many migrant workers and business people.

There are also marked variations in settlement patterns in the constituencies within the county. Mwea constituency exhibits two types of settlements. There is a clustered settlement in Wang’uru town and Kagio urban centre and scattered settlement occupying the lower arid parts of the constituency. Ngariama ranch is also a fast growing area owing to the government programme of re-settling the landless in the area. Settlements in Ndia constituency are concentrated in Sagana, Baricho and Kibirigwi towns and in the upper part of the constituency where coffee and tea

are grown. There is no marked variation in settlement pattern in Gichugu, even though the upper part of the constituency are more populated than the lower part.

The population density for the County was 488 people per Km<sup>2</sup> in 2012 but expected to increase to 524 people per Km<sup>2</sup> in 2017.

### **Energy Access**

All the major towns and urban centres in the county such as Kerugoya, Sagana, Wang'uru, Kianyaga, Kimunye, Kagio, and Kagumo are connected with electricity, however the major source of energy in the county is firewood which is used by 105,756 households followed by charcoal and gas used by 59,579 households and 28,987 households respectively. There are only 11,652 rural homes with electricity and 40 trading centres are not connected to the national grid.

### **Vegetation**

Main Forest Types and size of forests. The main types of forests in the county are indigenous natural forests which cover an area of 35,876 Ha, plantations which cover 1,540 Ha, bamboo forests which cover 7,500 Ha, bush land/grassland forests that cover 6,956 Ha and tea zone forests which cover 290 Ha. The main types of forests in the county are indigenous natural forests which cover an area of 35,876 Ha, plantations which cover 1,540 Ha, bamboo forests which cover 7,500 Ha, bush land/grassland forests that cover 6,956 Ha and tea zone forests which cover 290 Ha.

There are 7 forests in Kirinyaga County with 5 gazetted forests namely, Mt. Kenya forest covering 35,043 Ha; Njukiini west forest covering an area of 570.2 Ha; Murinduku forest covering an area of 194.2 Ha; Kariani forest covering an area of 24.28 Ha and Kamuruana forest with an area of 23 Ha. There are also 2 non gazetted forests namely Karimandu forest covering an area of 12 Ha and Kerugoya urban forest covering an area of 10 Ha. The main products from these forests are timber, poles, fuel wood, fruits and honey.

## **7.3.4 Baseline Information of Nyeri County**

### **Physical and Topographic Features**

The main physical features of the county are Mount Kenya (5,199m) to the east and the Aberdare ranges (3,999m) to the west. The western part of the county is flat, whereas further southwards, the topography is characterized by steep ridges and valleys, with a few hills such as Karima, Nyeri and Tumutumu. These hills affect rainfall patterns, thus influencing the mode of agricultural production in some localized areas.

The major rivers found in the county are Sagana, Ragati, Chania, Gura and Nairobi. If well tapped, these rivers and the numerous streams can make the county self-sufficient in surface and sub-surface water resources for domestic, agriculture and industrial development.

### **Ecological Conditions**

The county has two forest eco-systems, namely Aberdare and Mt. Kenya. It also has other isolated forested hills under the management of County Government such as Karima, Nyeri and Tumutumu. Apart from being a source of traditional forest products such as timber, fuel, fodder, herbal medicine among others, these forests play vital roles which include; maintenance of water cycle, wildlife habitat and are also repository of a wide range of biodiversity. Since soil conditions in the county are similar, agricultural productivity is influenced by rainfall intensity and temperature conditions.

### **Climatic Conditions**

The county experiences equatorial rainfall due to its location within the highland zone of Kenya.

The long rains occur from March to May while the short rains come in October to December; occasionally this pattern is disrupted by abrupt and adverse changes in climatic conditions. The annual rainfall ranges between 1,200mm-1,600mm during the long rains and 500mm-1,500mm during the short rains. In terms of altitude, the county lies between 3,076 meters and 5,199 meters above sea level and registers monthly mean temperature ranging from 12.8°C to 20.8°C.

### **Administrative and Political Units**

Nyeri County is divided into various administrative and political units. The administrative units are crucial for the management and service delivery to the public. The political units are represented by elected persons such as the members of National and County assemblies.

Nyeri County is divided into various administrative units. These units are the sub-counties, divisions, locations and sub-locations. The county is divided into eight administrative sub counties that includes; Kieni East, Kieni West, Mathira East, Mathira West, Nyeri Central, Mukurweini, Tetu and Nyeri South. Kieni East Sub County is the largest with a land size of 817.1 Km<sup>2</sup> while Mathira East is the smallest with an area of 131 Km<sup>2</sup>. Mathira East has got the highest number of locations and sub locations while Nyeri Town has got the least.

### **Population**

The population growth rate in the county is 0.48 per cent against the national average of 3.0 per cent and 1.6 per cent for the region. The county has a population of 707,003 comprising of 346,311 males and 360,692 females in 2013 as projected from the 2009 population and housing census.

The highest and the lowest population for 2013 are the cohort of age 10-14 and 75-79 respectively. Ages 10-14 represent 11.4 per cent, while 75-79 comprise of just one per cent of the total population. Over 60 per cent of the population is below 30 years, portraying a youthful population which is more productive.

### **Energy Access**

The county is poorly supplied with electricity with only 26.3 per cent (2009 population and housing census) of the households connected. A total of 112 trading centers and 170 secondary schools are connected with electricity. There are plans to increase the percentage of households and institutions connected with electricity through up scaling of the rural electrification programme. The main sources of energy are; firewood, paraffin, electricity, gas, charcoal, biomass residue, biogas and others. Firewood is widely used with 72.2 per cent of the households using it as main cooking fuel. Markets and Urban Centres. In Nyeri County, there are 192 trading centers with 14,010 registered retail traders and 274 wholesalers. Most of the traders are small scale dealing with locally produced merchandise for household consumption

### **Vegetation**

**Main Forest Types and Size Of Forests** The county has a total of 12 gazetted forests mainly of indigenous and plantation trees. The major forests are found within the Aberdare ranges and Mt. Kenya with the size of gazetted forest being 861.7 Km<sup>2</sup>. The ungazetted forests are managed by the county government. There are also a number of important hills, with a combination of indigenous and plantation flora (Karima, Tumutumu, Nyeri etc).

### **7.3.5 Baseline Information of Laikipia County**

#### **Position and Size**

Laikipia County is one of the 14 counties within the Rift Valley region and one of the 47 counties in the Republic of Kenya. It borders Samburu County to the North, Isiolo County to the North East, Meru County to the East, Nyeri County to the South East, Nyandarua County and Nakuru County to the South West and Baringo County to the West. It lies between latitudes 0°18" and 0°51" North and between longitude 36°11" and 37°24' East. It covers an area of 9,462km<sup>2</sup> and is ranked as the 15th largest county in the country by land size.

#### **Administrative Units and Political Units**

Laikipia County is one of the 47 counties in the country. It comprises of three administrative sub-counties namely Laikipia East, Laikipia North, and Laikipia West (the sub county units are geographically equivalent to the constituencies).

The sub county headquarters are at Nanyuki, Doldol, Rumuruti and Nyahururu respectively. The county is further sub-divided into 15 divisions, 51 locations and 96 sub-locations respectively. The Laikipia East subcounty lies to the east, Laikipia North to the North, Laikipia Central to the south east, Nyahururu to the south west and Laikipia West to the west of the county.

The county has three sub county units namely Laikipia East constituency, Laikipia West Constituency and Laikipia North constituency. The county has 15 electoral wards, 5 in Laikipia East, 6 in Laikipia West and 4 in Laikipia North constituencies.

#### **Physical and Topographic Features**

The altitude of Laikipia County varies between 1,500 m above sea level at Ewaso Nyiro basin in the North to a maximum of 2,611 m above sea level around Marmanet forest. The other areas of high altitude include Mukogodo and Ol Daiga Forests in the eastern part of the county at 2,200 m above sea level. The county consists mainly of a plateau bordered by the Great Rift Valley to the

West, the Aberdares to the South and Mt. Kenya massifs to the South East all of which have significant effects on the climatic conditions of the county. The level plateau and the entire county drainage is dominated by the Ewaso Nyiro North basin with its tributaries which have their sources in the slopes of the Aberdares and Mt. Kenya and flow from South to North. The tributaries include Nanyuki, Timau, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok, Pesi and Ngobit Rivers. The flow of these rivers matches the county's topography

which slopes gently from the highlands in the South to the lowlands in the North. The rivers determine to a large extent the settlement patterns, as they are a source of water for human and livestock consumption as well as irrigation activities. There are two major swamps in the county namely: Marura Swamp which runs along the Moyot valley in Ol Pajeta Ranch and the Ewaso Narok Swamp around Rumuruti Township. The swamps have some agricultural potential if properly protected and managed. However, they are currently under pressure due to encroachment for human settlement and agricultural production. The South-western part of the county has the highest potential for forestry and mixed farming due to its favorable climatic conditions. These conditions have resulted in some areas especially around Marmanet being the most densely populated. The eastern and northern parts of the county are suitable for grazing while the plateau lying in the central and the northern parts of the county is suitable for ranching.

#### **Ecological Conditions**

The county is endowed with several natural resources. These include pasture rangeland, forest, wildlife, undulating landscapes and rivers among others. The high and medium potential land constitutes 20.5 per cent of the total

county's land area while the remaining 79.5 per cent is low potential hence unsuitable for crop farming. The major soils in the county are mainly loam, sand and clay. Black cotton soil which has inherent fertility spreads in most parts of the plateaus. The dark reddish brown to red friable soils and rocky soils are mainly found on the hillsides. The limiting factors to agricultural production are the poor weather conditions characterized by frequent dry spells and poor rainfall distribution.

The county has gazetted forest area totalling to 580 Km<sup>2</sup> comprising of both the indigenous and plantation forests. The indigenous forests include Mukogodo and Rumuruti which are under threat from encroachment. The plantation forests include Marmanet and Shamaneik. Laikipia County is richly endowed with wildlife, which is widely distributed in the semi arid areas extending to Samburu, Meru and Mt. Kenya wildlife corridors/ecosystems. Most of the wildlife is found in the large scale private ranches, which occupy over 50 per cent of the total area of the county. The rest is found in group ranches predominantly owned by the Maasai, in the gazetted forests of Mukogodo, Rumuruti and Marmanet and the other uninhabited tracts of land in the county. Though this is an important natural resource, it has been a source of conflict between the farming and pastoralist communities. Among the major wildlife species found in this county are the lion, leopard, elephant, buffalo and the rhinoceros though there are other smaller species also in abundance particularly the African wild dog and gazelles

### **Climatic Conditions**

The county experiences a relief type of rainfall due to its altitude and location. The annual average rainfall varies between 400mm and 750mm though higher annual rainfall totals are observed on the areas bordering the slopes of Mt. Kenya and the Aberdare Ranges. North Marmanet receives over 900mm of rainfall annually; while the drier parts of Mukogodo and Rumuruti receive slightly over 400mm annually. The plateau receives about 500mm of rain annually, while Mukogodo Forest receives an average rainfall of about 706mm annually. The northern parts of the county represented by Dol Dol receive lower rainfall compared to the southern parts such as Nyahururu

The seasonal distribution of rainfall in the county is as a result of the influences of Northeast and South trade winds, the Inter-Tropical Convergence Zone and the Western winds. The long rains occur from March to May while the short rains are in October and November. The parts neighbouring Aberdare Ranges and Mt. Kenya form an exception to this pattern as they receive conventional rainfall between June and August because of the influence of the trade winds. The annual mean temperature of the county ranges between 16° C and 26°C. This is as a result of relief and trade winds resulting to cooler conditions in eastern side which is near Mt. Kenya and hotter in the low-lying areas in the North. The western and southern parts of the county have cooler temperatures with the coolest month being April and the hottest month being February. The average duration of sunshine is between ten and twelve hours daily.

### **Population size and composition**

According to the 2009 KNBS Housing and Population Census, the total population for the county stood at 399,227 people of which 198,625 were males and 200,602 were females. This population is projected to be 427, 173 persons in 2012. It is also expected to rise to 457,514 and 479,072 in 2015 and 2017 respectively. The ratio of men to women stands at almost one to one. The proportion of women is higher than that of men in all the age cohorts except for those in the range of five to 19 years. It therefore means that the county will require to look into the special needs of women as they form the bigger proportion of the population.

### **Vegetation**

There are six gazetted and one non gazetted forests in Laikipia covering a total area of 580 square kilometers. Mukogodo is one of natural forests within the county. Artificial forests include Lariak, Marmanet, Ng'arua, Rumuruti



and Shamaneik. Part of the forests especially in Ng'arua and Rumuruti have been excised for agricultural and settlement purposes. Recovery of farmland has been successful through farm forestry. However, deforestation, forest fires and grazing have contributed to gradual depletion of the forest cover over the years

### **7.3.6 Baseline Information of Isiolo County**

#### **Location and size**

Isiolo County borders Marsabit County to the north, Samburu and Laikipia counties to the west, Garissa County to the south east, Wajir County to the north east, Tana River and Kitui counties to the south and Meru and Tharaka Nithi counties to the south west as shown in Figure 1.1. Isiolo town lies 285 kilometres north of Nairobi, the Capital City of Kenya. The county has an area of 25,700 Km<sup>2</sup>.

#### **Administrative and Political Units**

The County has three sub-counties, ten wards, 22 locations and locations and 43 sub locations.

Isiolo sub-county has the highest number of wards (five) while Garbatulla has the highest number of locations (ten) and sub-locations (19). Merti sub-county is the largest area of 12,612 Km<sup>2</sup> while Isiolo sub-county is the smallest with an area of 3,269 Km<sup>2</sup> Figure 3 shows the county's administrative boundaries.

The County has two constituencies and ten wards. The constituencies are Isiolo North and Isiolo South. Isiolo North Constituency has seven wards which are Wabera, Bulla Pesa, Chari, Cherab, Ngare Mara, Burat and Oldo/Nyiro. Isiolo South Constituency has three wards namely Sericho, Kinna and Garbatulla. Table 2 below shows the county's electoral wards by constituencies and corresponding ward population

#### **Population Size and Composition**

The county's population stood at 143,294 as per the 2009 Population Census comprising of 73,694 males and 69,600 females. The population was projected to rise to 159,797 by the end of 2012 and 191,627 by 2017. The population consists largely of Cushites communities (Oromo-speaking Boran and Sakuye) and Turkana, Samburu, Meru, Somali and other immigrant communities from other parts of the country. The planned massive capital investments under development of the LAPSET Corridor including International Airport, Resort City, and oil storage facilities are expected to boost rapid population growth in the county.

#### **Physical &Topographic Features**

Most of the land in the county is flat low lying plain resulting from weathering and sedimentation. The plains rise gradually from an altitude of about 200 M above sea level at Lorian swamp (Habaswein) in the northern part of the county to about 300M above sea level at Merti Plateau.

There are six perennial rivers in the county namely; Ewaso Ngiro North, Isiolo, Kinna, Bisanadi, Likiundu and Liliaba rivers. Ewaso Ngiro North River has its catchments area in the Aberdare ranges and Mount Kenya. It also serves as a boundary mark between Isiolo North and Isiolo South constituencies. Isiolo River originates from Mount Kenya and drains into Ewaso Ngiro River. Kinna and Bisanadi rivers are found in the Southern part of the county and drains into the Tana River. Likiundu and Liliaba originate from Nyambene hills and drains into Ewaso Ngiro North River.

The county has a combination of metamorphic rocks and other superficial rock deposits. Tertiary rocks (Olive Basalt) are found in the northern parts of the county, where oil exploration has been going on. The areas covered with tertiary marine sediments that have a high potential for ground water harvesting.

## **Ecological Conditions**

The county is classified into three ecological zones namely Semi-Arid, Arid and the very Arid. Semi Arid zone covers part of Wabera Ward, Bulla Pesa Ward and some parts of Burat Ward in Isiolo North Constituency. It also covers some Southern part of Kinna Ward in Isiolo South Constituency. This zone covers five percent of the total area of the county and receives rainfall ranging between 400 – 650 mm annually. The relatively high rainfall is due to influence of Mount Kenya and Nyambene Hills in the neighbouring Meru County. The vegetation in this zone is mainly thorny bush with short grass. Arid zone covers Oldo/Nyiro, Ngare Mara and some parts of Burat Wards in Isiolo North Constituency and whole of Garbatulla Ward and northern part of Kinna Ward in Isiolo South Constituency. The zone covers 30 percent of the total area of the county. Rainfall received here ranges between 300 mm and 350 mm annually and supports grassland and few shrubs. Severe arid zone covers Chari, Cherab, parts of Oldo/Nyiro Ward in Isiolo North Constituency and Sericho Ward in Isiolo South Constituency. These areas account for 65 percent of total area of the county. Rainfall received here ranges between 150 and 250 mm annually. The area is barren and very hot and dry most of the year.

## **Climatic Conditions**

The county is hot and dry in most months in the year with two rainy seasons. The short rains season occurs in October and November while the long rain occurs between March and May. The rainfall received in the County is usually scarce and unreliable posting an annual average of 580.2 mm. The wettest months are November with an average of 143 mm of rainfall and April with an average of 149 mm of rainfall. The erratic and unreliable rainfall cannot support crop farming which partly explains the high food insecurity and food poverty levels recorded in the county. Rain fed crops are grown in Bulla Pesa, Wabera and Kinna wards where the black cotton soil retains moisture long enough to make crops mature.

High temperatures are recorded in the county throughout the year, with variations in some places due to differences in altitude. The mean annual temperature in the county is 29 degrees centigrade. The county records more than nine hours of sunshine per day and hence has a huge potential for harvesting and utilization of solar energy. Strong winds blow across the county throughout the year peaking in the months of July and August. The strong winds provide a huge potential for wind generated energy.

## **Population Density and Distribution by Constituency**

Isiolo North Constituency has a total population of 100,176 as per 2009 census report distributed as follows: Wabera ward with a population of 17,431; Bulla Pesa ward 22,722; Burat ward 18,774; Chari ward 4,781; Cherab ward 15,560; Ngare Mara ward 5,520; and Oldo/Nyiro ward 15,388. The 2009 census results also showed that Isiolo North Constituency had a population density of 6 persons per square Kilometre.

Isiolo South Constituency had a total population of 43,118 distributed as follows: Garbatulla ward with a population of 16,401; Kinna ward 14,618; and Sericho ward 12,099. The Constituency had a population density of four persons per Km2. There is dire need to have strategic plans and spatial plans for the two constituencies.

## **Energy Access (Main Sources of Energy, Electricity Coverage)**

The county's main source of energy is wood fuel. Over 70 percent of the households rely on fire wood as their main source of power. This has led to over-harvesting of trees primarily for charcoal causing extensive land degradation in the county. Of the 31,326 households in the county, only 2,500 have access to electricity. 85 percent of the trading centres, most schools and health facilities are not connected with electricity. Provision of clean sources of alternative

energy will be critical in slowing down the cutting of trees. It will further save the time spent especially by women and girls in fetching wood fuel for domestic purposes.

### **Vegetation**

Currently two forests are earmarked for gazettelement in the county, namely Gotu and Kipsing forests. The types of trees in found are those suitable for dry areas. These are mainly *Acacia Propopis* and *Cassiasis* species.

## **7.3.7 Baseline Information of Embu County**

### **Location and size**

Embu County covers an area of 2,818 Km<sup>2</sup>. It borders Kirinyaga County to the West, Kitui County to the East, Tharaka-Nithi County to the North and Machakos County to the South.

### **Administrative and political units**

Embu County is divided into five administrative sub-counties: Embu West, Embu North, Embu East, Mbeere South and Mbeere South. These sub-counties are further divided into 11 divisions, 42 locations and 111 sub-locations. The county has four parliamentary constituencies: Manyatta, Runyenjes, Mbeere North and Mbeere South.

### **Physical and Topographic Features**

Embu County slopes from North-West towards East and South-East with a few isolated hills such as Kiambere, Kianjiru and Kiang'ombe which rise above the general height and slope. The County is characterised by highlands and lowlands. It rises from about 515m above sea level at the Tana river basin in the East to over 4,570m above sea in the North West which is part of Mt. Kenya. Embu County is served by six major rivers;for of them, Thūci, Tana, Kīī and Rūvingasī which form part of the Embu County's boundaries.The other two rivers are Thiba and Īna. All these rivers are perennial. Between Embu town and Thūci river lies an area with an altitude ranging from 910m to 1,525m above sea level. The Southern part of the County is covered by Mwea plains. It then rises Northwards,culminating in hills and valleys to the Northern and Eastern parts.

### **Climatic Conditions**

The rainfall pattern is bi-modal with two distinct rainy seasons.Long rains occur between March and June while the short rains fall between October and December. Rainfall quantity received varies with altitude averaging to about 1067.5mm annually and ranging from 640mm in some areas to as high as 1,495mm per annum. At higher altitudes, (above 1700m), the pattern changes to tri-modal. Temperatures range from a minimum of 12 °C in July to a maximum of 30 °C in March with a mean of 21 °C. The extensive altitudinal range of Embu County influences temperatures that range from 20 °C to 30 °C. July is usually the coldest month with an average monthly temperature of 15 °C while September is the warmest month with an average monthly temperature rising to 27.1 °C. There is however localised climate in some parts of the County especially the Southern region due to their proximity to the Masinga, Kamburu, Gītaru, Kīndaruma and Kīambere dams.

### **Demographic characteristics**

The 2009 population census put the county's population at 516,212 (254,303 male; 261,909 female). The 2012 projected population based on a growth rate of 1.7% was 543,221 (267,609 male; 275,612 female). By 2015 the population is projected to grow to 571,645 (281,613 male; 290,033 female), and to 591,412 (291,348 male; 300,064 female) by 2017. The number of people employed was 295,565, which represented 91% of the total labour force based on the 2009 census. The projected county labour force at 2012 is 311,021 (152,734 male; 158,287 female) representing about 57 % of the county's population. The majority of the labour force is engaged in farming either

directly or indirectly. There is need to identify development strategies that will lead to the establishment of small-scale industries and other income-generating activities to absorb the labour force and enhance household incomes.

### **Vegetation**

There are four non gazetted forests in the county: Kiang'ombe, Kimeri, Kianjiru and Kiambere with a total area of 3,751 ha. Mount Kenya Forest, which is gazetted, occupies 20,879 ha in the county. The main forest products obtained include timber, poles, firewood, carvings, charcoal, posts, seedlings and honey.

## **7.3.8 Baseline Information of Tharaka Nithi County**

### **Location and Size**

Tharaka Nithi County covers an area of about 2,662.1 km<sup>2</sup>; including the shared Mt Kenya forest estimated to cover 360 km<sup>2</sup>. It is located in the upper Eastern region of Kenya and borders Embu County to the South and South West, Meru County to the North and North East, Kirinyaga and Nyeri Counties to the West and Kitui to the East and South East. The county lies between latitude 000 07' and 000 26' South and between longitudes 370 19' and 370 46' East. The County is approximately 2,662.1 Km<sup>2</sup>; including the shared Mt Kenya forest estimated to have 360Km<sup>2</sup> in Tharaka Nithi County.

### **Administrative and Political Units**

Tharaka Nithi County is divided into four (4) administrative sub-counties namely: Tharaka North, Tharaka South, Meru South and Maara. Tharaka North sub-county is the largest covering an area of 803.4 km<sup>2</sup>, while Maara is the smallest sub-county covering an area of 468.2 km<sup>2</sup>.

### **Ecological Zone and climatic conditions**

The county lies between altitudes 5,200m and 600m height above sea level. The county has 360 Km<sup>2</sup> forest cover within M.T. Kenya which serves as a water catchment area for Rivers, Tourist Attraction site, Source of fuel, fodder and Honey. Temperatures in the highland areas range between 14°C to 30°C while those of the lowland area range between 22°C to 36°C.

The county has a bi-modal rainfall pattern with the long rains between the months of April and June and the short rains between the months October to December. The county receives high rainfall of about 2,200mm in M.T Kenya Forest and low rainfall of about 500mm in Tharaka region. The high altitude areas experience reliable rainfall while middle areas of the county receive moderate rainfall. The lower regions receive low, unreliable and poorly distributed rainfall.

### **Physical and Topographical features**

The county has a number of Hills in its landscape, these includes: Kiera, Munuguni and Njuguni in Maara constituency, Kijege and Ntugi in Tharaka constituency. The topography of Chuka/Igambang'ombe and Maara constituencies is greatly influenced by the Mt. Kenya volcanic activity leading to formation of 'V' shaped valleys within which the main tributaries of River Tana flows originating from Mt. Kenya forest. The tributaries flowing eastwards are: - R.Thuuci, R.Maara(South and North), R.Nithi, R.Mutonga, Naka, and R.Ruguti. Tharaka on the other hand is traversed by several rivers, which originate from both the Mt. Kenya and Nyambene Hills, flowing eastwards as tributaries of Tana River. These include R.Mutonga, R.Thingithu, R.Kathita, R.Thanantu, R.Thangatha, R.Kithinu and R.Ura which provides water for irrigation in the moderately densely populated locations in parts of Tharaka. The region comprises of low, hilly, stony and sandy marginal lowlands with moderate forest cover.

**Demographic Characteristics**

According to 2009 population census, the county had a total population of 365,330 with an average population density of 150 persons per km<sup>2</sup>. The 2012 projected population based on a growth rate of 3% was 399,735 (195,256 males; 204,479 females) and to 478,570 (233,765 males and 244,805 females) by 2017. Furthermore, the total workforce was 202,887 representing 55.5% of the total population. In particular, 62,785 (31%) were employed in different sectors in the county. This implies that a very small proportion of the work force contribute to the county's economy. Therefore concerted efforts are needed to make use of the unemployed population whether skilled or unskilled labour.

**7.4 Environmental and Social Characteristics of Proposed Project Sites**

During the screening exercise the following information was observed and documented and it gives the characteristics of the project site generally as shown in the following page.

### 7.4.1 Environmental and Social Characteristics of Proposed Project Sites

SUB COUNTY	Population Density	Public Safety	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	General Ecological Setting	Comments
<b>NYERI COUNTY</b>									
NYERI TOWN	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Cypress Croton species Avocado Jacaranda Blue gum Kay apple Maize Sugar cane Banana Lukeworts Lantana camara	Gently sloping Flat	Loam	Avi-fauna	No sensitive environment but good vegetation cover	
MATHIRA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Croton species Avocado Blue gum Kay apple Maize Nuts Coffee Euphobia Mango Banana Lantana camara	Gently sloping Slopy	Red loam Sandy loam	Avi-fauna	No sensitive environment but good vegetation cover	
OTHAYA	High Medium	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Cypress Blue gum Crotons coffee Castor oil	Relatively flat Gently sloping	Red loam	Avi-fauna	No sensitive environment but good vegetation cover	

				Avocado Mangoes Napier grass Lantana camara Tea bushes					
TETU	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Cypress Blue gum Avocado Maize Wattle Nandi flame Crotons Banana Tea bushes Lantana camara Shrubs	Slopy	Red	Avi-fauna	Good vegetation cover	
MUKURWEINI	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Cypress Blue gum Avocado Mango Maize Coffee Nuts Wattle Nandi flame Crotons Banana Lantana camara Shrubs	Slopy	Red and dark loam	Avi-fauna	Good vegetation cover	
KIENI	Medium	Potential Electric shocks,	Public Commercial Agricultural	Gravelia Cypress Blue gum	Flat Relatively flat Gently sloping	Sandy loam Clay loam	Avi-fauna	Medium vegetation cover	

		electrocution and OSH hazards	Residential	Maize Wheat Kay apple Euphobia Nappier gras Wheat Indigenous species					
<b>MERU COUNTY</b>									
IGEMBE SOUTH	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Avocado Blue gum Crotons Maize Miraa Nappier gras Mango Banana Lantana camara Indigenous species	Slopy	Loam	Avi-fauna	Good vegetation but very slopy challenge for small cars	
IGEMBE CENTRAL	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Croton Castor oil Miraa Cypress Kay apple Mangoes Wattle Paw paw Nuts Avocado	Gentle sloping	Loam	Avi- fauna	Good vegetation cover	
IGEMBE NORTH	High	Potential Electric	Public Commercial	Blue gum Gravelia	Relatively flat Gently sloping	Loam Some	Mongoose Avi –fauna	Good vegetation	



		shocks, electrocution and OSH hazards	Agricultural Residential	Banana Croton Avocado Maize Nandi flame Castor oil Miraa Wattle		areas with rocks		cover	
IMENTI CENTRAL	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Mango Paw paw Croton Nandi flame Avocado Maize Coffee Cypress Wattle Acacia Castor oil Lantana camara Euphobia	Gentle sloping	Sandy loam Loam	Avi-fauna	Good vegetation cover Wetland within the vicinity of Tx	
TIGANIA EAST	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Mango Kay apple Sisal Cactus Jacaranda Croton Avocado	Relatively flat	Loam	Avi fauna	Good vegetation cover	

				Maize Cypress Acacia Lantana camara Euphobia					
TIGANIA WEST	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Whistling pine Jacaranda Mango Avocado Lutea macamia Paw paw Nandi flame Maize Coffee Lantana camara	Flat	Loam	Avi fauna	Good vegetation	
IMENTI SOUTH	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Mango Avocado Maize Coffee Jacaranda Lantana camara	Gently sloping Slopy	Loam	Avi fauna	Good vegetation	
IMENTI NORTH	High Medium	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Cypress Cassava Nandi flame	Slopy Flat	Loam	Avi fauna	Good vegetation cover including many bananas	

				Avocado Nuts Maize Coffee Guava Jacaranda Lantana camara				One Tx is near Meru national park	
BUURI	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Cypress Euphobia Jacaranda Avocado Maize Paw paw Acacia Coffee Kay apple	Relatively flat	Loam	Avi fauna	Good vegetation cover	
<b>ISIOLO COUNTY</b>									
ISIOLO NORTH	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Euphobia Acacia Macamia lutea Jacaranda Gravelia Cactus	Flat	Sandy loam Sandy	Avi fauna	Medium vegetation	
<b>LAIKIPIA COUNTY</b>									
LAIKIPIA NORTH	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Blue gum Crotons Nappier grass Maize Kale Wattle	Slopy	Sandy loam	Avi fauna	Good vegetation cover	

				Banana Whistling pine Ingenious species					
LAIKIPIA EAST	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Blue gum Crotons Nappier grass Cypress Maize Kale Wattle Banana Kay apple Whistling pine Ingenious species Bougainvillea Shrubs	Gently sloping Flat	Sandy loam	Avi fauna	Good vegetation cover	
<b>THARAKA NITHI COUNTY</b>									
MAARA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Coffee Blue gum Crotons Nappier grass Jacaranda Mango Maize Muvote Avocado Cassava Tea Nandi flame	Slopy	Sandy loam Red loam Red	Avi fauna	Good vegetation cover	
THARAKA	High Medium	Potential Electric	Public Commercial	Mango Acacia	Relatively flat Undulating	Sandy loam	Avi fauna	Medium vegetation	

		shocks, electrocution and OSH hazards	Agricultural Residential	Paw paw Baobab Euphobia Bougainvillea				cover	
IGAMBA NGOMBE	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Croton Sugar cane Avocado banana Blue gum Mango Coffee Cypress Tea	Sloppy Gently Sloping	Red loam	Avi fauna	Good vegetation cover	
<b>EMBU COUNTY</b>									
MANYATTA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Croton Sugar cane Avocado umbrella Kay apple Nut Paw paw Whistling pine banana Blue gum Mango Coffee Cypress Tea	Relatively flat	Red loam	Avi-fauna	Good vegetation cover	
RUNYENJES	High	Potential Electric	Public Commercial	Gravelia Croton	Gentle slope Relatively flat	Loam	Avi fauna	Good vegetation	

		shocks, electrocution and OSH hazards	Agricultural Residential	Sugar cane Avocado umbrella Kay apple Nut Paw paw Whistling pine banana Blue gum Mango Coffee Cypress Tea				cover	
MBEERE NORTH	High Medium	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Acacia Euphobia Cactus Baobab Gravelia Sisal Mango croton Shrubs Banana Lantana camara Indigenous species	Relatively flat Gently sloping	Sandy	Avi fauna	Medium vegetation cover	
MBEERE SOUTH	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Acacia Euphobia Cactus Baobab Gravelia Sisal Mango Croton	Flat	Sandy	Avi fauna	Good vegetation cover	

				Lantana camara Indigenous species					
<b>KIRINYAGA COUNTY</b>									
KIRINYAGA CENTRAL	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Coffee Banana Gravelia Cypress Croton Mango Blue gum Avocado Nuts Maize Euphobia Jacaranda	Gently sloping	Loam	Avi fauna	Good vegetation cover	
GICHUGU	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Coffee Banana Gravelia Cypress Croton Mango Blue gum Avocado Nuts Maize	Gentle sloping	Red loam	Avi fauna	Good vegetation cover	
NDIA	High	Potential Electric shocks, electrocution and OSH	Public Commercial Agricultural Residential	Coffee Banana Gravelia Jacaranda Lutea macamia	Sloppy	Loam	Avi fauna	Good vegetation cover	

		hazards		Croton Euphobia Mango Blue gum Avocado Nuts Maize					
MWEA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Croton Gravelia Blue gum Banana Lantana camara Euphobia Mango Avocado Rice field	Flat	Loam Clay loam	Avi fauna	Good vegetation cover	
<b>MURANGA COUNTY</b>									
MARAGWA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Croton Gravelia Kay apple Blue gum Banana Lantana camara Euphobia Nandi flame Shrubs Indigenous Avocado	Gentle slope	Loam	Avi fauna	Good vegetation Cover	
KANGEMA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Banana Gravelia Mango Blue gum Avocado Croton Umbrella	Slopy	Loam	Avi fauna	Good vegetation cover	



				Nut Cypress Tea bushes lantana camara Muvote					
KIGUMO	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Wattle avocado Croton Coffee Cypress Mango Gravelia Lantana camara	Slopy	Loam	Avi fauna	Good vegetation cover	
KIHARU	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Croton Tea Lutea macamia Cypress Jacaranda Sodom apple Euphobia Avocado Nuts Banana Whistling pine Mango Gravelia Shrubs Lantana camara	Gentle slope Slopy	Loam Red loam	Avi fauna	Good vegetation cover	
KANDARA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Blue gum Gravelia Banana Avocado Wattle Umbrella Lantana camara	Sloppy Gentle slope	Red loam	Avi fauna	Good vegetation cover	

				Tea Euphobia Coffee Wattle					
GATANGA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Banana Blue gum Lantana Avocado Lantana camara Coffee Mango Euphobia Umbrella Croton Umbrella	Gentle slope	Loam	Avi fauna	Good vegetation cover	
MATHIOYA	High	Potential Electric shocks, electrocution and OSH hazards	Public Commercial Agricultural Residential	Gravelia Banana Blue gum Lantana Avocado Lantana camara Coffee Mango Umbrella Croton Umbrella	Slopy	Loam	Avi fauna	Good vegetation cover	

## 7.4.2 Photo Gallery



## **7.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT OF THE PROJECT**

### **7.5.1 Environmental and Social Screening**

To ensure that the project is implemented in an environmental and social sustainable manner, an Environmental and Social Management Framework (ESMF) was prepared to guide project implementation. The ESMF recommended that environmental and social screening for the project be undertaken and an Environmental and social management plan (ESMP) be prepared. The project implementation would be done through dividing it into ten lots in line with the company's administrative structure for easy of management. Therefore this environmental and social screening report is for Lot 7.

### **7.5.2 Objective of Environmental screening**

The Environmental Management and Coordination (Amendment) Act of 2015 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. The environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the Financiers i.e. Africa Development Bank (AfDB).

The objective of Environmental and Social Screening is to ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies. Screening was done because the project does not fall in the category of those which must undergo environmental impact assessment. The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. The environmentalists undertook screening of some of the selected transformers sampled under the LMCP to determine the impacts that will be related to the project. The LMCP provides many positive impacts but also has some negative impacts that must be mitigated against to ensure protection of the environment. The negative impacts are presented below.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

The screening process was undertaken through a combination of different methods. Prior to going to the field, a desk appraisal of the project description was done in order to understand the project in terms of its design. A Screening form was prepared to help gather data once in the field. Once in the field data was collected through observations, photography and talking to people who were nearby the transformers. The screening form was then filled and data keyed in so as to be processed. The findings are reported in a qualitative form by describing major themes such as; population, land uses, topography, occupational health and safety, topography, vegetation, soils and population density to name but a few.

### **7.5.3 Potential Negative Impacts**

Despite the various socio economic and environmental benefits outlined in earlier chapter, the project will also have some negative impacts. The following are the negative impacts and suggested mitigation measures.

#### **Impact on Natural Vegetation**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **Impacts on air quality from vehicle exhaust emissions**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **Risk of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **Electric shocks and electrocution of people**

Electricity, though a good master and a bad servant, is a hazard and safety precautions must be adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **Occupation safety and health hazards**

During construction many people will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles etc.

#### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

#### **Construction material sourcing-wooden poles**

Majority of these service lines are constructed using wooden poles. This would impact on the environment because many poles will be used during construction.

#### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

## **7.6 Environmental and Social Management Plan (ESMP)**

Effectiveness in addressing environmental and social concerns requires a number of functions. These include: Ensuring that proper appraisal of environmental and social impacts of new interventions takes place and proper measures are put in place to mitigate these impacts. As already noted when negative impacts are identified and cannot be avoided then mitigating those impacts is important to reduce any harm it may cause to the environment. The end product of the screening exercise will be ESMP. The basis for compliance in ensuring environmental sustainability of the project is through implementation of ESMPs by the contractors during construction. The SHE Department of the company will monitor implementation of the ESMP.

Mitigation measures involve avoiding of impact altogether, minimizing the impact, rectifying the impact and gradual elimination of impact over time. Mitigation measures are twofold: physical and socio-economic. Physical measures relate to issues of project siting, re-vegetation and preventive measures like bush clearing, erosion, sedimentation and pollution control and good construction / farming practices, waste management, and application of Environmental Guidelines for Contractors. Socio-economic measures will include education and awareness, use of qualified staff, adherence to rules and regulations, institutional support through supervision and recruitment of qualified personnel.

The mitigation measures for the public health issues; explore options to accommodate crew off site and avoid camps and in absence of that, educate the crew about preserving vegetation, provide decent temporary sanitation facilities like toilets if necessary. Further there is need to use local and regional labour as much as possible, use protective gear during work and provide HIV/AIDS awareness creation to the workers and the community.

The mitigation measures for use of hazardous waste include; use off site treatment methods and only deliver poles ready for fixing, proper disposal of any waste and or materials from construction activities.

A summary of typical environmental and social impacts and the corresponding typical mitigation measures for the impacts are presented in the ESMP. Environmental and Social Management Plan (ESMP) for development projects provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. This section presents the environmental and social management plan (ESMP) for the proposed project. The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and decommissioning.

ESMP is a vital output of the Environmental screening process as it provides a checklist for project monitoring and evaluation. The ESMP outlined below addresses the potential negative impacts and mitigation measures associated with the proposed last mile connectivity project during construction, operational and decommissioning phases for lot 7.



## Environmental and Social Management & Monitoring Plan

No	Potential negative impacts	Mitigation measures	Monitoring activities and surveillance	Responsibility for management and Monitoring	Performance Indicator	Timing/project phase	Estimated Cost (Ksh)
1	<b>Impact on Vegetation and trees</b>	<ul style="list-style-type: none"> <li>• Clear limited areas only where the pole will be erected</li> <li>• Some tree branches can be pruned instead of cutting the whole tree</li> <li>• KPLC to plant trees as a way of compensation for the cleared ones</li> </ul>	Inspections	Project engineer Way leaves officer Contractor	<ul style="list-style-type: none"> <li>• No. of trees cut</li> <li>• No of trees planted</li> </ul>	Construction & operation	1,500,000
2	<b>Construction material sourcing-wooden poles.</b>	<ul style="list-style-type: none"> <li>• Ensure accurate budgeting to ensure only necessary material is ordered</li> <li>• Any remaining material to be taken back to stores</li> <li>• Proper storage to ensure minimal loss</li> <li>• Plant more trees to compensate for the poles used</li> </ul>	Inspections	Project Engineer Contractor	<ul style="list-style-type: none"> <li>• No of trees planted</li> <li>• No materials left on site</li> </ul>	Construction period	-
3	<b>Occupation safety and health hazards.</b>	<ul style="list-style-type: none"> <li>• The contractor must observe all the safety precautions to ensure workers work safely</li> <li>• Safety awareness creation to the workers –tool box talk before work</li> <li>• Use of personal protective equipment like gloves, helmet, safety shoes, climbing shoes etc.</li> <li>• Follow safe work procedures</li> <li>• Work that demand skills</li> </ul>	Inspection	Contractor Safety Engineer Project Engineer	<ul style="list-style-type: none"> <li>• Workers in PPE</li> <li>• Records of safety awareness sessions held with workers</li> <li>• Fully stocked First Aid Kit</li> <li>• Competency records based on work being done</li> </ul>	Construction Operation & decommissioning	50,000

No	Potential negative impacts	Mitigation measures	Monitoring activities and surveillance	Responsibility for management and Monitoring	Performance Indicator	Timing/project phase	Estimated Cost (Ksh)
		should be performed by technical people <ul style="list-style-type: none"> <li>Observe clearance from power lines and workers to be experienced with necessary qualifications</li> <li>Test power lines to ensure they are shut down/dead before work</li> <li>Maintain a fully stocked and accessible first aid kit</li> <li>Observe OSHA 2007 regulations</li> </ul>					
4	<b>Impacts on air quality from vehicle exhaust emissions</b>	<ul style="list-style-type: none"> <li>Drivers shall not leave vehicles idling so that exhaust emissions are lowered.</li> <li>Maintain and service vehicles and machinery and equipment so that they are in good working order to ensure minimum emissions are produced.</li> </ul>	Inspection	Contractor Project engineer	<ul style="list-style-type: none"> <li>Vehicle maintenance Records</li> </ul>	Construction & decommissioning	Nil
5	<b>Noise</b>	<ul style="list-style-type: none"> <li>Proper servicing of vehicles</li> <li>Contractor should ensure minimal noise generation</li> </ul>	Inspection	Contractor Project Engineer	<ul style="list-style-type: none"> <li>Vehicle maintenance Records</li> </ul>	Construction & decommissioning	Nil
6	<b>Damage to crops and trees</b>	<ul style="list-style-type: none"> <li>Compensation for loss/damage of crops and trees to the owners</li> </ul>	Inspections/spot checks	Project engineer Way leaves officer	<ul style="list-style-type: none"> <li>Records of payments made</li> </ul>	Construction and operation	In project budget
7	<b>Solid waste</b>	<ul style="list-style-type: none"> <li>All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal</li> <li>Proper budgeting of materials to reduce</li> </ul>	Inspection	Contractor Project Engineer	<ul style="list-style-type: none"> <li>No waste on site</li> <li>Records of material return to store if any</li> </ul>	Construction & Decommissioning	Nil



No	Potential negative impacts	Mitigation measures	Monitoring activities and surveillance	Responsibility for management and Monitoring	Performance Indicator	Timing/project phase	Estimated Cost (Ksh)
		wastage					
8	<b>Public health risk</b> Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).	<ul style="list-style-type: none"> <li>Public awareness of the public health issues to both workers and communities</li> </ul>	Inspection/interviews	Safety Engineer/ Public safety officer Contractor	<ul style="list-style-type: none"> <li>Records/No. of public awareness sessions with workers and communities</li> </ul>	Construction	50,000
6	<b>Electric shocks and electrocution of people.</b>	<ul style="list-style-type: none"> <li>Proper public education to the people on safe use of electricity</li> <li>Proper wiring in the customers' premises by qualified technicians</li> <li>Use of danger/hatari signs on the poles</li> <li>Staff Training and regular equipment service and testing</li> <li>Only trained &amp; certified workers to install and work on electrical installations</li> </ul>	Inspection	Contractor Project Engineer Safety engineers	<ul style="list-style-type: none"> <li>No of Public safety awareness sessions</li> <li>No of accidents recorded</li> <li>No of deaths</li> <li>Presence of Hazard communication signs</li> </ul>	Operation	Normal budget
8	<b>Risk of Fire from live conductors and Transformers-</b> Potential adverse impacts related to fire hazards. The	<ul style="list-style-type: none"> <li>No burning of vegetation along the distribution lines rights-of-way</li> <li>Timely maintenance of the right of way</li> <li>Time maintenance of transformers</li> </ul>	Routine maintenance	Operation and Maintenance Engineer	Cleared way leave	Operation	Normal budget
10.	<b>Oil Leaks -</b>	<ul style="list-style-type: none"> <li>Need to design appropriate protection devices against accidental discharge of transformer oil substances.</li> <li>Frequent inspection and</li> </ul>	Routine maintenance	Operation and Maintenance Engineer	No leaks	Operation	Normal budget

No	Potential negative impacts	Mitigation measures	Monitoring activities and surveillance	Responsibility for management and Monitoring	Performance Indicator	Timing/project phase	Estimated Cost (Ksh)
		<p>maintenance of the transformers should be done to minimize spilling.</p> <ul style="list-style-type: none"> <li>All waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.</li> </ul>					
11.	<b>Open excavations</b>	<ul style="list-style-type: none"> <li>Barricade the proposed project area using high visibility tape to avoid falls into open excavations</li> <li>Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents.</li> <li>Contractor to compensate any injuries to the public and animals arising from his negligence</li> </ul>	Spot checks	Contractor Project engineer	Open excavations must be marked if any	Operation	Normal budget
	<b>Vandalism</b>	<ul style="list-style-type: none"> <li>Community policing to be encouraged to reduce vandalism of transformers and distribution cables</li> <li>Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards</li> </ul>	Spot checks	Operation and Maintenance Engineer	Public campaigns	Through out	Normal budget

## **7.7 CONCLUSIONS AND RECOMMENDATIONS**

The findings of this exercise reveal that the Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving power connection, security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefits to education through connecting schools.

The positive impacts notwithstanding the project will also have some negative impacts resulting from construction and implementation of the project such as; emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others. The proponent is committed to ensure that the LMCP is implemented in an environmental and social sustainable way. This will be achieved through implementation of the ESMP developed.

The ESMP outlines several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

With proper mitigation and enhancement of the positive impacts the project will accrue many benefits to all Kenyans in general.

## **8 LOT8: NAIROBI WEST/SOUTH**

## EXECUTIVE SUMMARY

The last mile connectivity project is an initiative implemented by Kenya Power to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project benefits from external funding by AfDB and will enable Kenya Power to supply electricity to customers at a subsidized cost. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and see into connection of more customers to the national grid. The last mile connectivity project will also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accelerated access to electricity among others.

Last mile connectivity project for Lot 8 will be undertaken in Kajiado, Makueni and Machakos Counties. Collection of baseline information for the proposed project area consider population densities of project sites, vegetation distribution, climatic conditions of the project sites, topography and soils. The proposed project area is densely populated both in urban and peri urban areas, especially those near major towns and Nairobi. The area has moderate vegetation cover comprising of indigenous and exotic forest covers, farm forests are also common in the area especially in the hilly agriculturally rich areas. The project area is sparsely populated mainly in the semi arid areas. The project area receives high temperatures ranging from 29°C-35.8°C and low temperatures ranging from 10°C-20.2°C. The area also receives bimodal rainfall, with long rains falling between March-July and short rains between September and December. Topography of the proposed project area is characterized by Athi Kapiti plains, hilly areas such as Chyulu and Mbooni. A part of the project area has black cotton soils while others are characterized by shallow dark red soils.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

The company acknowledges that Last Mile Connectivity Project has some negative impacts on the environment and social wellbeing of people. As such, an Environmental Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project.

The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impact of the project which include; oil leaks from transformers, shock and electrocution of people as well as noise from construction will be mitigated as outlined in the ESMP. On the basis of the above and taking cognizance that the company has proved to be environmentally and socially credible, it is important to have the project implemented to enhance economic wellbeing of the society.

## **8.1 INTRODUCTION AND PROJECT BRIEF**

### **8.1.1 Last Mile Connectivity Project**

The Government has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households lying within transformer protection distance. The project involves building low voltage lines both single phase and three phases along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- xxi. Accelerated access to electricity;
- xxii. Improved standards of construction hence improved quality of supply;
- xxiii. Provision of new supply in a shorter time;
- xxiv. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **8.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; it has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## **8.2 PROJECT OVERVIEW**

### **8.2.1 Location of the project**

The last mile connectivity project for Lot 8 consider maximization of underutilized transformers located in constituencies within Kajiado, Makueni and Machakos Counties. Such constituencies include: Kajiado County (Kajiado Central, Kajiado South, Kajiado West, Kajiado North and Kajiado East); Makueni County (Makueni, Kibwezi East and West, Mukaa, Kathonzweni, Makindu, Mbooni East and West and Nza) and Machakos County (Machakos, Masinga, Yatta, Kangundo, Kathiani, Athi River and Mwala).

### **8.2.2 Baseline Information**

The screening process for Last Mile Connectivity Project examined various environmental and social aspects of the project site such as; population density, vegetation distribution, topography, climatic conditions and soils.

#### **8.2.2.1 Population density**

The project area which comprises of Kajiado, Makueni and Machakos Counties has high population density in urban areas and in some agriculturally rich peri urban areas. Medium population densities are mostly in peri-urban and agriculturally rich rural areas. Most of the rural areas within the project area are sparsely populated thus low population density.

Kajiado North is the Most populated constituency in Kajiado County with a projected population of 294, 857 (147,167 male and 147, 690 females) by 2017. Kajiado North constituency also has a density of 1,369 persons per Km<sup>2</sup>. The density is projected to reach 2,087 persons per Km<sup>2</sup> by 2017. This is due to presence of highly populated areas of Rongai, Ngong and Kiserian which are residential areas serving the Nairobi City. Kajiado West has the lowest density of 14 persons per Km<sup>2</sup> due to its vast area. The area is sparsely populated due to harsh climatic conditions unfavourable for farming and settlement. The county had a population density of 31 persons per Km<sup>2</sup> in 2009 and is expected to increase to 46 persons per Km<sup>2</sup> by 2017.

Makueni County is generally sparsely populated except in Kaiti and Mbooni constituencies which have Kilungu and Mbooni hills respectively. These areas have a fairly high projected population density of 296 and 203 persons per square kilometer, respectively compared to the county's density of 115 in 2012, Kaiti and Mbooni constituencies also lie in the fertile upper parts of the county which experience a higher average rainfall of 800mm-1200mm.

According to the 2009 Kenya Population and Housing census the total population of Machakos County is 1,098,584. It was projected to increase to 1,166,516 in 2012; 1,238,649 in 2015 and 1,315,244 in 2017. This increase suggests that population will be increasing by 2%. The population density and distribution in the County is driven by the economic activity carried out in the specific sub county. As at 2009 the County had a population density of 177 per Km<sup>2</sup>, it was projected at 188 per Km<sup>2</sup> as at 2012, 200 per Km<sup>2</sup> as at 2015 and 212 per Km<sup>2</sup> as at 2017.

#### **8.2.2.2 Vegetation Distribution**

Kajiado County has a total forest area of 16,866.88 Ha comprising of indigenous and exotic forests. A total of 15,626.8 Ha of the forest land is gazetted forest while 1,240 Ha is trust land. Gazetted forest areas are found at the border areas of the county, mainly Ngong hills (3,077 Ha), Loitokitok (765.8 Ha), and Namanga (11,784 Ha). Forest in trust land includes Embakasi (573 Ha) and Ololua (667 Ha). The project area also has farms under forest cover, a concept that is promoted to help increase tree cover in the County. Farm forestry involves growth of fruit trees, wind breakers and tree species used for medicinal purposes.



The total area under forest cover in Makueni County is 191 Km<sup>2</sup>, which includes 151Km<sup>2</sup> of the five Gazetted forests and 40 Km<sup>2</sup> of the three non-gazetted forests. The Gazetted forests are Nthangu, Makuli, Mbooni, Kilungu and Kibwezi forests. Farm forestry is undertaken in the County to prevent the increasing need for cutting of indigenous tree species for charcoal.

The forests in Machakos County cover an area of 477.617 Km<sup>2</sup> which is 7.6 per cent of the County's total land. The forests are categorized as gazetted and un-gazetted. The gazetted forest covers 606.97 ha while the un-gazetted cover 1774 ha. These forests are distributed in various parts of the County. Other trees grown in the area for commercial purposes and to prevent soil erosion include: Eucalyptus, Grivellia, Cypress and pine.

### **8.2.2.3 Topography**

Kajiado County is divided into three different areas namely; Rift Valley, Athi Kapiti plains and Central Broken Ground. The Rift Valley is a low depression on the western side of the county running from north to south. It is made up of steep faults giving rise to plateau, scarps and structural plains. The Athi Kapiti Plains consist mainly of gently undulating slopes, which become rolling and hilly towards the Ngong hills. The altitude ranges from 1580 to 2460 metres above sea level. The hills are the catchment areas for Athi River, which is fed by Mbagathi and Kiserian tributaries. The Central Broken Ground is an area stretching 20-70 kilometres wide from the north-eastern boarder across the county to the southwest where altitude ranges from 1220 to 2073 metres above sea level.

Makueni County is characterised by volcanic hills such as chylulu, which lie along the southwest border of the county in Kibwezi West Constituency, Mbooni Hills in Mbooni constituency and Kilungu Hills in Kaiti constituency which rise to 1,900m above sea level. The county terrain is generally low-lying from 600m above sea level in Tsavo at the southern end of the county.

Machakos County has hills and a small plateau rising to 1800-2100m above sea level constitutes the Central part of the County. To the West, the County has a large plateau elevated to about 1700m which is southeast sloping. The County rises from 790 to 1594 m above sea level. In the North West the County has stand-alone hills.

### **8.2.2.4 Climate**

Kajiado County has a bi-modal rainfall pattern. The short rains fall between October and December while the long rains fall between March and May. The bimodal rainfall pattern is not uniform across the County as it increases with altitude. The long (March to May) rains are more pronounced in the western part of the County while the short (October to December) rains are heavier in the eastern part. The rainfall amount ranges from as low as 300mm in the Amboseli basin to as high as 1250mm in the Ngong hills and the slopes of Mt. Kilimanjaro. The highest temperatures of about 34°C are recorded around Lake Magadi while the lowest of 10°C is experienced at Loitokitok on the eastern slopes of Mt. Kilimanjaro.

Makueni County experiences two rainy seasons, the long rains occurring in March /April while the short rains occur in November/December. The hilly parts of Mbooni and Kilungu receive 800-1200mm of rainfall per year. High temperatures of 35.8°C are experienced in the low-lying areas causing high evaporation which worsens the dry conditions. The areas to the North such as Kilungu and Mbooni hills are usually cool with temperatures ranging from 20.2°C to 24.6°C.

The average rainfall in Machakos County falls between 500 mm and 1300 mm. The short rains are expected in October and December while the long rains are expected in March to May. The highland areas within the County such as Mua, Iveti and Kangundo receive an average of 1000mm while the lowland areas receive about 500mm;

ideally the rainfall within the County is influence by the latitude. In terms of temperature, July is the coldest month while October and March are the warmest. Temperature varies between 18°C and 29°C throughout the year. Since the County does not experience rain throughout the year it then means that there are months that experience dry spells. These months are mainly February to March and August to September.

#### **8.2.2.5 Soils**

Kajiado County consists of three geological regions: quaternary volcanic, Pleistocene and basement rock soils. Alluvia soils are also found in some areas. Quaternary Volcanic soil is found in the Rift Valley. Basement System Rocks which comprise various gneisses, cists, quartzite and crystalline limestone, are found mainly along the river valleys and some parts of the plains. Pleistocene soils are found in the inland drainage lake system around Lake Amboseli.

Makueni County has a total arable land of 5042.69Km<sup>2</sup> which is 74 percent of the total area. A total of 1,762.71Km<sup>2</sup> is non-arable accounting for 21.9 percent of the total area. The soils within Makueni County support crops such as maize, green grams, pigeon peas, sorghum and fruits such as mangoes.

Machakos County has well drained shallow, dark red clay soils particularly in the plains. The Athi plains, are mainly underlain by phonolite lava and tuff, are flat and end in a bluff just west of the Athi River, the bluff representing the end of a lava flow. The underlying rocks of Kapiti Plains are volcanic lavas, tuffs and basement complex.

## **8.3 PROJECT SCREENING**

### **8.3.1 Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

### **8.3.2 Environmental Screening for Last Mile Connectivity Project**

The Environmental Management Coordination Act of 1999 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. However, these instruments do not contain guidelines regarding the screening, identification, assessment and mitigation and monitoring of potential adverse, localized environmental and social impacts of small-scale investments, where the project details and specific project sites are not known at the time of appraisal of the parent project. Thus, the environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the donors i.e. AfDB.

The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

### **8.3.3 Objective of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

## **8.4 Environmental and Social Characteristics of Project sites**

The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project; the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

#### 8.4.1 ENVIRONMENTAL AND SOCIAL CHARACTERISTICS OF PROPOSED PROJECT SITES

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
<b>KAJIADO NORTH CONSTITUENCY</b>						
High and other places Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural – (Dairy and Maize)</li> <li>• Kenya Power Substation</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Cypress, Jacaranda, Pine, Euphorbia, Croton and Kay apples</li> <li>• Natural vegetation dominated by grass and Acacia</li> </ul>	Gently sloping and other places relatively flat	Black cotton	Terrestrial animals and birds	Good
<b>KAJIADO WEST CONSTITUENCY</b>						
Medium and other places Low	<ul style="list-style-type: none"> <li>• Commercial</li> <li>• (Markets and Micro-enterprises)</li> <li>• Churches</li> <li>• Residential</li> <li>• Agricultural (Maize, onions and greenhouses)</li> <li>• Health facilities</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Trees and planted edges e.g. Euphorbia, Cypress, Grevillea Robusta, Acacia, Lantana Camara, Croton, kay apples</li> <li>• Maize, Grass, Shrubs, Acacia, Euphorbia, Pine, Eucalyptus, cypress.</li> </ul>	Relatively Flat and other places gently sloping	Black cotton	Terrestrial animals and birds	TX no. 12689 not found on ground. TX nos. 12264 & 12706 not marked on ground
<b>KAJIADO EAST CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – maize and greenhouses</li> <li>Water points</li> <li>Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Eucalyptus, Cassia spectabilis, Makhamia Lutea, Pine, Cypress, kay apples</li> <li>Natural vegetation Euphorbia, Cactus, grass, herbs</li> </ul>	Relatively flat	Black cotton	Terrestrial animals and birds	TX no. 15112 not marked on ground. The TX is located next to Lilyanna Preparatory Kindergaten
<b>KAJIADO SOUTH CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Scarce</li> <li>Natural vegetation like grass, acacia, euphorbia, lantana camara, herbs and shrubs. planted like jacaranda, Grevillea, croton, maize</li> </ul>	Relatively flat	Black cotton and other areas red soil	Terrestrial animals and birds	TX NO. 20177 not found on ground. Some homes adjacent to TX nos. 19917 & 19916 are not connected to electricity
<b>KAJIADO CENTRAL CONSTITUENCY</b>						
High and Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Mosque</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, Eucalyptus, Pine, Cypress, Jacaranda, Cassia spectabilis, Umbrella, pawpaw Euphorbia, Makhamia lutea</li> <li>Natural vegetation grass, herbs, shrubs, acacia,</li> </ul>	Gently sloping Relatively flat	Sandy loam and other places red soil	Terrestrial animals and birds	Some homes adjacent to TX Numbers 15727, 30283 & 15324 are not connected to electricity.
<b>MACHAKOS CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – maize &amp; livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, Eucalyptus, cypress, pine, Jacaranda, Nandi flame, Makhamia Lutea, kay apples, Croton &amp; bouganvillea</li> <li>Natural vegetation dominated by grass, acacia, cactus</li> </ul>	Sloping with flowing rivers	Red soil	Terrestrial animals and birds	Some homes adjacent to TX Nos. 32127 & 31386 are not connected to electricity
<b>MWALA CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> <li>Administration offices</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, Pine, Cypress, Yellow Oleander, Euphorbia, sisal, maize, Croton</li> <li>Natural vegetation e.g. Lantana Camara, acacia, shrubs and other indigenous tree species</li> </ul>	Relatively flat	Red soil	Terrestrial animals and birds,	TX Number 30975 not marked on ground. TX numbers 30975 & 46891; immediate houses not connected to electricity.
<b>MASINGA CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – maize and livestock</li> <li>Hotels</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Tea plantations, Umbrella trees, Palm trees, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Cypress,</li> <li>Natural vegetation grass, herbs, shrubs</li> </ul>	Gently sloping	Red Soil and black cotton	Terrestrial animals and birds	TX Numbers 77362 & 85118, adjacent homes and shops not connected to electricity. TX Number 77656 not marked on ground.
<b>YATTA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium and Low	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural –maize, &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Mangoes, Grivellia, Guavas, Croton, tea, sisal, maize, Euphorbia</li> <li>Natural vegetation grass, herbs, shrubs, Acacia, Cactus, Sodom apple, cassia spectabilis</li> </ul>	Relatively flat and other places gently sloping with seasonal streams	Red soil	Terrestrial animals and birds	TX Numbers 86203, 86524, 86523, 85724 & 86204, adjacent homes not connected.
<b>MAVOKO CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural – maize, chicken &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Grevillea, Mangoes, maize, Eucalyptus, Pine, Cypress, Jacaranda</li> <li>Natural vegetation Lantana camara, grass, shrubs</li> </ul>	Relatively flat	Black cotton	Terrestrial animals and birds	TX Number 46906 not marked on ground.
<b>KANGUNDO CONSTITUENCY</b>						
Medium and high	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Maize and livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Maize, Croton, Euphorbia, Grevillea, Mangoes, Eucalyptus, Jacaranda, Cypress</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara &amp; Acacia</li> </ul>	Gently sloping and other places relatively flat and seasonal rivers	Red soil	Terrestrial animals and birds	TX Numbers 15413, 14765, 14763, 30533 adjacent homes not connected to electricity. TX number 30533 not marked on ground. Way leaves to be maintained
<b>MATUNGULU CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural – Maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Maize, Croton, Grevillea, Mangoes, Eucalyptus Cypress, Pine, Guavas</li> <li>Natural vegetation Guavas, grass, shrubs, Cassia spectabilis</li> </ul>	Gently sloping and other places relatively flat	Red Soil	Terrestrial animals and birds	TX Number 85571, immediate houses not connected to electricity.
<b>KIBWEZI EAST CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – sisal plantation</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sisal plantation, Yellow Oleander, Grevillea, Jacaranda &amp; Cassia spectabilis</li> <li>Natural vegetation sycamore, shrubs &amp; Lantana Camara</li> </ul>	Gently sloping and other places relatively flat	Red soil	Terrestrial animals and birds	TX number 20024, immediate homes not connected to electricity. TX number 33084 on paper is different from what was observed on ground (35084)
<b>KIBWEZI WEST CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Administrative offices</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Maize, Croton, Grevillea, Jacaranda, Yellow Oleander,</li> <li>Natural vegetation grass, shrubs, acacia, sycamore &amp; cassia spectabilis</li> </ul>	Relatively flat	Sandy	Terrestrial animals and birds	TX Number 32054, adjacent homes not connected to electricity.
<b>MAKUENI CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
High, Medium and Low	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Administrative offices</li> <li>Schools</li> <li>Health facilities</li> <li>GK Prisons</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Croton, Nandi flame, Cypress, Jacaranda, Grevillea, Eucalyptus, Pine</li> <li>Natural vegetation grass, herbs, shrubs, acacia, cassia spectabilis &amp; other indigenous species</li> </ul>	Gently sloping other areas relatively flat	Sandy & Red soil	Terrestrial animals and birds	TX Number 33328 not marked on ground. TX numbers 16248, 16251 and 14944, immediate homes not connected to electricity.
<b>MBOONI CONSTITUENCY</b>						
High and Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural – Dairy farming and Maize</li> <li>Planted forests</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. planted forests, euphorbia, eucalyptus, Pine, Cassia spectabilis, Cypress, Grivellia, Avocado trees, coffee &amp; bananas,</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara &amp; sycamore</li> </ul>	Sloping with streams	Red soil	Terrestrial animals and birds	TX Numbers 16567, 16566, 31169 & 32876, adjacent homes not connected to electricity. TX number 32876 not marked on ground
<b>KAITI CONSTITUENCY</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural – Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Grivellia, Croton, Mangoes, Pine &amp; Euphorbia</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara, Cassia spectabilis, Acacia</li> </ul>	Gently sloping and other areas relatively flat	Red soil	Terrestrial animals and birds	TX Numbers 46457 & 14893, adjacent homes and shops not connected. TX Number 16669 on paper is different from what was observed on ground (324181). TX number 46457 not marked on ground.
<b>KILOME CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	Fauna	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – Maize</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Croton, Yellow Oleander, Eucalyptus, Pine, Mangoes, Maize, Cypress, &amp; Jacaranda</li> <li>Natural vegetation Acacia, Euphorbia</li> </ul>	Gently sloping and other places relatively flat	Red soil and sandy soil	Terrestrial animals and birds	TX numbers 31464, 31463 & 16597, some adjacent homes not connected to electricity.
<b>KATHIANI CONSTITUENCY</b>						
High and Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Agricultural – Maize, Mangoes and Livestock</li> <li>Coffee factories</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Coffee, Kay apples, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Sisal, Cypress &amp; bananas</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara, Makhamia Lutea,</li> </ul>	Sloping with flowing streams	Red Soil	Terrestrial animals and birds	TX Number 46988 not marked on ground. TX Number 31018 & 13857 not same as the one found on ground.

#### 8.4.2 Photos



*One of the transformers in Kajiado County with its surrounding environment*



*One of the transformers in Machakos County*

## **8.5 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **8.5.1 Positive Impacts**

#### **Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to work on the low voltage lines and those that will start businesses to satisfy the needs of the former respectively. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to persons within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global

opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

### **Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Information on HIV/AIDS will be disseminated via radio and televisions; a means that is quite reliable. In addition Kenya Power shall also disseminate information through awareness creation by the contractor and company Safety, Health & Environment Department.

### **Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risk posed by indoor air pollution from burning of kerosene mainly include: acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

### **Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information. Translating into better results and an informed society.

### **Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

### **Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

### **Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information which is useful for decision making. Some

information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

### **Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

### **8.5.2 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

#### **Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **Electric shocks and electrocution of people**

Electricity, though a good master and a bad servant, is a hazard and safety precautions must be adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **Noise during construction**

Noise pollution from the proposed development during construction noise will be generated from the construction machines and construction workers

### **Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

### **Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among.

### **Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

### **Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.



## **8.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development projects allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 2: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

<b>Expected Negative Impacts</b>	<b>Recommended Mitigation Measures</b>	<b>Responsible Party</b>	<b>Time frame</b>	<b>Cost (Ksh)</b>
<b>Minimize vegetation disturbance</b>				
Vegetation Disturbance	<ul style="list-style-type: none"> <li>• Properly demarcate the project area to be cleared during installation of supply cables and erection of poles</li> <li>• Designate parking lots within the project area to prevent vegetation disturbance</li> <li>• Introduction of trees within the project area in replacement of disturbed vegetation</li> <li>• Select alternative alignments to avoid disturbance of sensitive natural vegetation</li> </ul>	Project engineer and contractor	1 Month	<b>3,000.00</b>  <b>0.00</b>  <b>30,000.00</b>
Local Sourcing of wooden poles	<ul style="list-style-type: none"> <li>• Plant more trees to compensate for the poles used</li> <li>• Ensure accurate budgeting to only have necessary material is ordered</li> <li>• Properly store the poles to minimize potential loss</li> <li>• Supply seedlings to farmers to increase forest cover</li> </ul>			<b>100,000.00</b>  <b>0.00</b>  <b>0.00</b> <b>100,000.00</b>
<b>Reduce soil erosion and surface run off</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Increased soil erosion and surface run off	<ul style="list-style-type: none"> <li>• Ensure leveling of the project site to reduce run off velocity and increase infiltration of storm water</li> <li>• Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</li> </ul>	Project engineer and contractor	Throughout construction period	<p>0.00</p> <p>2,000.00</p>
<b>Air Pollution</b>				
Dust emission	<ul style="list-style-type: none"> <li>• Avoid excavation works in extremely dry seasons</li> <li>• Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</li> <li>• Provide and ensure use of appropriate personal protective equipment by workers on site</li> </ul>	Project engineer and contractor	Throughout project period	30,000.00
Exhaust emission	<ul style="list-style-type: none"> <li>• Minimize vehicle idling time to lower amounts of exhaust fumes released</li> <li>• Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible</li> <li>• Maintain machinery and vehicle in good working conditions to</li> </ul>			0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	ensure minimal emissions are produced			
Generation of Wastes				
Solid waste e.g. conductor and tree cuttings.	<ul style="list-style-type: none"><li>All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal</li><li>Proper budgeting of materials to reduce wastage</li><li>Practice 3Rs of waste management: reduce, reuse, recycle of materials</li></ul>			
Waste oils from transformers	<ul style="list-style-type: none"><li>Properly Manage storage, transfer, and disposal of transformer oils according to industry standards</li></ul>			
Minimize occupational safety and health risks				
Open excavations	<ul style="list-style-type: none"><li>Barricade the proposed project area using high visibility tape to avoid falls into open excavations</li><li>Cover all open excavations immediately after erection of poles</li></ul>	Project engineer and contractor  Contractor and project engineer	Throughout project period	2,000.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Working at height	<ul style="list-style-type: none"> <li>• Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</li> </ul>		Throughout project period	50,000.00
	<ul style="list-style-type: none"> <li>• Whenever using scaffolds ensure workers maintain a secure clearance from power lines.</li> </ul>			0.00
	<ul style="list-style-type: none"> <li>• Provide storage bags for portable tools used while working at height</li> </ul>			0.00
	<ul style="list-style-type: none"> <li>• Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements</li> </ul>			0.00
Shocks and Electrocutions	<ul style="list-style-type: none"> <li>• Only trained &amp; certified workers to install, maintain or repair electrical equipment;</li> <li>• Test the power lines to ensure they are shut down before work</li> <li>• Whenever using scaffolds ensure workers maintain a secure clearance from power lines.</li> </ul>	Contractor and Company Management	Throughout project period	0.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Pricks and cuts	<ul style="list-style-type: none"> <li>Ensure project area is kept free of sharp objects</li> <li>Provide appropriate foot protection to workers within the site</li> </ul>	Contractor and project engineer	Throughout project period	<p>0.00</p> <p>20,000.00</p>
<b>Public safety and health</b>				
Shocks and electrocutions	<ul style="list-style-type: none"> <li>Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards</li> <li>Display appropriate signage for use during construction and implementation of the project to enhance awareness creation on the potential hazards of the project</li> </ul>	Contractor and proponent	Before commencement and during implementation of the project	5,000.00
HIV/AIDS and Communicable Diseases	<ul style="list-style-type: none"> <li>Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide protection for use when necessary</li> <li>Distribute HIV &amp; AIDS awareness materials in collaboration NACC</li> </ul>			
Social Vices	<ul style="list-style-type: none"> <li>Awareness creation to the public and liaising with area administration to enhance security</li> <li>Create public awareness on the</li> </ul>			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards			
<b>Damage to property</b>				
Damage to structures erected on the way leaves	<ul style="list-style-type: none"> <li>Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures</li> </ul>	Contractor and proponent	Before commencement of the project	<b>5,000.00</b>

## **8.7 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.





## **9 LOT9: COAST**

## **EXECUTIVE SUMMARY**

The last mile connectivity project is an initiative to help achieve government of Kenya pledge of stimulating economic growth and accelerating job creation for the wellbeing of its citizens. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and accelerate connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accrued benefits of electricity access among others.

The last mile connectivity project for Lot 9 shall be undertaken in counties within Coast region covering Kilifi, Kwale, Mombasa and Taita Taveta Counties.

Baseline information for the proposed project area analyzed during the screening exercise considered population density, vegetation distribution, climatic conditions, topography, Soils and Social set ups with a key focus on identifying sensitive ecosystems that could be affected by the LMCP. The project area is diverse with dense populations in urban areas and medium to low in the rural places. The area has moderate vegetation cover comprising of planted palm trees, cashew nuts, neam, casuarina and scattered Acacia in the rural areas especially of Ganze and Kwale. The project area is also characterized by sugarcane plantations, maize farms as well as Mangofera species. The project area experiences high temperatures ranging from 30°C to 38°C annually with high humid levels along the coast lines. The area also receives bimodal rainfall throughout the year, with long rains falling between March-July and short rains between September and December. Topography of the proposed project area is characterized by low lying lands along the sea belt and some undulating landscape in areas of Kwale and Ganze sub counties. Most of the project area has sandy soils and limestone and coral rock.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution component for the projects has been pegged to identified transformers that will be maximized across the country with general drop lines to connect customers and at other places extension of the Low voltage lines to a maximum of two poles in order to achieve accelerated connections. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and customer connections at the end user levels. The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance, risk of sparks and fire from live conductors, occupational health hazards among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

To mitigate the anticipated negative and social impacts, an Environmental and Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB

guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impacts of the project which include; oil leaks from transformers, shock and electrocution of people, noise from construction, Occupations health and safety hazards among others will be mitigated as outlined in the ESMP. Diligence on the part of the contractor will be paramount to ensure minimization and where possible avoidance of anticipated negative impacts.

## **9.1 INTRODUCTION AND PROJECT BRIEF**

### **9.1.1 Last Mile Connectivity Project**

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans. This pledge can mainly be achieved through expansion of power distribution system to be within reach of more Kenyans thus enabling them connect to the grid at affordable costs. The need to reduce cost burden of increased connectivity on Kenya Power as well as reduce amount paid by customer to connect to the grid resulted into conception of Last Mile Connectivity Project.

The Last Mile Connectivity Project benefits from external funding and aims at extending low voltage network on existing distribution transformers; to households located within transformer protection distance. The project involves building low voltage lines both single phase and three phase along rural access roads. The project also focuses on availing service connection including meters to customers' premises prior to engaging customers for payment. Therefore, activities such as way leaves acquisitions together with attendant county and other authorities' permits and approvals, materials procurement/delivery logistics, construction, etc. shall be dealt with prior to the customer being requested to connect.

Benefits of Last Mile Connectivity project include:

- xxv. Accelerated access to electricity;
- xxvi. Improved standards of construction hence improved quality of supply;
- xxvii. Provision of new supply in a shorter time;
- xxviii. Opportunity for the company to develop long term network expansion plans.

Last Mile Connectivity Project aims at ensuring increased access to electricity, especially among low income groups. The company will make use of the existing 35,000 distribution transformers to connect approximately 1.2 million customers. The project does not expect any resettlement but there will be need to compensate people whose assets e.g. crops and trees will be damaged during project implementation.

### **9.1.2 Justification of the project**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## 9.2 PROJECT OVERVIEW

The Last Mile Connectivity Project for LOT 9 shall be undertaken for identified transformers located within constituencies in **Coast region covering Kilifi County** (Ganze, Malindi, Magarini, Rabai, Kaloleni); **Kwale County** (Matunga, Msabweni, Kinango, LungaLunga); **Mombasa County** (Mvita, Nyali, Changamwe, Jomvu, Kisauni, Likoni); and **Taita Taveta County** (Taveta, Wundanyi, Mwatate, Voi).

### 9.2.1 Baseline information of the project area

Some of the environmental and social aspects considered for Last Mile Connectivity Project include; population, vegetation distribution, topography, climate, soils and the social setup especially settlement and road networks within the project area. The mid-point operation within coast region is Mombasa County. Mombasa county is located South Eastern part of the Coastal region of Kenya. It covers an area of 229.9km<sup>2</sup> excluding 65 km<sup>2</sup> of water mass which is 200 nautical miles inside the Indian Ocean. It borders Kilifi County to the North, Kwale County to the South West and the Indian Ocean to the East. The county lies between latitudes 36° 80' to the East and 4° 10' south of the equator and between longitude 39° 34' and 39° 46' east of the Greenwich meridian.

The county also enjoys proximity to an expansive water mass as it borders the exclusive ecological zone of the Indian Ocean to the east.

The general project area for LMC Lot 9 covered Kilifi, Kwale, and Mombasa and Taita Taveta counties in Coast region as shown in the map in the following page.

Map showing general project area for LMC Lot 9



#### i. Population

The project area is mainly characterized by High, medium and low population densities. High population densities mostly in urban and some peri-urban areas; medium population densities in peri-urban and some rural areas and Low population densities in rural areas. Some rural areas are also characterized by high population density. The main communities residing in the project area are the Mijikenda (rural) and the Arabs (cities) and the general area is cosmopolitan. There are other communities who have settled in the project area because of employment, commercial

activities or intermarriages. The communities mostly speak tribal languages and due to close interactions and education, Kiswahili and English are also widely spoken.

#### **9.2.1.1 Vegetation Distribution**

The project area has Coastal climate along the Indian beaches dominated mainly by Mangrove vegetation. There are natural forests with indigenous trees especially in the Kaya forests, Shimba hills national park, and in the wider spread there are acacia, Lantana Camara, and Most of the planted trees include Palms, Casuarina, Cashewnuts, and some plantations of Sisal and sugarcane. Some trees of traditional value observed during the screening exercise included Baobab trees.

#### **9.2.1.2 Topography**

The terrain is characterized by three distinct physiographic features which includes the coastal plain which is found along the shoreline covering parts of the south coast, the island, parts of Changamwe and the North Coast. The plain consist of an expansive flat land with raised beach terraces covered mainly by coral limestone and back reef sand deposits that not only provide firm foundation for construction but also provide building materials.

The second category is the hilly areas mainly found within the western part that is underlain by shells and rises gently from 45m to 132m above the sea level. This is characterized by poorly drained clay soils which restrict resettlement and infrastructural development.

The third category is the Indian Ocean and the shoreline covered with geologically sedimentary rocks of Jurassic to recent age. The topography has evolved as a result of the lowering of the sea level over time leading to severe erosion by the storm water draining into the sea. In addition the subsequent rise in sea level led to the submergence of the valleys and the creation of Mombasa Island surrounded by deep natural creeks, ports and harbors such as Kilindini, Tudor, Makupa and old port creeks.

Other notable physiographical features include the fringing coral reefs, cliffs, and tidal flats, sandy beaches the coastal plain and a hilly severely dissected and eroded terrain. These features have greatly influenced the economic development in a number of ways. For instance, the sea supports maritime trade while the fringing coral reef, creeks and tidal flats with extensive mangrove forests which are breeding grounds for fish. The fringing coral reefs in North Coast are an important marine conservation area hosting the Mombasa marine national park and reserve. Kwale county harbours Shimba hills national park with undulating terrain and areas with red soils are suitable for cashewnut, oranges and tropical crops farming. The dry areas of Kilifi County including Ganze are characterized with rugged terrain with sandy loam, Sandy clay to red soils with massive areas of denudated land with marginal economic production.

#### **9.2.1.3 Climate**

The project area has varying climatic conditions. Mombasa county lies within the coastal strip in the hot tropical region where the climate is influenced by monsoon winds.

##### **I) Rainfall**



The rainfall pattern is characterized by two distinct long and short seasons corresponding to changes in the monsoon winds. The long rains occur in April –June with an average of 1040mm and correspond to the south eastern monsoon winds. The short rains start towards the end of October lasting until December and correspond to the comparatively dry north eastern monsoons, averaging 240mm. The annual average rainfall for the county is 640mm.

## **II) Temperature**

The annual mean temperature in the county is 27.9°C with a minimum of 22.7°C and a maximum of 33.1°C. The hottest month is February with a maximum average of 22.7°C. Average humidity at noon is about 65 per cent

The climate in Kwale County is generally associated to the regional climatic patterns attributed to the semiannual movement of the inter-tropical convergence zone (ITCZ) as well as the two monsoons experienced in the area, namely, the northeastern monsoon (kaskaz) in January to March and the southeastern monsoon in June October. The dominant rainy season occurs in the March to June period while the short rains are in November to December. The average annual rainfall is approximately 1000 mm (NES, 1985). The long rains season amounts to over 155 days of rain in 6 out of 10 years, while for the short rains amounts to about 40-55 days. The wettest area in the region is around Ramisi, with the climate becoming drier to the west and north.

The average annual temperature in the area is usually above 28°C (NES, 1985). The months of January and February are the driest with a maximum average temperature of 33°C. The coldest month is usually July with a minimum of 23°C. The area is generally hot and humid all the year round with an average humidity at noon of about 65% due to a high evaporation rate.

### **9.2.1.4 Soils**

The project area has a wide range of soils ranging from sandy within the coastal fronts, limestone in the greater area. Kwale County has areas with titanium deposits and redsoils in Matuga and Kinango as well as a greater part of Shimba Hills National Park. Deep red and Sandy loam clay soils in Wundanyi support a wide range of planted trees as well as crops. Due to climatic change and land degradation, some areas of Kilifi county like Ganze have sandy clay denuded soils with minimal vegetation cover and greater spans of pastoral land. The general area is rich in limestone deposits.

## **9.3 PROJECT SCREENING**

### **9.3.1 Environmental and Social Screening**

Screening is a process of determining whether a project requires EIA or not, and provides indication at the level that this should be done. Screening clarifies the level of environmental assessment and therefore serves to cut cost and time and also ensures that projects with serious environmental impacts also do not escape the right level of EIA treatment.

Environmental and social screening is also undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

### **9.3.2 Environmental Screening for Last Mile Connectivity Project**

The Environmental Management and Coordination (Amendment) Act of 2015 and the Environmental (Impact Assessment and Audit) Regulations (June 2003) prescribe the conduct for Environmental Impact Assessment for development projects. The environmental and social screening process complements Kenya's EIA procedures for meeting the environmental and social management requirements. The Environmental and Social Screening Process also meets the requirements of the Financiers i.e. Africa Development Bank (AfDB).

The screening process has been developed based on identified Transformers that need to be maximized across the country. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The environmental and social screening process is consistent with Kenya's environmental policies and laws as well as with other international legislations like for the WB, JICA and AfDB safeguard policies on Environmental Assessment.

### **9.3.3 Objective of Environmental Screening**

To ensure that the projects are designed and implemented in an environmentally and socially sustainable manner, taking into account Kenya's relevant sector legislation as well as the donors' Safeguard Policies.

The environmental and social screening is undertaken for Last Mile Connectivity Project to determine the potential environmental and social impacts of connecting the customers to the grid from distribution transformers. Connection of customers will be done from distribution transformers within 600m radius from their premises. Some connections will involve extension of low voltage line using poles with others will only require dropping of cables. In order to determine the potential impacts of implementing the project; the screening process considered the environmental and social characteristic of project sites per constituency as outlined in the table below.

**Table 3: Environmental and Social Characteristics of Proposed Project Sites**

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>KWALE COUNTY</b>						
<b>KINANGO CONSTITUENCY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosques</li> <li>Schools</li> <li>Agricultural – Maize, Pawpaw, mangoes, Bananas, Cashew nuts, palm</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Mbao, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Sisal,</li> <li>Natural vegetation dominated by shrubs, grass and Lantana Camara</li> <li>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</li> </ul>	Gently sloping to slopy	Sandy clay, Sandy Loam,	Terrestrial birds	transformer `19352 &19362 not marked on ground, frequent outages at Shimba hills market, TX's along Mombasa road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>MSAMBWENI</b>						
Medium, High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosques</li> <li>Schools</li> <li>Agricultural – Maize, Pawpaw, mangoes, Bananas, Cashew nuts, palm</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Mbao, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Sisal, Bananas, sugarcane, eucalypts</li> <li>Natural vegetation dominated by shrubs, grass and Lantana Camara</li> <li>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</li> </ul>	Gently sloping	Sandy clay, Sandy, Sandy Loam,	Terrestrial birds, No sensitive ecosystems	transformer `19965 marked as 7794 on ground, 18369 not marked on ground, TX's along busy roads; contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>LUNGA LUNGA</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium to High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosques</li> <li>Schools</li> <li>Agricultural – Maize, Pawpaw, mangoes, Bananas, Cashew nuts, palm</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Mbao, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Sisal, Bougain Villea, Cactus, ornamental plants</li> <li>Natural vegetation dominated by shrubs, grass and Lantana Camara</li> <li>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</li> </ul>	Gently sloping	Sandy clay, Loam, Murram, Limestone rock	Terrestrial birds; No sensitive ecosystems	transformer `20180 marked as 7800 on ground, TX's along Mombasa road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>MATUGA SUBCOUNTY</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosques</li> <li>Schools</li> <li>Agricultural – Maize, Pawpaw, mangoes, Bananas, Cashew nuts, palm</li> <li>Administrative</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Cashew nuts, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Mangoes, Banana, Eucalypts, Pawpaw, palm, neam</li> <li>Natural vegetation dominated by shrubs, grass and Lantana Camara, scattered sycamous trees</li> <li>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</li> </ul>	Relatively flat, Gently sloping	Sandy, Loam, Sandy Loam	Terrestrial birds	TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>TAITA TAVETA COUNTY</b>						
<b>TAVETA SUB- COUNTY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<p>Planted trees e.g. Cashew nuts, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Mangoes, Banana, Eucalypts, Pawpaw, palm, neam</p> <p>Natural vegetation dominated by shrubs, grass and Lantana Camara, scattered sycamous trees</p> <p>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</p> <p>Invasive vegetation dominated by Prosopis Juliflora (Mathenge) prompting frequent wayleave maintainance</p>	Gently sloping and Relatively flat	Sandy, Loam,	Terrestrial birds, No sensitive ecosystems	TX 20504 marked as 36022 on ground, TX 19321 has Prosopis outgrowth underneath. TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>VOI</b>						
Medium and High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	<p>Planted trees e.g. Cashew nuts, Umbrella, Acacia, Casuarina, Neam, Croton, Nandi flame, Mangoes, Banana, Eucalypts, Pawpaw, palm, neam, sisal,</p> <p>Natural vegetation dominated by shrubs, grass and Lantana Camara, scattered Acacia, Baobab, cactus</p> <p>Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation</p> <p>Invasive vegetation dominated by Prosopis Juliflora (Mathenge)</p>	Gently sloping and Relatively flat	Red soils	Terrestrial birds, No sensitive ecosystems	Some TX's not marked on ground, TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
		prompting frequent wayleave maintenance				
<b>MWATATE</b>						
Medium and High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	Planted trees e.g. Mangoes, grivellia, Mbao, Pawpaw, Umbrella, Croton, Cedar, Sugarcane, Banana, Eucalypts, Jacaranda, Maize Natural vegetation dominated by Croton, grass and Lantana Camara, Euphobia, Kay Apple, Sycamorus, Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation	Hilly	Red clay, Red soils	Terrestrial birds, rugged terrain and immense tree cover needs to be factored.	For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007
<b>MOMBASA COUNTY</b>						
<b>LIKONI</b>						
High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	Planted trees e.g. Mangoes, grivellia, Mbao, Pawpaw, Umbrella, Croton, Cashew nuts, Bananas, Casuarina Natural vegetation Lantana Camara, Acacia, Baobab, Wayleave acquisition where necessary, compensate damaged property and clear only necessary vegetation	Slopy, Gently sloping and relatively flat	Sandy	Terrestrial birds, next to the ocean.	TX 7724& 6779 not marked on ground, For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007; area

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
						very congested and extra caution necessary
<b>KISAUNI</b>						
High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	Planted trees e.g. Mangoes, grivellia, Mbao, Pawpaw, Umbrella, Croton, Cashew nuts, Bananas, Neam, Palm, Casuarina, oranges, Sugarcane Natural vegetation Lantana Camara and Sodom apple. Wwhere necessary, compensate damaged property and clear only necessary vegetation	Gently sloping and relatively flat	Sandy & Sandy loam	Terrestrial birds, No sensitive ecosystems	For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007; area very congested and extra caution necessary
<b>CHANGAMWE</b>						
High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Agricultural</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	Planted trees e.g., Neam, Bougain villia, Palm, Paw paw, Nandi flame Natural vegetation minimal coz area developed with housing	Gently sloping	Sandy Limesto ne	Terrestrial birds, No sensitive ecosystems	For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007; area very congested and extra caution necessary
<b>JOMVU</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
High	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Health facilities</li> <li>•Schools</li> </ul>	Few Planted trees e.g., Neam, Mang, Bananas, Umbrella, Casuarina, Palm, Cashew nut Natural vegetation Shrubs	Undulating and Slopy	Sandy Limestone, Sandy clay, Sandy red	Terrestrial birds, sensitive ecosystems due to gullies undulating terrain	For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007; area very congested and extra caution necessary
<b>KILIFI</b>						
<b>MAGARINI</b>						
High and Medium past Malindi salt plants	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neam, Casuarina, palm, pawpaws, Cashew nuts, pumpkins</li> <li>• Natural vegetation grass, herbs, shrubs, Baobab, Accacia, Mwangati, Mkwaju,</li> </ul>	Gently sloping	Sandy loam	Terrestrial birds, No need to clear shrubs that will never grow to touch powerlines	TX Number 6745 not marked on ground, For TX's along road contractors and public to exercise extra care during works, safe wiring by approved technicians to be ascertained at customers premises Contractors to observe OSHA 2007; area very congested and extra caution necessary.
<b>MALINDI</b>						
Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Grevillea, Mangoes, maize, Eucalyptus, Pine, Cypress, Jacaranda, Napier grass Makhamia lukea</li> <li>• Natural vegetation Lantana camara, grass, herbs, shrubs</li> </ul>	Gently sloping	Red Soil	Terrestrial birds	TX Number 20947 on ground marked as 20919. TX 19267 not marked
<b>KILIFI SOUTH</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosque</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural - maize &amp; Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Palm, Mangoes, maize, Sisal, Cashew nuts, Neam, Bananas, pawpaws, eucalypts</li> <li>Solanum indica</li> </ul>	Gently sloping to relatively flat	Sandy & Red Soil	Terrestrial birds	TX Number 38671 Poles slunting. Tree outgrowth/ branches touching 11 KV line. and need to be replaced.
<b>KILIFI NORTH</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Cashew nuts, palms, Grevillea, Mangoes, maize, pineapples, Casuarina</li> <li>Natural vegetation Lantana camara, baobab, Accacia, grass, herbs, shrubs</li> </ul>	Gently sloping	Sandy Soil	Terrestrial birds	TX Number 38671 Poles slunting. Tree outgrowth/ branches touching 11 KV line. and need to be replaced.
<b>KALOLENI</b>						
High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Cashew nuts, palms, Grevillea, Mangoes, maize, pineapples, Casuarina, Bananas</li> <li>Natural vegetation Accacia, grass, herbs, shrubs</li> </ul>	Slopy, other areas relatively flat	Sandy loam Soil	Terrestrial birds	No issues
<b>RABAI</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium to High	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosques</li> <li>Schools</li> <li>Health facilities</li> <li>Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>Planted trees e.g. Cashew nuts, palms, Grevillea, Mangoes, maize, pineapples, Casuarina , umbrella, Mbao, Casuarina, Cassava, Cha mama, Jatropha</li> <li>Natural vegetation Lantana camara, Accacia, grass, herbs, shrubs</li> </ul>	Gently sloping	Sandy Clay, Sandy Loam Soil	Terrestrial birds	No issues
<b>MATUGU</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Mosque</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural – Sugarcane, Maize</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Sugarcane, Croton, Grevillea, Mangoes, Eucalyptus, Pine, Mbao, Cypress, Avocadoe, Umbrella, bananas,</li> <li>Natural vegetation Acacia, grass, herbs, shrubs, Lantana Camara</li> </ul>	Relatively flat, flowing stream	Black sandy clay, Marrum , red soil	Terrestrial birds	TX Number 41988 was not found on ground, marking existing, TX38368& 40639 adjacent homes and shopping centre not connected. TX Number40369 not marked on ground.
<b>GANZE</b>						
Medium	<ul style="list-style-type: none"> <li>Commercial (Markets)</li> <li>Residential</li> <li>Churches</li> <li>Schools</li> <li>Health facilities</li> <li>Water points</li> <li>Agricultural –Livestock</li> </ul>	<ul style="list-style-type: none"> <li>Planted e.g. Palm trees, Mkwaju, Casuarina,</li> <li>Natural vegetation grass, herbs, shrubs, Lantana Camara,</li> </ul>	Gently sloping	Red soil	Terrestrial birds	TX along road, enure traffic and public safety.

## **9.4 POTENTIAL IMPACTS OF THE PROJECT**

The section identifies both negative and positive impacts associated with the project. The impacts affect both social and environmental wellbeing of the project area.

### **9.4.1 Positive Impacts**

#### **Employment and Wealth Creation**

Last Mile connectivity project shall create employment opportunities during construction and operational phases. During the construction phase, there shall be direct and indirect opportunities for workers who shall be employed to connect customers to the grid, artisan work in wiring premises, a wide range of businesses extending to service industry. Earnings received from the direct and indirect employments shall help improve livelihoods of persons in employment. In addition direct and indirect employment will translate into incomes at the household levels which will trigger other spending and demand in the local economy.

#### **Electricity access to low income groups**

Last mile connectivity project shall enable Kenya Power to supply electricity at low costs to persons within 600m radius of existing distribution transformers. The low cost of supplying electricity has attracted many people in the low income groups who feel they shall be able to afford the subsidized costs.

#### **Loan Payment Model**

Last Mile Connectivity Project shall implement the Stima Loan payment model especially for customers in the low income bracket who will not be able to pay the required connection fee upfront. Loan payment for an extended period of time shall enable customers in low income and vulnerable groups to afford electricity connection without much strain.

#### **Local Supply of Materials**

Poles to be used during construction phase shall be sourced locally thus reducing extra costs incurred during transportation. Local sourcing of materials shall also be beneficial to locals suppliers especially from payments received during purchase. Local sourcing of materials shall therefore generate new income revenues for the local population across the country. The new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy

#### **Improved living standards**

Implementation of last mile connectivity project will result in connecting approximately 1.2 million customers to the national grid. Access to electricity enables people to use domestic electric appliances such as electric cookers, iron boxes etc. It also limits exposure to smoke during cooking and is appropriate for lighting.

#### **Social Inclusion**

LMCP aims at connecting electricity to all social groups in the country. This is in line with the tenets of social inclusion which the World Bank defines as the process of improving the terms for individuals and groups to take part in society. Further, Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global

opportunities. It ensures that people have a voice in decisions which affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.

### **Awareness creation on HIV/AIDS**

The Kenya Power HIV/AIDS policy underscores the fact that HIV/AIDS has no cure and the only way to stop its spread is through attitudinal and behavioral changes as well as management that can be secured effectively through education (awareness and information campaigns). As such, the project will ensure dissemination of information on HIV/AIDS to communities and workers who otherwise would not have had the correct information. Kenya Power shall disseminate information through awareness creation through the contractor and company's Safety, Health & Environment Department.

### **Health Benefits of LMCP**

According to 2009 population census, 70% of Kenyans used kerosene for lighting. This poses health risk as reported by World Bank report 2008 on the Welfare of Rural Electrification. Health risk posed by indoor air pollution from burning of kerosene mainly include acute lower respiratory infections, low birth weight, infant mortality, and pulmonary tuberculosis. Available data suggest that insufficient illumination (low light) conditions can cause some degree of eye strain, and reading in these conditions over long periods of time may have the potential to increase the development of nearsightedness (myopia) in children and adults. The Last Mile project will result in many families replacing kerosene lamps for lighting with electricity there-by reducing disease burden at the family level and on the government.

### **Benefits to Education**

Access to reliable electricity at the household level and schools will create opportunities for children to study, access more information through informative TV channels and radios. This increases the amount of time spent by children studying and accessing valuable information. As a result translating into better results and an informed society.

### **Increased revenue**

The implementation of the project will boost income streams accrued from increased sales of electricity to KPLC in the long run. Though not in the short term, these revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results in improvement in service provision by the government to its citizens.

### **Improved Security**

There will be enhanced security in the country arising from well-lit social, commercial and individual premises. With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes and gender based violence.

### **Improved Communication**

Access to electricity will lead to improved communication for the beneficiaries. This will be enabled by the fact that charging of mobile phones will be easier and cheaper. Access also to mass media like radio and T.V will provide opportunity for the households to access a wide range of information which is useful for decision making. Some

information that shall be received include: information on markets, farm inputs, crop management and local affairs, nutrition, diseases, investments and entertainment among others.

### **Gender Considerations**

Electricity is a basic service especially for lighting but is still a luxury for many rural women and men. Access to modern electricity will go a long way towards alleviating the daily household burdens of women, giving them more time, improving their health and enhancing their livelihoods. The Last Mile Project will increase access to electricity across the whole country. Available literature on gender and energy suggests that providing electricity to communities and homes and motive power for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment.

### **9.4.2 Negative Environmental and Social Impacts**

Despite the various socio economic and environmental benefits outlined, the project will also have some negative impacts. As regards the proposed KPLC Projects, potential adverse environmental and social impacts on the natural and human environment are likely to arise from inputs as well as project processes at the construction and operation and maintenance phases. The following are the negative impacts and suggested mitigation measures.

#### **Impacts on Natural vegetation and biodiversity**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace. Grass and short vegetation will be cleared to pave way for erection of poles.

#### **Impacts on air quality from vehicle exhaust fumes**

Exhaust emissions are likely to be generated by the construction vehicles and equipment. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

#### **Risks of sparks/fire from live conductors**

Potential adverse impacts related to fire hazards can result from the project. The live conductors can cause short circuiting in case conductors touch one another due to strong winds, falling tree branches or trees. In case of big sparks falling on dry grass there can be a likelihood of fire.

#### **Solid waste**

Little if any solid waste will be generated which includes conductor cuttings and tree cuttings.

#### **Electric shocks and electrocution of people**

Electricity is a hazard if safety precautions are not adhered to and properly used. Within the households electric shocks are likely in case of poor handling of electricity such as using wet hands, poor wiring and overloading of sockets.

#### **Occupation safety and health hazards**

During construction contractor workers will be engaged in activities such as pole and conductor wiring and working at heights. Workers can be exposed to occupational risks like falling from heights, being pressed by poles, slips and shocks.

### **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Oil Leaks from transformers**

Transformers can experience a leak arising from a fault, poor handling and vandalism. These leaks may result in potential contamination of surface and groundwater as well as soil.

### **Noise during construction**

Noise will be generated from the construction machines and construction workers during the construction phase and is expected to be minimal and spread.

### **Contamination from creosote-treated poles**

Soil and water pollution due to unsafe disposal of creosote-treated poles may occur if proper care and management procedures are not put in place

### **Social Vices**

Increasing numbers of workers in construction sites during project period can result into social vices in the project area such as increased cases of theft among.

### **Soil erosion and surface runoff**

Loose soils from excavations done during erection of poles can be washed away if not compacted thereafter.

### **Open Excavations**

Open excavations made during erection of poles can result into accidents when left unprotected using high visibility tapes and can act as breeding grounds for vectors especially when left unused for a long period of time.

## **9.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 4: Environmental and Social Management Plan**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
<b>Minimize vegetation disturbance along construction site</b>				
Vegetation Disturbance	<ul style="list-style-type: none"> <li>Choose routes that offer minimal disturbance to vegetation and where inevitable clear manually only necessary vegetation.</li> <li>Properly demarcate the project area to be cleared during installation of supply droplines</li> <li>Designate parking lots within the project area to prevent vegetation disturbance</li> <li>Plant suitable trees within the project area to compensate for any damaged ones</li> <li>Compensate for any damaged trees and crops</li> </ul>	Project engineer and contractor	2 Months	<p><b>150,000.00</b></p> <p>To be determined</p>
<b>Reduce soil erosion and surface run off</b>				
Increased soil erosion and surface run off	<ul style="list-style-type: none"> <li>Use existing roads and avoid ground disturbance as much as possible</li> <li>Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</li> </ul>	Project engineer and contractor	Throughout construction period	<p><b>0.00</b></p> <p><b>200,000</b></p>
<b>Air Pollution</b>				



Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Dust emission	<ul style="list-style-type: none"><li>• Avoid excavation works in xtremely dry seasons</li><li>• Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</li><li>• Provide and ensure use of appropriate personal protective equipment by workers on site</li></ul>	Project engineer and contractor	Throughout project period	30,000.00
Exhaust emission	<ul style="list-style-type: none"><li>• Use well serviced vehicles and any other motorized equipment</li><li>• Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible</li></ul>			0.00
Minimize occupational safety and health risks				
Open excavations	<ul style="list-style-type: none"><li>• Barricade the proposed project area using high visibility tape to avoid falls into open excavations</li><li>• Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents.</li><li>• Contractor to compensate any injuries to the public and animals arising from his negligence</li></ul>	Contractor	Throughout project period	To be determined

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Working at height	<ul style="list-style-type: none"> <li>Observe clearance from power lines and workers to be experienced with necessary qualifications</li> <li>Test power lines to ensure they are shut down before work</li> <li>Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</li> <li>Provide storage bags for portable tools used while working at height.</li> </ul>		Throughout project period	0.00   0.00   300,000.00   20,000.00
Safety and health awareness	<ul style="list-style-type: none"> <li>Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements</li> </ul>	Contractor and project engineer	Throughout project period	0.00
Pricks and cuts	<ul style="list-style-type: none"> <li>Ensure project area is kept free of sharp objects</li> <li>Provide appropriate foot protection to workers within the site</li> </ul>	Contractor and project engineer	Throughout project period	0.00  100,000.00
<b>Public safety and health</b>				
Shocks and electrocutions	<ul style="list-style-type: none"> <li>Create awareness to the public on the potential impacts of powered lines to prevent electrical hazards</li> </ul>	Contractor and proponent	Before commencement of the project	500,000.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Project infrastructure	<ul style="list-style-type: none"><li>Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards</li></ul>			
HIV/AIDS	<ul style="list-style-type: none"><li>Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide condom dispensers at all project worksites</li></ul>			
Social Vices	<ul style="list-style-type: none"><li>Awareness creation to the public and liaising with area administration to enhance security</li></ul>			
Damage to property				
Damage to structures erected on the way leaves	<ul style="list-style-type: none"><li>Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures</li><li>Use existing wayleaves and road reserves to minimize disturbance and unnecessary compensations</li><li>Where it is inevitable, compensate for damaged property</li></ul>	Contractor and proponent	Before commencement of the project	To be determined
Risk of sparks/ fires from live conductors	<ul style="list-style-type: none"><li>Contractor to ensure all fittings are tight and implemented using quality materials to prevent</li></ul>	Contractor, Proponent	Implementation	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	arcing and any loose connections. <ul style="list-style-type: none"> <li>• Contractor to ensure right tension and spacing is well implemented for conductors.</li> <li>• Premises to be wired by qualified technicians and test certificates maintained</li> </ul>	Customers	Before connection	

## **9.6 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others and shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

## **10 LOT10: NORTH EASTERN**

## **EXECUTIVE SUMMARY**

The last mile connectivity project is an initiative to help achieve government pledge of stimulating economic growth and accelerating job creation for the wellbeing of Kenyans. The project benefits from external funding and thus shall enable Kenya Power to supply electricity to customers at a subsidized cost while also implementing the Stima Loan payment model. Supply of electricity at a subsidized cost shall enable persons in low income groups to access electricity and see into connection of more customers to the national grid. The last mile connectivity project shall also avail meters to customers prior to engaging them for payment. The project's benefits include provision of new supply over a short period of time and accelerated access to electricity among others.

Environmental and Social screening is undertaken to determine whether LMCP requires EIA or not and to provide indication at the level that this should be done. The screening process aims at enhancing environmental and social suitability of LMCP. This will help manage environmental and social risks associated with the project. The screening process has been developed because the locations and types of the distribution and transmission component for the projects which are not known prior to the appraisal of the parent project, and therefore potential adverse localized environmental and social impacts cannot be precisely identified. Furthermore, Kenya's environmental legislation does not provide for the environmental and social screening of small-scale projects, such as those included in the distribution and transmission component of KPLC Projects. The EMCA and other international legislations and donors' safeguard policies like on Environmental Impact Assessment requires that all projects are screened for potential adverse environmental and social impacts to determine the appropriate mitigation measures.

The Last mile connectivity project has numerous positive impacts not only to the company but also to customers. The project aims at implementing Stima Loan payment model to enable customers in low income groups access electricity, supply of electricity at a subsidized cost will enhance security in different areas, promote social inclusion, gender consideration, benefit education and improve livelihood among others. Anticipated negative environmental and social impacts during construction and implementation of the project include: transformer oil leakages, electric shocks and electrocution of people, social vices, vegetation disturbance and risk of sparks and fire from live conductors among others. The company will ensure implementation of the developed environmental and social monitoring plan to mitigate the potential negative impacts while maximizing on the positive impacts identified.

The company acknowledges that the Last Mile Connectivity Project has some negative impacts on the environment and social wellbeing of the people. As such, the Environmental Social Management Plan has been developed to assist the company in mitigating and managing the environmental and social issues associated with the life-cycle of the project. The ESMP developed will ensure compliance with regulatory authority stipulations and AfDB guidelines. It will also enhance sufficient allocation of resources on the project budget so that the scale of ESMP-related activities is consistent with the significance of project impacts.

In conclusion, the last mile connectivity project will ensure supply of electricity at an affordable cost to customers, connection of more customers to the national grid and improvement of security in different areas through availability of reliable electricity. On the other hand, negative impact of the project which include; oil leaks from transformers, shock and electrocution of people as well as noise from construction will be mitigated as outlined in the ESMP. On the basis of the above and taking cognizance that the company has proved to be environmentally and socially credible, it is important to have the project implemented to enhance economic wellbeing of the society.

## 10.1 Introduction and Project Brief

The Government of Kenya has pledged to stimulate economic growth and accelerate job creation to improve the economic wellbeing of Kenyans. Among the many interventions to achieve this is expansion of the power distribution system to be within reach and thus enable more Kenyans connect to the grid at affordable cost and hence initiate economic activities at the micro-economic level. The current trend of network expansion driven by customer demand is approaching saturation. In the foreseeable future there is a likelihood of the annual connectivity stagnating at the 300,000-400,000 level. To jumpstart and accelerate connectivity, a new thinking is needed as happened in 2004.

To reduce the cost burden of increased connectivity on KPLC, as well as reduce the amount paid by the customer to connect to the grid, the strategy proposed is to extend the distribution network to as near the customer as possible using external or government funding. This can initially be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization). This model would involve building low voltage lines both single phase and three phase (to a small extent) along rural access roads.

KPLC has a total of 35,000 distribution transformers spread across the country. The transformers were installed for various reasons, i.e., for new customers, reinforcement of existing transformers due to load growth, reinforcement to reduce length of the low voltage lines hence improve transformer protected distances, etc. As such majority of the transformers will be having varied lengths of the low voltage network emanating from them, some of which will be passing in close proximity to ready and potential customers.

Data collected from KPLC regions indicates that the company has potential to connect approximately 472,002 households that are within 600 meters of the transformers through individual service lines. Of these households, some will be within developed areas, majority of who will be reached by a service cable drop or a pole or two, whereas in the expansive zones in the peri-urban and rural areas, construction of a 600m low voltage line for a single customer will not be an exception. Based on an average of two spans (@ 50m) single phase LV line, 30m service cable drop (10% of the service drops assumed to be three phase), 40km return transport and implementation by labour and transport contractors, the projected cost of connecting all these households is approximately USD 685million (KShs. 58.2Billion).

Benefits of Last Mile Connectivity project include:

- xxix. Accelerated access to electricity;
- xxx. Improved standards of construction hence improved quality of supply;
- xxxi. Provision of new supply in a shorter time;
- xxxii. Opportunity for the company to develop long term network expansion plans.

Currently, only 35% of the households are connected to the national electricity grid. The Government plans to increase this to 65 % by 2020 and 100 % by 2030 and has put in place strategies to accelerate access to modern energy services through public and private initiatives. The government, with support from development partners, has allocated substantial resources for development of energy infrastructure including exploitation of renewable energy resources. This effort provides opportunities for collaboration with the private sector in renewable energy development and national electrification.



### **10.1.1 Importance of LMCP**

The Kenya Government, through the ministry of Energy & Petroleum, intends to increase electricity access in the country to 70% by 2017 and as part of the initiative to connect many households, has secured funding of US\$ 153.4 Million from the African Development Bank (AfDB) under the Last Mile Connectivity project (LMCP) which involves mostly electrification programs through maximizing existing transformers.

The Last Mile Connectivity project is aimed to support the Government's initiatives of ensuring increased electricity access to Kenyans, particularly among the low income groups. The existing distribution transformers shall be exploited to the maximum through extension of the low voltage network to reach households located in the vicinity of these transformers.

KPLC has a total of about 35,000 distribution transformers spread across the country. Within a 600 meter radius from these transformers, and the company has a potential to connect 472,002 households corresponding to approximately 1.2 million customers. The cost of connecting these households is estimated at about USD 685 Million (KShs 58.2 billion).

The project will involve connection of customers within 600m of existing transformers. Of these households, some will be within developed areas, majority of who will be reached by a drop or a pole or two. This can also be achieved by extending the low voltage network on existing and other upcoming distribution transformers to reach households lying within transformer protection distance (maximization).

Consequently, the potential negative environmental and social impacts anticipated are negligible. The actual level of environmental assessment will range from; no environmental assessment being required, the application of simple mitigation measures (using the environmental and social screening) to the preparation of a simple EIA report if need be after screening has been done.

The project beneficiaries will include individuals at household level, commercial enterprises in market centres and public institutions such as learning institutions, health facilities and administrative offices.

### **10.1.2 Project component**

The project aims at extending the low voltage system so that counties with low penetration rate benefit the most from the project. The proposed project is expected to benefit 200,000 customers, equivalent to approximately 1, 000,000 people.

The main project component focuses on the expansion of the low voltage lines from the existing distribution transformers to customers as well as the installation of pre-paid energy meters.

The project consists of the following components:

- Construction of the low voltage network and installation of energy meters;
- Project supervision and management by a consultancy firm to assist KPLC during the project implementation;
- Financial audit of the project accounts carried out on an annual basis;
- Environmental and social costs of the project;

### **10.1.3 Justification of LMCP**

Kenya Power being the sole supplier of electricity and having implemented policies and engaged in maximization projects to ensure increased connectivity to electricity to customers'; it has foreseen network expansion driven by customer demand approaching saturation. As such, there is need to have a new approach to jumpstart and accelerate connectivity at a subsidized cost to consumers.

Despite increasing demand for supply of electricity at a subsidized cost among low income groups, the company has not been able to successfully achieve the need due to increased costs of all inputs used in the process. Therefore, implementation of Last Mile Connectivity Project; which benefits from external funding, is a sure way of connecting more consumers, especially low income groups to the grid. This will ensure achievement of government pledge to stimulate economic growth and accelerate job creation for economic wellbeing of Kenyans; provision of new supply in a shorter duration of time and availability of reliable power supply.

## **10.2 Project Overview**

### **10.2.1 Location of the project**

The environmental and social screening was undertaken within constituencies in Nairobi and Kiambu Counties, these include: Lamu East, Lamu west, Kitui East, Kitui rural, Kitui Central, Kitui South, Kitui west, Kitui North, Garsen, Bura Constituency, Galore, Ijara, Mwingi East, Mwingi South, Mwingi West, Balambala and Garisa Township Constituencies

### **10.2.2 Baseline information of the project sites in Garisa County**

#### **10.2.2.1 Population**

Garissa County is one of the three counties in the North Eastern region of Kenya. It covers an area of 44,174Km<sup>2</sup> and lies between latitude 10 58'N and 20 1' S and longitude 380 34'E and 410 32'E. It borders the Republic of Somalia to the east, Lamu County to the south, Tana River County to the west, Isiolo County to the north - west and Wajir County to the north.

The county has a total population of 700,050 consisting of 376,327 males and 323,723 females as at 2012. The population is projected to increase to 786,553 and to 850,080 persons in 2015 and 2017 respectively. Urban population constitutes about 16% of the county's total population. Garissa County has 124,115 children who are below five years old. This is about 17.7% of the total population. In the county, there are 191,837 children who are within the primary school going age. Of this, 54.8 per cent are boys while 45.2 per cent are girls. There is a total of 168,456 children who are within the secondary school going age. The secondary school age population for girls is 72,282 since most girls do not proceed to secondary school in the county due to early marriages. The primary school going population age of 10-14 years is high compared to the population of the secondary school going age of 15-19 years. Youth (18-35 years old) population stands at 199,384, and therefore the youth constitutes about 28.5 per cent of the total population. This is a significant proportion of the population whose needs must be addressed. Thus the county requires a comprehensive program targeting this segment of the population.. The elderly population (i.e 80 years old and above) is low. This is due to low life expectancy rate in the county which stands at 56 years for males and 65 years for females. The dependency ratio in the county stands at 48%. This has a negative impact on development since more resources are required to take care of this population.

#### **10.2.2.2 .Topography**

Garissa County is basically flat and low lying without hills, valleys and mountains. It rises from a low altitude of 20m to 400m above sea level. The major physical features are seasonal *Laghas* and the Tana river Basin on the western side. The river Tana has tremendous effect on the climate, settlement patterns and economic activities within the county. Given the arid nature of the county, there is great potential for expansion of agriculture through harnessing of river Tana and *Laghas*. Climate

## **10.2.3 Baseline information of the project sites in Kitui County**

### **10.2.3.1 Population**

Kitui County Its capital and largest town is Kitui although Mwingi is also another major urban centre. The county has a population of 1,012,709 (2009 census) and an area of 24,385.1 km<sup>2</sup> According to the 2009 national housing and population census, the county had 3,134,265 people which is projected to rise to 4,247,770 by year 2017.

### **10.2.3.2 Climate**

The climate is semi-arid; it receives roughly 71 cm (28 inches). A significant point however is that rainfall occurs practically only during the rainy seasons (one long around May and June, and one short, around September and October).

### **10.2.3.3 Soil**

The soils in the East are relatively low in natural fertility but rich in sodium, making them highly suitable for grazing. The soils in the Central parts of the County are usually high in fertility, but not intensively used for agricultural production due to the lack of water. Alluvial deposits (Fluvisols) occur in isolated patches along rivers and on hill slopes.

These so-called 'black cotton soils' mainly consist of clays (silty to silty-clayey loam). The soils are found in the Western part of the County. In the South shallow stony soils exist, with rock outcrops alternated with the black cotton soils and light brown sandy loams. The drainage of all soils is very poor and most are easy erodible. This results in high runoff and erosion: big parts of the soils are highly degraded and eroded, with gullies through the soils to the bedrock. It also results in low infiltration of rainwater on the valley sides and the banks of rivers

## **10.2.4 Baseline information of the project sites in Tana River County**

### **10.2.4.1 Population**

Tana River County is one of the six Counties in the Coast region. It borders Kitui County to the West, Garissa County to the North East, Isiolo County to the North, Lamu County to the South East and Kilifi County to the South. The county lies between latitudes 0 00'53" and 200'41" South and longitudes 38025'43" and 40015' East. The county has a total area of 38,862.2 Km<sup>2</sup> with a projected population of 276,567 (KNBS, 2014) and covers about 76 kms of the coastal strip

The projected population of Tana River County in 2012 was estimated at 261,348 with 130,875 being female and 130,473 male. The county has an inter census population growth rate of 2.83 per cent slightly lower than the national average of 2.9 per cent. The ratio of male to female is 99:100 and the pattern is projected to remain the same by June 2018.

### **10.2.4.2 Climatic Conditions**

The region has a hot and dry climate within ecological zones ranging from III (in the very high grounds) to VII (in the plains or lowlands). Average annual temperatures are about 30°C with the highest being 41°C around January-March and the lowest being 20.6°C around June-July. Rainfall is low, bimodal, erratic and conventional in nature.

The total annual rainfall ranges between 280 mm and 900 mm with long rains occurring in April and May, short rains in October and November with November being the wettest month. The Inter Tropical Conventional Zone (ITCZ), which influences the wind and non-seasonal air pattern for the river Tana, determines the amount of rainfall along the river line. The dry climate in the hinterland can only support nomadic pastoralism.

#### **10.2.4.3 Soils**

Tana River Delta falls within the Coastal Plains, one of the three physiographic zones on the Kenyan coast that rises from sea level to 140 m. The delta has a coastal strip 35 km long protected by a 50 metre high sand dune system. The geomorphology of the Coastal Plain is dominated by a series of raised old sea level terraces. Most of the coastal environment and the modern shore configuration follow the 0-5m and the 5-15m sea level terrace complexes.

Tana River County has generally deep to very deep soils and this condition helps to justify the vegetation in the range land map. In addition, crop farming also do well in deep soils therefore this map is useful to the agriculturalists. The soil types that exist in the county include loamy, clay and sandy.

#### **10.2.4.4 Climate**

Climatic conditions for the Tana Basin catchment range from humid in the highlands to very arid in the lowlands. Similarly, temperatures vary from 100C to 300C (Table 3). Mean annual rainfall ranges from 2400mm – 200mm in the same order. Rainfall is bimodal, coming during the long rains season of March – May, and short rains season of October-December.

Land cover in the Tana Basin reflects the climatic range and varies from alpine type at the top of Mt. Kenya through moorlands, tropical forests, savannah grassland in middle region to semi-arid lands and coastal mangrove forests. The Region has over 80% of its land under Arid and Semi-Arid Land conditions. Tana Delta is characterized by low and unreliable rainfall. It receives low and erratic bimodal rainfall that is slightly variable in both space and time. In most cases, rain falls as short high intensity storms that produce

Considerable runoff and soil erosion. Mean annual rainfall ranges from 300 – 900 mm per annum. Average humidity is 85%.

### **10.2.5 Baseline information of the project sites in Lamu County**

The County has two constituencies namely Lamu West and Lamu East. Lamu West constituency covers Amu, Hindi, Mpeketoni and Witu Divisions while Lamu East constituency covers Faza, Kizingitini and Kiunga Divisions.

#### **10.2.5.1 Settlement Patterns**

Settlement patterns in the County are diverse because they are determined by many factors which include access to economic opportunities in agriculture, livestock keeping, fishing and trade. Other factors include government settlement programmes and security concerns. Witu Division which is predominantly a livestock zone is occupied mainly by the Orma community. Mpeketoni, Hindi and some parts of Witu are settlement scheme areas established in the 1970's and 1980's. These are predominantly agricultural areas and are inhabited by almost all the Kenyan communities. In Hindi and Mpeketoni the Kikuyu community are however the majority. Mpeketoni Division is also home to the Sanye which is one the smallest tribes in Kenya which are normally excluded from mainstream development activities. Amu Division where Lamu town is located harbours almost all Kenyan communities but the majorities are the Bajunis.

In the Island which includes Patte, Kizingitini Ndau and Siyu amongst others, the predominant community are the Bajunis who live in villages. One of the main economic activities in the Islands is fishing, though small scale agriculture is also practiced. Kiunga Division is inhabited by the Boni community and Bajunis. The Bonis are preoccupied with traditional bee keeping while the Bajunis are fishermen. Kiunga which is the main town is popular with many communities due to its location which is on the border with the Republic of Somalia.

There is marked variation in population densities in the district with Kizingitini Division, which is the smallest in the area having the highest density. Other divisions which are densely populated are Amu and Faza Divisions. Kiunga Division is the most sparsely populated having a density of 3 persons per square kilometre.

#### **10.2.5.2 Topographic Features**

Lamu County is generally flat and lies between zero and 50 meters above sea level which makes some parts of the county become flooded during the rainy seasons; mostly those around Lake Kenyatta in Mpeketoni Division and along Tana River Delta like Chalaluma in Witu Division occasionally become flooded during rainy seasons. Other areas which are near the sea experience floods during the high tides. Other important features in the County are rock outcrops which occur on the Islands of Manda and Kiwayuu and sand dunes which are found mostly in Lamu Island and parts of Mkokoni in Kiunga Division.

The main topographical features include the coastal plains, Island plains, Dodori River plain and the sand dunes while the most common rock formation are residual coral limestone and columns of sand. The coastal plain, though not extending to the coastline creates the best agricultural land in the district. Also to be found in these plains are sand dunes though not many. The island plain is found to the coastal, northern and western parts of the county and has good potential for agricultural development. The Dodori River plain which is in the Dodori national reserve is home to many wildlife species. The sand dunes which are found to the north-eastern and the southern parts of the county rise to a height of about 50metres above sea level and are a source of fresh water in the county.

There are 4 major catchments areas each with its own characteristics. These are Dodori catchments and coastal zone. Duldul catchments, the Lamu Bay drainage catchments and the Tana River catchments. The lack of permanent river flow in the county indicates that groundwater storage is not very high. Lake Kenyatta in Mpeketoni Division is the only permanent open water site in the county though it has been known to dry during the exceptionally dry years. The few seasonal streams in the district flow from the west towards the south-eastern part of the county. However, none of these streams reach the Indian Ocean. As a result of rainfall, several swamp sites exist throughout the county with the main ones located in Dodori, Belebele in Hindi, Ziwa la Magarini and Chomo Ndogo – Chomo Kuu along the Hindi – Bargoni road, Luimshi and Kenza on Nairobi ranch and Kitumbini and Ziwa la Gorji in Witu.

#### **10.2.5.3 Climatic Conditions**

There are no marked variations in temperatures within the county. Temperatures generally range from 23 degrees centigrade to 32 degrees centigrade throughout the county. The hottest months are December to April while the coldest months are May to July. The mean temperature is usually 29 degrees centigrade. The county can therefore be divided into two livelihood zones, namely the rich agricultural and livestock zone in the mainland (mainly settlement schemes) and the fishing and marine zones (the islands) both with varying economic diversities. The zones are also distinct in terms of ecology, infrastructural network and population distribution.

The county has a bimodal pattern of rainfall. The long rains occur from mid-April to the end of June, with the highest rainfall occurring in the month of May. The short rains occur in November and December and are generally unreliable. The months of January to March and August to October are usually hot and dry. Due to Ocean influence,

the rain pattern is such that its reliability decreases as one move towards the hinterlands. There are therefore 3 major rainfall zones in the county. The arid areas along the northern borders receiving below 540mm of rainfall annually, while the semi-arid areas covering Amu division and the Islands receive between 550mm and 850mm annually. The sub humid zone covering Witu and Mpeketoni Division receive between 850mm and 1,110mm of rainfall annually.

## **10.3 Project Screening**

### **10.3.1 Introduction of screening**

Many projects are considered by the public and private agencies every year. Development projects have biophysical as well as social and economic impacts. Sufficient understanding of these factors are necessary for the initial screening decision. It is therefore, important to establish mechanisms by identifying projects which requires EIA, and this process of selection of project is referred to as "Screening".

Screening process divides the project proposals within the following three categories

- project clearly requiring an EIA
- project not requiring an EIA
- project for which the need of application of an EIA is not clear

Environmental and social screening is undertaken to enhance environmental and social sustainability of proposed projects. The screening process focuses on environmental and social benefits of a project and identifying potential negative impacts of proposed projects. The aim of the screening process is thus to identify and manage environmental and social risks that could be associated with proposed projects. As a result, an environmental and social management plan is developed assigning responsibilities of actions and mitigation measures for identified negative impacts.

Environmental and social characteristics of the proposed project sites were identified based on; population density, existing land uses, vegetation, topography, soil types, general ecological setting and public safety.

The screening process also considered potential impacts of the connectivity project on Land value, job opportunities, income and economic activities. Findings reveal that implementation of the connectivity project within Kiambu and Nairobi County shall increase land value, create job opportunities and provide more income for persons opting for business ventures.

### **10.3.2 Objective of screening**

Determine the potential adverse environmental and social impacts of the proposed project;

Determine the appropriate environmental category as per OS 1 environmental assessment;

Based on the assigned environmental category, determine the appropriate level of environmental work required (i.e. whether an EIA is required or not (environmental category 1); whether the application of simple mitigation measures will suffice (environmental category 2); or whether the project has negligible adverse environmental and social risks. (Environmental category 3).

Determine appropriate mitigation measures for addressing adverse impacts

Determine the extent of potential solid and liquid waste generation, including hazardous wastes such as PCB and creosote, and appropriate mitigation measures;



Determine potential adverse impacts on physical cultural resources, and provide guidance to be applied in the case of chance finds;

Determine potential adverse social impacts due to land acquisition;

Determine whether indigenous peoples are likely to be affected by the project;

Facilitate the review and approval of the screening results and separate ESMP reports (the screening form would be looking at planned construction and rehabilitation activities); and

Provide environmental and social monitoring indicators to be followed during the construction, rehabilitation, operation and maintenance of the infrastructure service facilities and related project activities;

## **10.4 Potential impacts of the project**

### **10.4.1 Positive impacts**

The proposed last mile connectivity project will provide a milestone in spurring social and economic development in the country and will greatly help in achieving the objective of the Vision 2030 within the shortest time possible. Some of the socio economic benefits expected to accrue from the project includes but not limited to:-

#### **➤ Employment opportunities**

During implementation of the project various employment opportunities will be available. These include building of the service lines and wiring of individual houses. Given the magnitude of the project and number of connection envisaged, this project will create a considerable number of job opportunities across the country. This will go a long way in easing unemployment in the nation while the new income revenues received will create demand for other goods and services causing a trickledown effect to the entire economy.

#### **➤ Education**

Access to electricity at the household level and schools will lead to betterment of education services. Children will have opportunity to extend their study time because of better lighting system at home and in schools. Further, access to power will facilitate development and equipping of Laboratories in schools, promote use of laptops as well as introduction of ICT.

#### **➤ Reduction of pollution associated with use of thermal power, kerosene and wood fuel:**

Electricity supplied from National Grid would ensure less or no people use diesel generator sets for domestic power needs like pumping water, reduced reliance on kerosene both for lighting and cooking and will be an alternative to wood fuel and charcoal because of better and effective use of electrical appliances like cookers and electric irons. Consequently, this results in less carbon dioxide being released to the environment while less use of charcoal means reduced destruction of forests which will go a long way in conserving the environment.

#### **➤ Improved standard of living**

The implementation of this project will result in connecting about 1.2 million customers to the national grid. Access to electricity will change the standard of living of the people as they can use domestic appliances like iron boxes, fridge, television sets, washing machines to mention but a few. Use of electricity for lighting implies that the people will not be exposed to smoke arising from use of tin lamps which predisposes people to respiratory diseases.

#### **➤ Opportunity for business development**

Availability of power for more customers provides opportunities to establish small micro enterprises such as salons, barber shops, charging of phones, welding, baking use of electric sewing machines, agribusiness like poultry farming among others. The incomes earned by these people will create demand for other goods and services hence promoting the economy.

#### **➤ Communications**

Improved communication amongst the communities and connectivity to global facilities through internet, mobile technology etc. all powered by electricity.

#### **➤ Increase in Revenues**

The implementation of the project will boost its income streams accrued from increased sales of electricity. These revenues will go to system reinforcement to ensure reliable quality supply while some of it goes to the government as taxes which results to improvement in the economy.

➤ **Improved Security**

With the implementation of the project, the level of security will increase across the country. This is as a result of more security lights which helps keep off opportunistic crimes while other people are able to use electric fences.

## **10.4.2 Negative impacts of the project and their mitigations**

➤ **Electric shocks and electrocution of people.**

Electricity like fire is a good master and a bad servant if safety precautions are not adhered to and if not used properly.

### **Mitigation**

- Proper public education to the people on safety of using electricity
- Proper wiring in the houses by qualified technicians
- Use of danger/hatari signs on the poles

➤ **Occupation safety and health hazards.**

During construction many people will be engaged in working. Such people are exposed to occupational risks like falling from heights, being pressed by poles e.t.c

### **Mitigation**

- The contractor must observe all the safety precautions to ensure workers work safely
- Safety awareness creation to the workers
- Use of personal protective equipment like gloves, helmet, climbing shoes etc.
- Staff Training and regular equipment service and testing
- Only trained & certified workers to install, maintain or repair electrical equipment;
- Use of signs, barriers and education/ public outreach to prevent public contact with potentially dangerous equipment;
- Community policing to be encouraged to reduce vandalism of transformers and distribution cables
- Follow safe work procedures
- Maintain a fully stocked and accessible first aid kit
- Observe OSHA 2007 regulations

➤ **Public health risk**

At project implementation many new workers will be involved and new interactions between people are likely to take place. These interactions are likely to pose risks to the social fabric of the society. Such risks include public health related issues such as (HIV/AIDS, communicable and sexually transmitted diseases (STDs).

### **Mitigation**

Public awareness of the public health issues identified.

➤ **Impact on Natural Vegetation**

The project will involve short service lines within the 600m radius mainly along the road reserve. No tall growing trees will be allowed below the lines or along the way leave trace.

Grass and short vegetation will be cleared to pave way for erection of poles.

**Mitigation**

- KPLC to plant trees as a way of compensation for the cleared ones
- Clear limited areas only where the pole will be erected

➤ **Construction material sourcing-wooden poles.**

Majority of these service lines are constructed using wooden poles. This would impact on the environment as close to a million poles will be needed according to the preliminary estimates

**Mitigation**

- Consider use of concrete poles to avoid deforestation
- Plant more trees to compensate for the poles used
- Ensure accurate budgeting to ensure only necessary material is ordered
- Proper storage to ensure minimal loss

➤ **Impacts on air quality from vehicle exhaust emissions**

Exhaust emissions are likely to be generated by the vehicles used to ferry materials during construction. These exhaust emissions can impact on the quality of air.

**Mitigation**

- Drivers shall not leave vehicles idling so that exhaust emissions are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions are produced.
- Keep stockpiles for the shortest possible time
- Minimise movement of construction traffic around site this can be achieved through better planning of vehicle movement

➤ **Solid waste**

Little if any solid waste will be generated which includes conductor and tree cuttings.

**Mitigation**

- All left over conductor cuttings to be disposed appropriately or be returned to the store for proper disposal
- Proper budgeting of materials to reduce wastage
- Re use of materials

➤ **Risk of Fire from live conductors and Transformers-**

Potential adverse impacts related to fire hazards remain a main feature of this project. The Transformers will have combustible products like the transformer oil and the risks associated with fire hazards form a significant adverse impact on the human health and environment

### **Mitigation**

- No burning of vegetation along the distribution lines rights-of-way
- Timely maintenance of the right of way
- Time maintenance of transformers

#### **➤ Oil Leaks**

The refilling and emptying of the transformer oil can lead to accidental oil spills. There is a possibility of oil leaking from the transformers can lead to oil spills. This may lead to potential contamination of surface and groundwater as well as soil.

### **Mitigation**

- Need to design appropriate protection devices against accidental discharge of transformer oil substances.
- Frequent inspection and maintenance of the transformers should be done to minimize spilling.

## 10.5 Environmental and Social Characteristics of Proposed Project Sites

Table 5: Environmental and Social Characteristics of Proposed Project Sites

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
<b>LAMU EAST CONSTITUENCY</b>						
High and in other areas Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches/Mosques</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Police station</li> <li>• Cemetery</li> </ul>	<ul style="list-style-type: none"> <li>• Acacia, Shrubs and indigenous tree species</li> </ul>	Gently sloping	Sandy	Terrestrial and Avi-fauna	Public awareness on safe use of electricity required. Consult with local elders before cutting or pruning any indigenous tree
<b>LAMU WEST CONSTITUENCY</b>						
High and in other areas Medium	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches/mosques</li> <li>• Schools</li> <li>• Administrative (Chief's camp)</li> <li>• KWS Mpeketoni</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neem, mangoes, sorghum and pawpaws</li> <li>• Grass, shrubs and indigenous trees</li> </ul>	Relatively flat with presence of ocean and flowing rivers	Sandy soil	Terrestrial and Avi-fauna	TX No. 1903 on paper not same on ground (19009) Consult with local elders before cutting or pruning any indigenous

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
						tree
<b>KITUI RURAL CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>•Commercial</li> <li>•(Markets and Micro-enterprises)</li> <li>•Churches</li> <li>•Residential</li> <li>•Schools</li> </ul>	<ul style="list-style-type: none"> <li>• MakhamiaLutea, acacia, shrubs, cactus and sisal etc.</li> </ul>	Relatively Flat and other places Gently sloping with flowing rivers and streams	Sandy soil	Avi fauna and terrestrial fauna	Public awareness on safe use of electricity required -
<b>KITUI EAST CONSTITUENCY</b>						
Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. grivellia and sisal</li> <li>• Grass, acacia, cactus, meru oak, shrubs</li> </ul>	Hilly with flowing stream	Sand soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required -
<b>KITUI CENTRAL CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and High	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Croton, Grevillea, Jacaranda, sisal and food crops</li> <li>• Grass, Makhamia, Lutea, Meru oak, Cactus, Acacia</li> </ul>	Gently sloping, flowing stream	Sandy soil and Red loam soil	Avi-fauna and terrestrial fauna	Good
<b>KITUI SOUTH CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Schools</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. sisal, food crops and grevillea,</li> <li>• Natural e.g. cactus, Grass, baobab, cactus</li> </ul>	Relatively flat	Sandy soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required -
<b>KITUI WEST CONSTITUENCY</b>						



Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. mangoes, grivellia, sorghum, bananas, pigeon peas, croton, sisal and maize</li> <li>• Natural e.g. Grass, acacia, fig tree</li> </ul>	Relatively flat and other places gently sloping with flowing streams	Sandy soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>KITUI NORTH CONSTITUENCY</b>						
High and Moderate	<ul style="list-style-type: none"> <li>• Commercial</li> <li>• Schools</li> <li>• Residential</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Acacia, Baobab and Cactus</li> </ul>	Hilly and other places relatively flat	Sandy soil	Avi fauna and terrestrial fauna	-
<b>GARSEN CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Health facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neem, sisal, Pine, Eucalyptus, grevillea, Plenty of indigenous trees</li> <li>• Natural e.g. Grass, shrubs, cactus, prosopis juliflora, and acacia</li> </ul>	Gently sloping	Sandy soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>BURA CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Health facilities</li> <li>• Residential</li> <li>• Churches</li> <li>• Mosques</li> <li>• Schools</li> <li>• Small scale irrigation schemes</li> </ul>	<ul style="list-style-type: none"> <li>• Planted e.g. onions, maize, other food crops, Croton, grevillea,</li> <li>• Natural e.g. Grass, Acacia, prosopis juliflora</li> </ul>	Gently sloping and other places relatively flat with flowing river	Sandy soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>GALOLE CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Health facilities</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Mosque</li> </ul>	<ul style="list-style-type: none"> <li>• Shrubs, Acacia and Prosopis juliflora</li> </ul>	Relatively flat	Sand soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>IJARA CONSTITUENCY</b>						
Low	<ul style="list-style-type: none"> <li>• Commercial</li> <li>• Residential</li> <li>• Mosques</li> <li>• Water supply and treatment works</li> <li>• Schools</li> <li>• Agricultural</li> <li>• Health facilities</li> <li>• Administrative (police station and government offices)</li> </ul>	<ul style="list-style-type: none"> <li>• Cactus, Acacia and Prosopis juliflora, shrubs</li> </ul>	Relatively flat	Sand soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>MWINGI EAST CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• KETRACO Mwingi 132/33kV substation</li> <li>• Water points</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Croton</li> <li>• Natural e.g. Grass, acacia, cactus</li> </ul>	Relatively flat	Red Loam	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required -
<b>MWINGI SOUTH CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Transmission masts</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Cypress, Croton,</li> <li>• Natural e.g. Grass, cactus, shrubs, acacia and baobab</li> </ul>	Relatively flat and other places hilly	Sandy soil	Avi-fauna and terrestrial fauna	-
<b>MWINGI WEST CONSTITUENCY</b>						
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Administrative purposes</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Eucalyptus, grevillea, croton, fruits and food crops</li> <li>• Natural e.g. Grass, acacia, shrubs and cactus</li> </ul>	Hilly	Sandy loam	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>BALAMBALA CONSTITUENCY</b>						

Population Density	Existing Land Uses	Vegetation	Topography	Soil Types	General Ecological Setting	Public Safety
Medium and Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Health facilities</li> <li>• Agricultural</li> </ul>	<ul style="list-style-type: none"> <li>• Grass, acacia, shrubs</li> </ul>	Relatively flat	Sandy soil	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required
<b>GARISSA TOWNSHIP CONSTITUENCY</b>						
High, Medium and other places Low	<ul style="list-style-type: none"> <li>• Commercial (Markets)</li> <li>• G.K Prison</li> <li>• Recreational Centre</li> <li>• Residential</li> <li>• Churches</li> <li>• Schools</li> <li>• Administrative purposes</li> <li>• Health facilities</li> <li>• Agricultural</li> <li>• Mosques</li> <li>• Transmission Masts</li> <li>• GAWASCO treatment works</li> </ul>	<ul style="list-style-type: none"> <li>• Planted trees e.g. Neem, Casorina, Croton,</li> <li>• Natural e.g. Grass, shrubs, prosopisjuliflora, Acacia</li> </ul>	Relatively flat	Sandy loam	Avi-fauna and terrestrial fauna	Public awareness on safe use of electricity required

## **10.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

The Environmental and social management plan for the proposed development project allows for identification of environmental and social impacts, development of mitigation measures, management actions and establishment of a structure to ensure effective implementation of the mitigation measures. ESMP is an important outcome of the environmental and social screening process as it provides a checklist for project monitoring and evaluation. The ESMP specifies the mitigation and management measures that the proponent shall undertake and shows how the project shall mobilize organizational capacity and resources to implement these measures.

The environmental and Social Management Plan is as shown below:

**Table 6: Environmental and Social Management Plan**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
<b>Minimize vegetation disturbance along construction site</b>				
Vegetation Disturbance	<ul style="list-style-type: none"> <li>Choose routes that offer minimal disturbance to vegetation and where inevitable clear manually only necessary vegetation.</li> <li>Properly demarcate the project area to be cleared during installation of supply droplines</li> <li>Designate parking lots within the project area to prevent vegetation disturbance</li> <li>Plant suitable trees within the project area to compensate for any damaged ones</li> <li>Compensate for any damaged trees and crops</li> </ul>	Project engineer and contractor	2 Months	<p><b>200,000.00</b></p> <p>To be determined</p>
<b>Reduce soil erosion and surface run off</b>				
Increased soil erosion and surface run off	<ul style="list-style-type: none"> <li>Use existing roads and avoid ground disturbance as much as possible</li> <li>Site excavation works be planned in such a manner that a section is completed and rehabilitated before another commences</li> </ul>	Project engineer and contractor	Throughout construction period	<b>0.00</b>
<b>Air Pollution</b>				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Dust emission	<ul style="list-style-type: none"><li>• Avoid excavation works in extremely dry seasons</li><li>• Sprinkle water on degraded access routes to reduce dust emission during transportation of materials to project sites</li><li>• Provide and ensure use of appropriate personal protective equipment by workers on site</li></ul>	Project engineer and contractor	Throughout project period	50,000.00
Exhaust emission	<ul style="list-style-type: none"><li>• Use wheel serviced vehicles and any other motorized equipment</li><li>• Sensitize truck drivers to avoid unnecessary running engines on stationery vehicles and switch off engines whenever possible</li></ul>			0.00
Minimize occupational safety and health risks				
Open excavations	<ul style="list-style-type: none"><li>• Barricade the proposed project area using high visibility tape to avoid falls into open excavations</li><li>• Pole pits should be dug and poles erected immediately and where inevitable the pit shall be covered to avoid falls and injury to humans and animals, or traffic accidents.</li><li>• Contractor to compensate any injuries to the public and animals arising from his negligence</li></ul>	Contractor	Throughout project period	To be determined



Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
Working at height	<ul style="list-style-type: none"> <li>Observe clearance from power lines and workers to be experienced with necessary qualifications</li> <li>Test power lines to ensure they are shut down before work</li> <li>Provide appropriate personal protective equipment for workers involved in activities above 2 meters from ground level</li> <li>Provide storage bags for portable tools used while working at height.</li> </ul>		Throughout project period	0.00
Safety and health awareness	<ul style="list-style-type: none"> <li>Carry out safety and health inductions and toolbox talks for all workers involved in the project to enhance awareness on safety and health requirements</li> </ul>	Contractor and project engineer	Throughout project period	0.00
Pricks and cuts	<ul style="list-style-type: none"> <li>Ensure project area is kept free of sharp objects</li> <li>Provide appropriate foot protection to workers within the site</li> </ul>	Contractor and project engineer	Throughout project period	
<b>Public safety and health</b>				
Shocks and electrocutions	<ul style="list-style-type: none"> <li>Create awareness to the public on the potential impacts of powered lines to prevent</li> </ul>	Contractor and proponent	Before commencement of the project	200,000.00

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
	electrical hazards			
Project infrastructure	<ul style="list-style-type: none"><li>Create public awareness on the need to protect public infrastructure for continued supply of electricity and to minimize exposure to electrical hazards</li></ul>			
HIV/AIDS	<ul style="list-style-type: none"><li>Create awareness to the public and workers on HIV/AIDS and liaise with the ministry of health to provide condom dispensers at all project worksites</li></ul>			
Social Vices	<ul style="list-style-type: none"><li>Awareness creation to the public and liaising with area administration to enhance security</li></ul>			
Damage to property				
Damage to structures erected on the way leaves	<ul style="list-style-type: none"><li>Ensure timely dissemination of information on the need to carry out works on occupied way leaves to allow for relocation of erected structures</li><li>Use existing wayleaves and road reserves to minimize disturbance and unnecessary compensations</li><li>Where it is inevitable, compensate for damaged property</li></ul>	Contractor and proponent	Before commencement of the project	To be determined
Risk of sparks/ fires from	<ul style="list-style-type: none"><li>Contractor to ensure all fittings</li></ul>	Contractor, Proponent	Implementation	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time frame	Cost (Ksh)
live conductors	<p>are tight and implemented using quality materials to prevent arcing and any loose connections.</p> <ul style="list-style-type: none"> <li>• Contractor to ensure right tension and spacing is well implemented for conductors.</li> <li>• Premises to be wired by qualified technicians and test certificates maintained</li> </ul>	Customers	Before connection	

## **10.7 CONCLUSIONS AND RECOMMENDATIONS**

The Last Mile connectivity project will have numerous positive impacts not only to the company but also to the consumers especially those in low income groups. This is through improving security especially in areas that do not have power connection, improving living standards, ensuring social inclusion, enhancing communication among people through television and radios as well as benefiting education in Kenya especially through connecting schools. Negative impacts resulting from construction and implementation of the project include: emission of exhaust fumes, solid wastes generation, transformer oil leaks, shocks and electrocutions and noise during construction among others and shall be adequately mitigated.

The company is committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the company focuses on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

### **Recommendation**

- The positive impacts that emanate from the LMCP be maximised as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.
- KPLC to carry out adequate public/customer engagements must be carried out to ensure the potential customers understand the project and assess their eligibility in terms of willingness and ability to pay for power.
- All the customers under this project to be put on prepaid meters such that tokens bought may take into account the cost of connection and also to avoid bad debts as consumption will be paid up front.
- KPLC to have a dedicated team to follow up and monitor the project implementation and utilisation of electricity as well as the quality of service to the targeted customers and also to deal with any emerging challenges.